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Patente de Invención



Patente de Modelo de Utilidad

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Número: 438.019 TP 31.929

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C.E.



Otro



Número: _____

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TITULO (54)

**PREPINTURAS Y METODO DE PREPARACIÓN DE PINTURAS
 MARCADORAS DE VIAS PROVENIENTES DE PREPINTURAS**

6

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7

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8

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9

Comprobante de pago No. 01-44,648 por \$ 356,640.00 Fecha 23 de Julio de 2001
Comprobante de pago No. 01-40,364 por \$ 100,000.00 Fecha 4 de Julio de 2001
Comprobante de pago No. 01-40,628 por \$ 100,000.00 Fecha 23 de Julio de 2001

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ANEXOS

☒Comprobante de pago de la tasa de presentación de la solicitud
☐Comprobante de pago de la tasa por concepto de excedente de palabras en la publicación
☒Comprobante de pago por reivindicación de prioridad
☐Certificado de existencia y representación legal cuando el solicitante sea persona jurídica
☒Poderes, si fuere el caso (7 poderes)
☒Copia certificada de la primera solicitud, si se reivindica prioridad
☐Traducción simple de la primera solicitud, si se reivindica prioridad
☐Documento de cesión del inventor al solicitante o a su causante
☒Descripción de la invención
☒Una o más reivindicaciones
☐Dibujos y/o planos necesarios
☐De ser el caso, copia del contrato de acceso
☐De ser el caso, documento que acredite la licencia o autorización de uso de conocimientos tradicionales de las comunidades indígenas
☐De ser el caso, certificado de depósito del material biológico
☐Arte final 12 x 12.

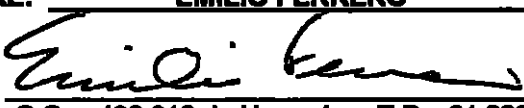
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FIGURA CARACTERISTICA:

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NOMBRE: EMILIO FERRERO

FIRMA: 

C.C. 438.019 de Usaquén T.P. 31.929

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**PREPAINTS AND METHOD OF PREPARING
ROAD-MARKING PAINTS FROM PREPAINTS**

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Applications Ser. Nos. 60/183,655 filed February 18, 2000, 60/183,656 filed February 18, 2000, and 60/247,639 filed November 10, 2000.

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to sets of prepaints, a method of preparing road-marking paint lines from the sets of prepaints and to a method of preparing a range of road-marking paints from the sets of prepaints.

Description of Related Art

Paint formulation involves the process of selecting and admixing appropriate paint ingredients in the correct proportions to provide a paint with specific cost, processing and handling properties, as well as the desired final dry paint film properties. The major ingredients of many paint formulations are a binder, an opacifying pigment, an optional pigment extender, and a fluid medium, e.g., water if the paint is a water-borne paint such as a latex paint or a solvent if the paint is a solvent-borne paint such as an oil-based paint. Typically, optional ingredients are included such as defoamers, coalescents, plasticizers, thickeners, non-thickening rheology modifiers, solvents, driers, anti-skinning agents, surfactants, mildewcides, biocides, and dispersants. After the paint is formulated and applied to a surface, the paint dries by evaporation of the water and/or solvent, with or without the application of heat or radiation, and the binder forms a film containing therein the pigment and the extender particles, if any.

Formulating paints is complex. It is not simply a matter of mixing a few paint ingredients in different ratios. Rather, it involves the selection and mixing of different paint ingredients in different ratios depending on the type of paint desired. This requires paint manufacturers to store many different paint ingredients and change paint ingredients during manufacture depending on the specific paint type being prepared.

Furthermore, it requires those involved in the supply chain and, in particular, paint retailers to carry a large inventory of paints in order to offer a range of paints having various

would be desirable to make paints, either at a relatively large-scale industrial plants or on a relatively smaller-scale, at point-of-sale or at point-of-use locations using a limited number of paint ingredients to prepare all of these different paint formulations, thus minimizing the number and type of paint ingredients required to make a range of paints.

In general, road-marking paint formulations are less complex than architectural paint formulations and typically are only tinted to a limited range of colors (white, yellow, light blue, red and black) rather than to the extremely wide palette of colors available for many architectural paint formulations. However, a number of different ingredients must be combined to form the final road-marking paint. Road-marking paint formulations may also require quick-setting which further complicates their formulation because the manufacturer, seller, or user must balance the advantages of quick-setting with the inherent limited pot-life that such paints exhibit. In addition, road-marking paints may need to be applied, due to road safety requirements, under different conditions than are typically experienced when an architectural paint is applied. For example, road-marking paints may need to be applied over a temperatures range of from just above 0°C to greater than 40°C and in different humidities. In addition, road-marking paints are exposed to rigorous conditions immediately after application, such as heavy traffic flow and deteriorating and unexpected weather conditions.

Thus, there is a need for a road-marking paint which can be used at the point of application under the ambient conditions, including temperature, humidity, traffic flow and the like, in addition to the other benefits offered by delayed product differentiation.

SUMMARY OF THE INVENTION

Paint manufacturers and retailers typically offer a range of paints, which includes at least two paint lines. As used herein, "the range including at least two paint lines" is meant that discrete elected levels of an observable property defining a first paint line are combined with discrete elected levels of an observable property defining a second paint line to define the paints in the range of paints. For example, to prepare a range of paints including four paint lines it may be necessary to prepare paints encompassing four sheen levels, four tint bases, two use areas — interior use and exterior use, and three quality levels, and preferably all combinations thereof which means 96 different paint formulations ($4 \times 4 \times 2 \times 3$) may be needed. Also encompassed, however, is a range of paints in which certain of the defined paints, up to 10-60% of the total number of paints, are selected to be omitted, for example, for commercial reasons. Further

contemplated is a range of paints in which the observable properties of the dried paint films substantially, but not exactly, fulfill the definition herein; for example, the sheen of a dried outdoor mid-tone gloss paint in the standard, better, and premium lines may differ by a few points without departing from the meaning of a range of paints of this invention.

A "paint line," as used herein, includes at least two different paints which offer dried film properties which differ materially from each other in at least one observable property such as color and outdoor durability.

As used herein, prepaints are "mutually compatible" if the paints formed by admixing the prepaints do not evidence signs of colloidal instability such as flocculation. Preferably, prepaints, as well as the paints formed from the prepaints, exhibit less than 5 g of residue such as gel and grit per liter of paint when the paint is passed through a 200 mesh screen, more preferably less than 1 g of residue.

The present invention provides a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line useful for road-marking applications. The prepaints include at least one fluid prepaint including at least one opacifying pigment, at least one fluid prepaint including at least one extender pigment, and at least one fluid prepaint including at least one polymeric binder. Preferably, the number of prepaints is 3-15.

Also provided is a method of forming at least one paint line useful for road-marking applications, which method comprises the steps of:

- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line, which set comprises (i) at least one opacifying prepaint comprising at least one opacifying pigment; (ii) at least one extender prepaint comprising at least one extender pigment, and (iii) at least one binder prepaint comprising at least one polymeric polymer binder; and
- (b) dispensing a predetermined amount of each of the prepaints into containers or an applicator to form the paint line.

Further provided is a method of forming a range of paints, which range includes at least two paint lines useful for road-marking applications, which method comprises the steps of:

- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate a range of road-making paints, which set comprises (i) at least one opacifying prepaint comprising at least one opacifying pigment; (ii) at least one extender prepaint comprising at least one extender pigment; (iii) at least one binder prepaint comprising at least one polymeric binder;

and (iv) at least one additional different prepaint selected from the group consisting of prepaints (i), (ii), and (iii); and

(b) dispensing a predetermined amount of each of the prepaints into containers or applicators to form the paints. The total number of prepaints is preferably 4-15.

The above methods may further include the step of mixing the prepaints before, while, or after they are dispensed into the containers or before or while they are dispensed into the applicators.

In another embodiment, the above goal is achieved by employing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line useful for road-marking applications. The set comprises (i) at least one opacifying/binder prepaint which comprises at least one opacifying pigment and at least one polymeric binder; and (ii) at least one extender pigment which comprises at least one extender pigment. The number of prepaints is preferably 2-15, also provided is a method of forming at least one paint line useful for road-marking applications, comprises the steps of:

(a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line, which set comprises (i) at least one opacifying binder prepaint comprising at least one opacifying pigment and at least one polymeric binder; and (ii) at least one extender/binder prepaint including at least one extender pigment and at least one polymeric binder; and

(b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the paint line.

A method of forming a range of paints is provided. The range includes at least two paint lines useful for road-marking applications. The method comprises the steps of:

(a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate the range of road-marking paints, which set comprises (I) at least one opacifying/binder prepaint comprising at least one opacifying pigment and at least one polymeric binder, (II) at least one extender prepaint comprising at least one extender pigment, and (III) at least one additional different opacifying/binder prepaint or one extender prepaint selected from (I) or (II); and

(b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the range of paints.

The above methods may further comprise the step of mixing the prepaints before, while, or after they are dispensed into the containers or before or while they are dispensed into the applicator(s). The total number of prepaints is preferably 3-15.

The method may further include the step of adjusting the viscosity of the dispensed prepaints before, while, or after they are dispensed into the containers or before or while they are dispensed into the applicator(s) using a thickener, water, or mixtures thereof. The methods may be carried out at a paint manufacturing facility, a point-of-sale or a point-of-use and may be controlled by a computer.

Additives may be used to enhance the application of the road making paints or final performance properties of the road-making paints. In addition, at least one colorant, typically white or yellow, may be added the dispensed prepaints. Alternatively, the opacifying prepaint may further comprise at least one colorant. The colorants are preferably white or yellow.

The prepaints may comprise a polymeric binder that is a latex polymer. They may further comprise at least one quick-setting fluid prepaint. Alternatively, the set of prepaints may contain a polymeric binder that is a quick-setting binder. Alternatively, the quick-setting component may be added as a separate ingredient. Furthermore, a combination of the above may be utilized.

One or more paint lines can be prepared. A paint line includes two or more different paints whose dried films differ materially from each other in at least one observable property.

If only one paint line is desired, *i.e.*, if one key property is to be varied (*e.g.*, sheen level, tint base, use type, or quality type), then the complete paint line can be made from one each of the opacifying prepaint, (i) extender prepaint (ii) and binder prepaint (iii) or one each of opacifying/binder prepaint (I) and prepaint extender (II).

If a range of paints including two paint lines is desired, *i.e.*, if two key properties are varied (*e.g.*, two properties selected from sheen level, tint base, use type, and quality type), this range of paints may be made from: at least one each of the opacifying prepaint, (i) the extender prepaint, (ii) and the binder prepaint (iii) and at least one additional different prepaint selected from the group consisting of opacifying prepaint (i) extender prepaint (ii), and binder prepaint (iii); and opacifying/binder (I), at least one each of prepaint (I), extender prepaint (II) and at least one additional different prepaint selected from the group consisting of the opacifying/binder prepaint I and the extender prepaint II; and depending on which key properties are to be varied. By "additional different prepaints" selected from prepaints (i), (ii), and (iii) or "additional different prepaints" selected from prepaints (I) and (II) is meant a prepaint different from prepaint

(i), (ii), and (iii) or (I) and (II), respectively, but otherwise meeting the limitations associated with prepaint (i), (ii), and (iii) or prepaits (I) and (II).

If a range of paints including three paint lines is desired, *i.e.*, if three key properties are varied (for example, three properties selected from sheen level, tint base, use type, and quality type), then the range of paints can be made from at least one each of the opacifying prepaint (i) its extender prepaint (ii) and the binder prepaint (iii) and at least two additional different prepaits selected from the opacifying prepaint (i) the extender prepaint (ii), and the binder prepaint (iii); or at least one each of the opacifying/binder prepaint (I), the extender prepaint (II), and at least two additional prepaits selected from the group consisting of prepaits I and II; depending on which key properties are to be varied.

If a range of paints including four paint lines is desired, *i.e.*, if four key properties are varied (for example, sheen level, tint base, use type, and quality type) then the complete range of paints can be made from at least one each of the opacifying prepaint (i), the extender prepaint (ii), the binder prepaint (iii) and at least three additional different prepaits selected from the group consisting of prepaits (i), (ii), and (iii) or at least one each of opacifying/binder prepaint (I), extender prepaint (II), and at least one additional prepaint selected from the group consisting of prepaits I and II; depending on which key properties are to be varied.

The technique described above may be repeated to vary as many additional key properties as desired.

The pigment volume concentration (hereafter "PVC") is a measure of how "binder-rich" a formulation is. It is calculated using the following formula:

$$\text{PVC (\%)} = \frac{\text{volume of pigment(s)} + \text{volume extender(s)}}{\text{volume of pigment(s)} + \text{volume extender(s)} + \text{volume binder(s)}} \times 100$$

The volume solids content (hereafter "VS") is the dry volume of pigment(s) plus dry volume of extender(s) plus dry volume of binder(s). It is calculated using by the following formula:

$$\text{VS (\%)} = \frac{\text{dry volume of pigment(s)} + \text{dry volume of extender(s)} + \text{dry volume of binder(s)}}{\text{total volume of formulation}} \times 100.$$

If additives are present, their volume is not included in determining the total dry volume.

In each of the above embodiments, the prepaits are selected so they provide a wide formulation space so that the desired final paint properties lie within the blend space defined when the prepaits are at the extremes. In many cases, the prepaits will not by themselves be

practical paints; however, by pushing the prepaints to these extremes one can maximize the blend space available for the paint line. When the prepaints, additives, and colorants are all fully compatible, they can be blended at the desired ratios to achieve the desired paint line(s) and range of paints without inducing colloidal instability.

This technique is similar to the design principles used in statistical experimental design and analysis of mixture component designs; however, instead of designing a mixture space to explore the response surface within it, one is designing the boundaries of the mixture space to maximize the flexibility of the paint system. The key to success is to have mutual compatibility of the individual ingredients in each prepaint and of the prepaints across the mixture space.

Paint properties can be predicted in a number of ways. One approach is to develop response surface models of the blend space using standard mixture component experimental design statistical tools. These simple statistical models can then be used by a linear optimization program, by a massive grid search, or by a graphical analysis tool. Another approach is to simply use empirical methods to determine which blends are needed for specific paint lines, then incorporate those simple empirical recipes in the paint making machine software.

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An extension of these techniques is to have the paint machine automatically pretest certain key properties (e.g., viscosity, drying speed, opacity or color) and make minor adjustments during the formulating of the paint from the prepaints. Having feedback loops in the paint machine can provide more precise matching of viscosity, drying speed, opacity, and color targets.

If colorants and optional additives are included in the prepaints to enhance specific paint properties and the additives and/or colorants are fully compatible, i.e., they can be blended at any ratio without inducing colloidal instability, then they can be blended in any combination falling within the formulation space needed to achieve the desired profile in the final paint. It is sufficient, however, for the colorants and optional additives to be compatible, i.e., they can be blended at desired ratios to achieve the desired property profile in the range of paints without inducing colloidal instability.

As used herein, "compatible paint ingredients" may be combined in the various prepaints and the paints formed from the prepaints provide the properties characteristic of the amount of ingredient used.

Preferably, all the fluid prepaints used in the methods of the present invention have the same or similar viscosities. This aids in mixing. Viscosity fluctuations in the final paints is expected to be reduced because of the prior equilibration of ingredients in the prepaints.

The prepaints are formulated to maximize the flexibility of paint manufacturing. Rather than purchasing individual paint ingredients, paint manufacturers, and even buyers at point-of-sale and point-of-use (paint stores, paint departments, and contractors) can purchase the set of prepaints required to prepare a desired range of paints. These prepaint sets will contain at least one each of the opacifying prepaint, the extender prepaint, and the binder prepaint and possibly additional prepaints depending upon the formulating flexibility desired. Optionally, the above prepaints are mixed with an additional prepaint which includes at least one colorant such as a colored pigment or dye.

The method of the present invention is not limited to preparing only latex paints *per se* but may also be extended to preparing any water-borne or solvent-borne coating, or related building product requiring mixing of ingredients, including, sealants, caulks, mastics, adhesives and other building-related products.

DETAILED DESCRIPTION OF THE INVENTION

In one embodiment, the prepaint is a fluid titanium dioxide prepaint which comprises at least one titanium dioxide opacifying pigment, at least one dispersant, at least one thickener, and water. The prepaint ingredients and other optional paint ingredients are mutually compatible with each other and in the final paint. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 65%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. Preferably, the prepaint is stable to sedimentation, *i.e.*, the pigment does not settle out after 10 days at 25°C.

In another embodiment, the prepaint is a fluid titanium dioxide prepaint useful for formulating a one pack, pigmented latex paint containing other paint ingredients. The prepaint includes at least one opacifying pigment, at least one dispersant, at least one thickener, at least one film-forming or nonfilm-forming polymeric binder, and water. The prepaint ingredients are mutually compatible with each other and with other optional paint ingredients. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 65%, a PVC of about 35% to 100%, preferably about 45% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. Preferably, the prepaint is stable to sedimentation, *i.e.*, it does not settle out after 10 days at 25°C. Optionally, the polymeric binder is adsorbed onto the titanium dioxide opacifying pigment or other opacifier of present.

In one embodiment of prepaint, the pigment, the extender, the prepaint includes at least one mineral extender, at least one thickener, an optional polymeric binder and water. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 70%, a PVC of about 35% to 100%, preferably about 40% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. The prepaint ingredients are compatible with each other and with the ingredients of the other prepaints and should be compatible with ingredients of the other prepaints with which it will be used.

In one embodiment of extender prepaint (II), the fluid pigment extender prepaint includes at least one mineral extender, at least one thickener, a polymeric binder and water. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 70%, a PVC of about 35% to 100%, preferably about 40% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. The prepaint ingredients are compatible with each other and with the ingredients of the other prepaints and should be compatible with the ingredients of the other prepaints with which it will be used.

In one embodiment, fluid latex polymer binder prepaint includes a water-borne latex polymer binder having a Tg of about -30°C to about 70°C, preferably about -10°C to about 60°C, and water. The binder prepaint has a volume solids content of about 25% to about 70%, preferably about 30% to about 65%, and a Brookfield viscosity of less than about 100,000 centipoise, preferably about 100 to about 50,000 centipoise, at a shear rate of 1.25 reciprocal seconds. The prepaint ingredients are compatible with each other and with the ingredients of the other prepaings that they will be used with.

In the embodiments where prepaings I, II, i, ii, and iii are used, minor amounts, *i.e.*, less than about 20% by weight, based on the total weight of the prepaint, of conventional paint additives an acid, a base, a defoamer, a coalescent, a cosolvent, a dispersing resins, a mildewcide, a biocide, an antifreeze agent, a durability enhancer (including water-miscible or emulsified epoxies, waterborne isocyanates and silanes), and the like may be included. These additives must be compatible with the other paint ingredients in the prepaings and the other prepaings used in the methods of this invention. Furthermore, if durability enhancers are employed, the road-marking paint may have a pot-life of less than about 8 hours and thus would need to be applied in this time frame.

Opacifying pigments useful herein include white pigments which impart white scattering power to the paint across all visible wavelengths without a high degree of absorption. Pigment extenders are inorganic solids or opaque polymers which do not impart the primary color or hiding power to the paint although they may have secondary influences on those properties. The tint bases used for deep tone paints typically contain no or only very low levels of opacifying pigments.

Suitable opacifying pigments include titanium dioxide (TiO₂) or a combination of titanium dioxide and auxiliary hiding pigments such as voided latex polymer particles, zinc oxide, lead oxide, a synthetic polymer pigment, and mixtures thereof. Rutile and anatase grades of titanium dioxide are suitable for use herein. Rutile titanium dioxide is preferred. The surface of the titanium dioxides may be treated with various organic and/or inorganic surface treatments, *e.g.*, as the oxides of silica, alumina, and zirconia. Fumed titanium oxide is also useful herein.

The voided latex particles useful herein have a particle size diameter of about 100 nm to about 2,500 nm, preferably about 500 nm to 1,100 nm and a void fraction of about 10% to about 75%. The voided latex particles have at least one void but may have multiple voids, non-spherical voids, interconnected voids, voids having channels connected to the outside of the

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particles, and void structures described as vesiculated and sponge-like. Preferably, the voided latex particles have a single void. The voided latex particles have a glass transition temperature (T_g), as measured by differential scanning calorimetry at a rate of 20°C/min, of at least about 20°C, preferably at least about 50°C. The higher the glass transition temperature, the harder the particle is and the less likely it is to collapse. If the voided latex particles collapse, they are unable to contribute to hiding. The voided latex particles may be prepared by conventional polymerization processes known in the art, such as those disclosed in US-A-3,784,391, US-A-4,798,691, US-A-4,908,271, US-A-4,972,000, US-A-5,041,464, US-A-5,157,084, US-A-5,216,044 and US-6,020,435, as well as Japanese Patent Applications 60/223,873, 61/62510, 61/66710, 61/86941, 62/127336, 62/156387, 01/185311, and 02/140272. Preferably, the voided latex particles are prepared according to US-A-4,427,836, US-A-4,469,825, US-A-4,594,363, US-A-4,880,842, US-A-5,494,971 and US-A-6,020,435.

Extender pigments provide low cost volume, are not soluble in water, and have a low absorption number. Extender pigments used in road-marking paints are optimized for dispersion viscosities, brightness, and low cost. Suitable extender pigments include barium sulfate (about 1 to about 15 microns), Blanc Fixe (about 0.5 to about 5 microns), calcium carbonate (about 0.05 to about 35 microns), silica (about 0.001 to about 14 microns), magnesium silicate (about 0.5 to about 15 microns), aluminum silicate (about 0.2 to about 5 microns), mica, bentonite, magnesium alumino-silicate, fumed alumina, colloidal attapulgite, synthetic amorphous sodium alumino-silicate, sodium potassium alumino-silicate, and the like including combinations thereof. Glass, ceramic, polymeric beads or microspheres and combinations thereof may also be used.

Latex polymeric binders are polymers or prepolymers which form the primary film of the paint. Binders bind the pigment(s) and/or extender(s), provide the required paint flow, and determine the durability and drying properties of the final paint film. The binders selected for the prepaints will depend upon the final use of the formulated paints. It may be necessary and desirable to use binders which may be either quick-setting or non-quick-setting and which have the ability to achieve quick-setting times between the slowest and fastest setting times. For example, it may be desirable to include binders which are quicker setting when the paints are applied on a humid or rainy day, but not desirable from a cost perspective when the paints are applied on a dry day. It is within the scope of the present invention to utilize both types of binders in the system by:

- (1) separating the component(s)/ingredient(s) that cause the quick-setting ("quick-setting component") from the component(s)/ingredient(s) that form the binder as a separate prepaint;
- (2) separating the component(s)/ingredient(s) that cause the quick-setting ("quick-setting component") from the component(s)/ingredient(s) that form the binder into separate prepaints;
- (3) employing a quick-setting binder in the binder prepaints (when a quick-setting binder is not required as a separate quick-setting component);
- (4) adding the quick-setting component separately from any of the prepaints; and
- (5) combinations thereof

In the method of the invention, the quick-setting component is added as a separate component or prepaint, as described in Example 4 below. By controlling the presence and level of either the quick-setting component or the quick-setting binder, one can "dial-in" exactly the formulation that one wants depending upon cost structure and environmental conditions.

As used herein, the term "quick-setting," means a coating that has a drying time of no greater than about 10 minutes as measured by a modified ASTM D1640 dry time test. The test used is similar to ASTM D1640 which is a standard test for drying of organic coatings at room temperature in which the test films are applied on a non-porous substrate (e.g., a glass plate or metal panel) by a suitable means to give a wet film thickness of 0.012 +/- 0.001 inches. The ASTM test method is modified in that only minimal thumb pressure is applied. The thumb is turned through an angle of 90° while in contact with the test film. The drying time at which this rotation does not break the film is recorded.

A number of these quick-setting binder systems are known in the art. Suitable quick-setting systems (with either quick-setting binders or components) include, but are not limited to:

- (a) an aqueous dispersion including an anionically-stabilized polymer having a Tg of at least about -10°C, a non-protonated or partially protonated polyamine functional polymer formed from either an amine or an imine monomer (quick-setting component), and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;
- (b) an aqueous dispersion including a polyamine functional polymer that is a latex polymer having pendant amine-functional groups and a Tg of at least about -10°C (*i.e.*, quick-setting binder or component) and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;
- (c) an aqueous dispersion including a polyamine functional polymer that is a latex polymer having pendant amine-functional groups and pendant acid-functional groups where the ratio of

amine-functional groups to acid-functional groups is greater than about 3 to 1 and where the polymer has a Tg of at least about -10°C and pendant acid-functional groups (*i.e.*, quick-setting binder or component); and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;

(d) an aqueous dispersion including a polyamine functional polymer having a Tg of at least about -10°C and that is a latex polymer having pendant amine-functional groups (*i.e.*, quick-setting component), and a latex polymer that has a Tg of at least about -10°C pendant acid-functional groups (*i.e.*, quick-setting component), and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;

(e) an aqueous dispersion including an aqueous emulsion containing a polyamine functional polymer (*i.e.*, quick-setting binder or component) having a Tg of at least about -10°C, formed from polymerizable monomers including (a) alkyl esters of acrylic or methacrylic acid where the alkyl ester is a C₁-C₁₈ alkyl ester; (b) from about 0.1 to about 5% by weight, based on the acrylic or methacrylic film forming polymer of at least one secondary or tertiary aminoacrylate monomer, or secondary or tertiary aminomethacrylate monomer, and (c) from about 0.1 to about 5% by weight, based on the acrylic or methacrylic film forming polymer of a crosslinkable monomer selected from the group consisting of acrylamide, methacrylamide, and N-alkylol acrylamide; and said polyamine functional polymer having less than 3 percent by weight, based on said film forming polymer of hydrophilic monomer incorporated therein, and a volatile base in an amount sufficient to deprotonate the conjugate acid of said polyamine functional polymer;

(f) a composition including an aqueous dispersion including a polymer having a Tg of at least about -10°C pendant strong cationic groups (*i.e.*, quick-setting component); an aqueous dispersion including a polymer having a Tg equal to or greater than about -10°C pendant weak acid groups;

(g) an aqueous dispersion including a polymer having a Tg of at least about -10°C and both pendant strong cationic groups and pendant weak acid groups (quick-setting binder), wherein the polymer has.

Suitable polymeric binders include, but are not limited to, latex polymers such as homopolymers, copolymers, or terpolymers such as acrylic and/or methacrylic, polyvinyl acetate, styrene-acrylic, styrene-butadiene, vinyl acetate-acrylic, ethylene-vinyl acetate, vinyl acetate-vinyl versatate, vinyl acetate-vinyl maleate, vinyl acetate-vinyl chloride-acrylic, ethylene-vinyl acetate-acrylic, and urethane polymers, optionally containing up to 10% by weight of functional

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monomers such as carboxylic acid, phosphate, sulfate, sulfonate, amide and like functional monomers and combinations thereof. Polymeric binders optionally incorporated in opacifying prepaint (i) and extender prepaint (ii) and the different prepaits selected from (i) and (ii), prepaits, or other prepaits, may be the same as or different from the polymeric binder incorporated in binder prepaint (iii). Likewise, polymeric binders incorporated in opacifying/binder prepaint I and extender prepaint II and the different prepaits selected from I and II, or other prepaits, may be the same as or different from each other. Other binders such as alkyds and their blends with chlorinated rubber, solvent-borne thermoplastic acrylics, unsaturated polyesters, two-part epoxies and the like may be included in the prepaits.

Thickener is a general term which includes any material added to a paint to modify its rheological profile. Preferred thickeners for use herein are associative thickeners. Suitable thickeners for use herein include polyvinyl alcohol (PVA), hydrophobically-modified, alkali soluble emulsions known in the art as HASE emulsions, alkali-soluble or alkali-swellable emulsions known in the art as ASE emulsions, hydrophobically-modified ethylene oxide-urethane polymers known in the art as HEUR thickeners, and cellulosic thickeners such as hydroxymethyl cellulose (HMC), hydroxyethyl cellulose (HEC), hydrophobically-modified hydroxy ethyl cellulose (HMHEC), sodium carboxymethyl cellulose (SCMC), sodium carboxymethyl 2-hydroxyethyl cellulose, 2-hydroxypropyl methyl cellulose, 2-hydroxyethyl methyl cellulose, 2-hydroxybutyl methyl cellulose, 2-hydroxyethyl ethyl cellulose, 2-hydroxypropyl cellulose, and the like. Also useful as thickeners are fumed silica, attapulgite clay and other types of clay, titanate chelating agents, and the like.

Suitable dispersants for use herein include non-ionic, anionic, and cationic dispersants such as 2-amino 2-methyl 1-propanol (AMP), dimethyl amino ethanol (DMAE), potassium tripolyphosphate (KTPP), trisodium polyphosphate (TSPP), citric acid and other carboxylic acids, and the like. Anionic polymers such as homopolymers and copolymers based on polycarboxylic acids, including those that have been hydrophobically- or hydrophilically-modified, e.g., polyacrylic acid or polymethacrylic acid or maleic anhydride with various monomers such as styrene, acrylate or methacrylate esters, diisobutylene, and other hydrophilic or hydrophobic comonomers. Also, included are salts of the aforementioned polymers, as well as mixtures of these dispersants.

Suitable defoamers include silicone-based and mineral oil-based defoamers, and the like.

Coalescents are not necessary if solvent-free latex polymeric binders are used in the binder prepaints. Solvent-free binders typically have a low Tg and low minimum film-forming temperature so that they are film-forming at ambient temperatures, such as about 20°C. If a coalescent is required, preferably it is incorporated in each of binder prepaint (iii) and any other prepaints containing latex polymeric binders. Suitable coalescents, plasticizers, and other optional solvents include ethylene glycol, propylene glycol, hexylene glycol, 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate (TEXANOL™), glycol ethers, mineral spirits, methyl carbitol, butyl carbitol, phthalates, adipates, and the like.

Suitable mildewcides and biocides include zinc oxide, isothiazolones, triazoles, and the like.

Suitable surfactants include cationic, anionic, and non-ionic surfactants.

As used herein, the term "road" is used as a generic term and includes any indoor or outdoor solid surface which is or may be exposed to pedestrians, moving vehicles, tractors, or aircrafts constantly or intermittently. Some non-limiting examples of a "road" include highways, streets, driveways, sidewalks, runways, taxiing areas, tarmac areas, parking lots, rooftops, indoor floors (such as in factories or shopping malls), and like surfaces. The surface material may be masonry, tar, asphalt, resins, concrete, cement, plaster, stone, stucco, tiles, wood, polymeric materials, metals such as aluminum, stainless steel, or carbon steel), and combinations thereof. All of the substrates may already have one or more layers of existing coating or paint which may be fresh or aged.

The road-marking paint may be applied to the surface by a number of ways known to those having ordinary skill in the art, including, but not limited to, spraying, rolling, brushing, extrusion, and combinations thereof.

Any of the prepaints may optionally contain absorbers that accelerate the drying of the road-marking paint, provided that the absorbers are added to the prepaint in a time frame that will permit the application of the paint. The addition of an absorber to a prepaint will cause a rapid increase in viscosity that may make it difficult or impossible to apply. Thus, the absorber may need to be added immediately prior to application to the road surface. In addition, the absorbers may be added separately. Suitable absorbers include organic superabsorbent polymers, ion-exchange resins, hollow sphere polymers, molecular sieves, talcs, inorganic absorbers such as inorganic superabsorbent gels and Sumica gel, porous and non-porous carbonaceous materials, encapsulated, alkali-swellaable polymers, and mixtures thereof. The level of absorber used is in

the range of from about 0.01% by weight to about 90% by weight, preferably from about 0.1% by weight to about 70% by weight, more preferably from about 1% by weight to about 30% by weight, based on the total weight of the latex polymer in the final paint.

Postponement of road-marking paint production can be particularly advantageous when techniques are used to accelerate the drying of the paint. Such techniques include the addition of optional additives, such as absorbers that accelerate the drying of the road-marking paint, or the use of reactive ingredients that crosslink/cure or "quick-set," as defined herein. Because such systems have a limited pot-life and must be utilized soon after preparation, formulating the road-marking paint at the point-of-use provides an improved manufacturing technique. It becomes much more practical to utilize such techniques because the paint is used shortly after it is formulated. Such techniques are further enhanced by producing the road-marking paint in the applicator(s) itself, shortly before or while the road-marking paint is applied. Production in the applicator(s), such as one mounted on the back of a vehicle used for road striping, avoids the problems normally associated with the use of quick-setting paints systems, *i.e.*, the instability or rapid absorption of water that provides the quick-setting character but requires application of the paint sometimes within a very short time (*e.g.*, from a few minutes to a few hours) after activation of the quick-setting character (*i.e.*, by mixing or addition).

Such quick-drying systems have very short dry times on the road and/or produce highly durable markings. To achieve formulation of the paint in the applicator(s), the prepaints, pumps and applicator(s) are advantageously mounted on vehicles that then applies the markings.

Crosslinking of water-borne road-marking paint may be achieved by adding water-miscible or emulsified epoxies, water-borne isocyanates, silanes and the like. Quick-setting binder systems, as described herein, also represent a type of crosslinking or curing (*i.e.*, ionic) and their use also benefits from postponement of the paint manufacture to the paint-of-use. This allows the use of quick-setting components that would have very limited pot life in the road-making paint. For example, a polyamine with a pKa that results in a protonated amine with very little loss of the volatile base which will deprotonate it, will have poor stability, but dry very rapidly on the road. Such quick-setting and crosslinking systems benefit from postponing preparation of the paint up to and including preparation of the paint in the applicator(s) because of their short pot life.

The prepaints herein permit the production of the final road-marking paint at many locations beyond the conventional paint manufacturing facility and may include production at the

point-of-use, such as in an on-line painting vehicle or on the job site, at a distributor, at a government transportation facility, and at point-of-sale (for example, manufacturer's retail store or large retail building-products facility).

In order to minimize the number of paint ingredients needed to prepare a range of road-marking paints one needs to consider the extremes of key properties required for the range of paints and then formulate prepaints which are capable of being blended in various combinations and amounts to provide the key properties required at their extreme values as well as at intermediate points. Specific properties may also be improved by adding paint additives which enhance the desired property.

All ranges disclosed herein are inclusive and the minimums and maximums of the nested ranges are combinable.

EXAMPLES

Example 1

The following ingredients are mixed to form a white opacifying prepaint which should have PVC of 50.8%, a VS of 57.43%, and a weight solids of 79.0%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Opacifying pigment - TiO ₂ (TiPure R-900, E.I. DuPont and Company, Wilmington, DE)	1000.0
Dispersant - Tamol 901 30% (Rohm and Haas Company, Philadelphia, PA)	28.0
Wetting Aid - Surfynol CT 136 (Air Products, Inc., Allentown, PA)	12.0
Defoamer - Drew L-493 (Drew Chemical Company, Kearny, NJ)	10.0
Acrylic Emulsion Polymer Binder 50% solids (Rhoplex AC-630, (Rohm and Haas Company, Philadelphia, PA)	532.7
Coalescent - Texanol (Eastman Chemical, Kings Port, TN)	20.0
Water	14.2
Ammonium hydroxide (28% NH ₃)	6.0
HEUR Thickener - Acrysol SCT-275 (Rohm and Haas Company, Philadelphia, PA)	1.5

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The prepaint is prepared using a laboratory mixer having a 45° pitch stirring blade. The binder, water, dispersant, wetting aid, and defoamer are combined and mixed. The titanium dioxide is slowly added and the mixture is stirred for 15-20 minutes. The coalescent, thickener, ammonium hydroxide, and additional water, if necessary, are then added.

Example 2

The following ingredients are mixed to form a yellow opacifying pigment prepaint which should have a PVC of 51.7%, a VS of 57.7%, and a weight solids of 67.5%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Opacifying pigment - TiO ₂ (TiPure R-900, E.I. DuPont and Company, Wilmington, DE)	181.8
Yellow Pigment - Hansa Yellow (Engelhard Corp., New Jersey)	291.0
Wetting Aid - Surfynol CT136 (Air Products Inc., Allentown, PA)	10.9
Dispersant - Tamol 901 30% (Rohm and Haas Company, Philadelphia, PA)	26.0
Defoamer - Drew L-493 (Drew Chemical Company, Kearny, NJ)	9.1
Acrylic Emulsion Binder 50% solids (Rhoplex AC-630) (Rohm and Haas Company, Philadelphia, PA)	525.4
Coalescent – Texanol (Eastman Chemical, Kings Port, TN)	20.9
Water	18.8
Ammonium Hydroxide (28% NH ₃)	5.4
HEUR Thickener Acrysol SCT-275 (Rohm and Haas Company, Philadelphia, PA)	1.4

The prepaint is prepared using a laboratory mixer having a 45° pitch stirring blade. The binder, water, dispersant, wetting aid and defoamer, are combined and mixed. The titanium dioxide and yellow pigment are slowly added and the mixture is stirred for 15-20 minutes. The coalescent, thickener, ammonium hydroxide, and additional water, if necessary, are then added.

Example 3

The following ingredients are mixed to form an extender pigment prepaint which should have a PVC of 61.0%, a VS of 61.4%, and a weight solids of 77.4%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Calcium Carbonate Extender - Omyacarb 5 (Omya, Proctor, VT)	845.1
Dispersant - Tamol 901 30% (Rohm and Haas Company, Philadelphia, PA)	4.9
Wetting Agent- Surfynol CT-136 (Air Products Inc., Allentown, PA)	1.8
Defoamer - Drew L-493 (Drew Chem. Corp., Kearny, NJ)	5.0
Acrylic Binder - (Rhoplex AC-630, 50% solids (Rohm and Haas Company, Philadelphia, PA)	452.0
Methanol	33.3
Coalescent – Texanol (Eastman Chemical, Kings Port, TN)	23.3
Water	14.0
Ammonium Hydroxide (28% NH ₃)	3.7
HEUR Thickener - Acrysol SCT-275 (Rohm and Haas Company, Philadelphia, PA)	0.2

The prepaint is prepared using a laboratory mixer having a 45° pitch stirring blade. The binder, water, dispersant, wetting aid and defoamer are combined and mixed. The extender pigment is slowly added and the mixture is stirred for 15-20 minutes. The methanol, coalescent, thickener, ammonium hydroxide, and additional water, if necessary, are then added.

Example 4

The following ingredients are mixed to form polyamine prepaint which should be quick-setting. It should have a PVC of 0%, a VS of 27.4%, and a weight solids of 28.8%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Polyamine (29.8%)*	837.54
Water	12.5
Methanol	20.0

* As described in US 6,013,721, example 3.

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Example 5

White road-marking paints are formed by combining the prepaints described above in the following manner:

Paint No.	Prepaints (lbs.)			<u>Water</u>
	<u>White</u>	<u>Extender</u>	<u>Polyamine</u>	
	<u>(Ex. 1)</u>	<u>(Ex. 3)</u>	<u>(Ex. 4)</u>	
5-1	160.44	1244.88	--	15.4
5-2	112.31	1286.38	--	15.4
5-3	160.44	1244.88	8.0	7.7
5-4	112.31	1286.38	8.0	7.7
5-5	160.44	1244.88	16.0	--
5-6	112.31	1286.38	16.0	--

The resulting paints should have the following properties:

Paint No.	<u>Paint Properties</u>		
	<u>PVC (%)</u>	<u>VS (%)</u>	<u>WS (%)</u>
5-1	60.0	60.0	76.7
5-2	60.3	60.0	76.7
5-3	60.0	60.1	76.9
5-4	60.3	60.1	76.9
5-5	60.0	60.2	77.1
5-5	60.3	60.2	77.1

Paint No. 5-1 is a slower dry white traffic paint. Paint No. 5-2 is a lower cost, slower dry white traffic paint. Paint No. 5-3 is a fast dry white traffic paint. Paint No. 5-4 is a lower cost, fast dry white traffic paint. Paint No. 5-5 is a faster dry, white traffic paint. Paint No. 5-6 is a lower cost, faster dry white traffic paint.

Example 6

Yellow road-marking paints may be formed by combining the prepaints described above

in the following manner:

Paint No.	Prepaints (lbs.)			Water
	<u>Yellow</u>	<u>Extender</u>	<u>Polyamine</u>	
	<u>(Ex. 2)</u>	<u>(Ex. 3)</u>	<u>(Ex. 4)</u>	
6-1	119.98	1231.05	--	15.4
6-2	76.35	1286.38	--	15.4
6-3	119.98	1231.05	8.0	7.7
6-4	76.35	1286.38	8.0	7.7
6-5	119.98	1231.05	16.0	--
	76.35	1286.38	16.0	--

The resulting paints should have the following properties:

Paint No.	<u>Paint Properties</u>		
	<u>PVC (%)</u>	<u>VS (%)</u>	<u>WS (%)</u>
6-1	60.0	60.0	75.7
6-2	60.3	60.0	76.0
6-3	60.0	60.1	75.9
6-4	60.3	60.1	76.2
6-5	60.0	60.2	76.1
6-6	60.3	60.2	76.4

Paint No. 6-1 is a slower dry yellow traffic paint. Paint No. 6-2 is a lower cost, slower dry yellow traffic paint. Paint No. 6-3 is a fast dry yellow traffic paint. Paint No. 6-4 is a lower cost, fast dry yellow traffic paint. Paint No. 6-5 is a faster dry, yellow traffic paint; and Paint No. 6-6 is a lower cost, faster dry yellow traffic paint.

WHAT IS CLAIMED IS:

1. A set of different, but mutually compatible, fluid prepaints, which set comprises:
 - (i) at least one opacifying prepaint comprising at least one white opacifying pigment;
 - (ii) at least one extender prepaint comprising at least one extender pigment; and
 - (iii) at least one binder prepaint comprising at least one polymeric binder.wherein the prepaints are sufficient to form at least one road-marking paint line.
2. A set of different, but mutually compatible, fluid prepaints, which set comprises:
 - (I) at least one opacifying/binder prepaint comprising at least one white opacifying pigment and at least one polymeric binder; and
 - (II) at least one extender/binder prepaint comprising at least one extender pigment and at least one polymeric binder;wherein the prepaints are sufficient to form at least one road-marking paint line.
3. The set of prepaints of claim 1 or claim 2, which further comprises at least one fluid prepaint comprising a quick-setting ingredient.
4. The set of prepaints of claim 1, wherein the prepaints further comprise a quick-setting ingredient.
5. The set of prepaints of claim 1 or claim 2, wherein the polymeric binder is a quick-setting binder.
6. The set of prepaints of claim 1 or claim 2, wherein the polymeric binder is a latex polymer.
7. The set of prepaints of claim 1 or claim 2, wherein the number of prepaints is from 3 to 15.
8. The set of prepaints of claim 1 or claim 2, wherein the opacifying prepaint further comprises at least one colorant.

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9. The set of prepaints of claim 8, wherein the colorant is white or yellow.
10. A method of forming at least one road-marking paint line, which method comprises the steps of:
- (a) providing a set of different, but mutually compatible, fluid prepaints which set comprises:
 - (i) at least one opacifying prepaint comprising at least one white opacifying pigment;
 - (ii) at least one extender prepaint comprising at least one extender pigment; and
 - (iii) at least one fluid binder prepaint comprising at least one polymeric binder; and
 - (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the road-marking paint line.
11. A method of forming a range of road-marking paints, which range comprises at least two paint lines, which method comprises the steps of:
- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least two paint lines, which set comprises:
 - (i) at least one opacifying prepaint comprising at least one white opacifying pigment;
 - (ii) at least one extender prepaint comprising at least one extender pigment;
 - (iii) at least one binder prepaint comprising at least one polymeric binder; and
 - (iv) at least one additional different fluid prepaint selected from the group consisting of prepaints (i), (ii), or (iii); and
 - (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the road-marking paint liner.

12. A method of forming at least one road-marking paint line, which method comprises the steps of:

(a) providing a set of different, but mutually compatible, fluid prepaints, which set comprises:

- (I) at least one opacifying/binder prepaint comprising at least one white opacifying pigment and at least one polymeric binder; and
- (II) at least one extender binder prepaint comprising at least one extender pigment and at least one polymeric binder; and

(b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the road-marking paint line.

13. A method of forming a range of road-marking paints, the range comprising at least two paint lines, which method comprises the steps of:

(a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least two paint lines, which set comprises:

- (i) at least one opacifying/binder prepaint comprising at least one white opacifying pigment and at least one polymeric binder;
- (ii) at least one fluid extender/binder prepaint comprising at least one extender pigment and at least one polymeric binder; and
- (iii) at least one additional different fluid prepaint selected from the group consisting of prepaints (I) and (II); and

(b) dispensing a predetermined amount of each of the prepaints into containers or applicator to form the road-marking paint lines.

14. The method of claim 10, 11, 12 or 13, wherein the set of prepaints further comprises at least one fluid prepaint comprising a quick-setting component.

15. The method of claim 10, 11, 12 or 13, wherein the opacifying prepaint (i), the binder prepaint (ii), the opacifying/binder prepaint (I), or extender/binder prepaint (II) further comprises a quick setting component.

16. The method of claim 10, 11, 12 or 13, wherein the polymeric binder is a quick-setting binder.
17. The method of claim 10, 11, 12 or 13, wherein the polymeric binder is a latex polymer.
18. The method of claim 10, 11, 12 or 13, wherein the number of prepaints is from 4 to 15.
19. The method of claim 10 or claim 11, which further comprises the step of mixing the prepaints before, while, or after they are dispensed into the containers.
20. The method of claim 10 or claim 11, which further comprises the step of mixing the prepaints before or while they are dispensed into the applicator(s).
21. The method of claim 12 or claim 13, which further comprises the step of mixing the prepaints before, while, or after they are dispensed into the containers.
22. The method of claim 12 or claim 13, which further comprises the step of mixing the prepaints before or while they are dispensed into the applicator(s).
23. The method of claim 10, 11, 12 or 13, which further comprises the step of adjusting the viscosity of the prepaints before, while, or after they are dispensed into the containers.
24. The method of claim 10, 11, 12 or 13, which further comprises the step of adjusting the viscosity of the prepaints before or while they are dispensed into the applicator(s).
25. The method of claim 10, 11, 12 or 13, which further comprises the step of adding additional ingredients that enhance the application or final performance properties of the road-marking paint.
26. The method of claim 10, 11, 12 or 13, which further comprises the step of adding at least one colorant to the dispensed prepaints.

27. The method of claim 26, wherein the colorant is white or yellow.
28. The method of claim 10, 11, 12 or 13, wherein the opacifying prepaint (i) further comprises at least one colorant.
29. The method of claim 12 or 13, wherein the opacifying/binder prepaint (I) further comprises at least one colorant.
30. The method of claim 29, wherein the colorant is white or yellow.
31. The method of claim 10, 11, 12 or 13, wherein the method is carried out at a paint manufacturing facility.
32. The method of claim 10, 11, 12 or 13, wherein the method is carried out at a point-of-sale.
33. The method of claim 10, 11, 12 or 13, wherein the method is carried out at a point-of-use.
34. The method of claim 10, 11, 12 or 13, wherein the method is controlled by a computer.
35. A device capable of carrying out the method of claim 10, 11, 12 or 13.
36. A vehicle which includes the device of claim 35 wherein the devices is mounted on said vehicle.

ABSTRACT

Sets of prepaints useful for forming a road-marking paint line are provided. Also provided are methods which permit the person applying the road-marking paint to vary the properties of the road-marking paint at the application point to suit the ambient conditions, including temperature, humidity, traffic flow and the like.

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APOSTILLE

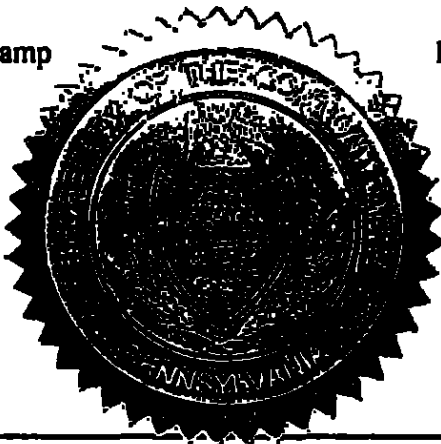
(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America
2. This public document has been signed by Catherine B. Boccuti
3. acting in the capacity of Notary Public, Montgomery County
4. bears the seal/stamp Catherine B. Boccuti, Notary Public, Commonwealth of Pennsylvania

Certified

5. at Harrisburg, Pennsylvania
6. The 19th day of July, 2001
7. by Kim Pizzigrilli, Secretary of the Commonwealth of Pennsylvania
8. No. 0117701

9. Seal/Stamp



10. Signature:

Kim Pizzigrilli
Kim Pizzigrilli



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REPRESENTATION AND POWER-OF-ATTORNEY

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Warminster, PA 18974, United States
of América,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el párrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso.

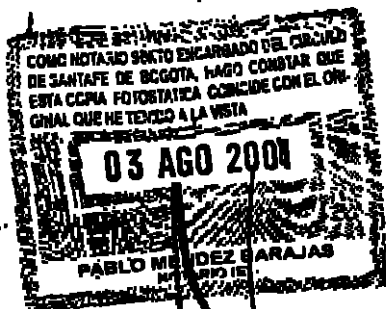
Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseñas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso-administrativos relacionados con

in due compliance with the terms of paragraph 1st. of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their sequence, by the principal, the first or second alternate depending on case, and the mere fact or its exercise will suffice. The exercise of the representation by the first, second or third alternates in their turn shall end at such time. In addition, we grant a Power-of-Attorney in favor of the above named attorneys at law to obtain the protection of my (our) industrial property against unfair competition, for which purpose I (we) authorize said attorneys to represent me (us) before any authorities or persons, with full and entire jurisdiction, specially those administrative, administrative-contencioso and judicial, as well as before Arbitration Court, in all matters concerning the following: a) Obtainment of patents, utility models and industrial designs; the registration of trademarks collective, defensive and service marks, slogans, commercial names, trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal, and administrative suits relating to those rights; actions and suits

estos derechos; acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

instituted by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this June 1, 2001
en/in Montgomery County, PA
por/by JOHN MICHAEL FRIEL
Firma John Michael Friel Signature



CERTIFICADO NOTARIAL (INDIVIDU)

A los _____ días del mes de _____
de 200__ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
John Michael FRIEL

a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

Notario Público o Funcionario Autorizado

CERTIFICADO NOTARIAL (SOCIEDAD)

Hoy _____ de _____ de 200__
Compareció(eron) ante mí

quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

Certifico:

1. Que he visto los siguientes documentos:*

2. Que dichos documentos prueban lo siguiente:

2.1. Que _____

es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____

2.2. Que el domicilio de dicha Sociedad/Compañía es _____

2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

2.4. Que el(los) Sr.(Sres.) _____

está(n) autorizado(s) para otorgar el presente Poder.

Ciudad _____

Estado _____

Hoy _____ de 200__

Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

* Los documentos deben identificarse con fecha y origen

NOTARIAL CERTIFICATE (INDIVIDUAL)

On this 1 day of June
200 1 before me, a Notary Public or Attesting Official of
Montgomery County, PA
personally appeared John Michael FRIEL

to me known, and known to me to be the person(s) who
executed that foregoing document, and who has(have) legal
capacity to execute it

Notarial Seal
Catherine B. Boccuti, Notary Public
Lower Gwynedd Twp., Montgomery County
My Commission Expires Nov. 12, 2002

Notary Public or Attesting Official

NOTARIAL CERTIFICATE (CORPORATION)

On this _____ day of _____ 200__
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

I certify:

1. That I have seen the following documents:*

2. That the above documents duly prove the following:

2.1. That _____

is a Corporation/Company legally constituted and in existence
in accordance with the laws _____

2.2. That the domicile of said Corporation/Company is _____

2.3. That the purpose or purposes for which the present Power
of Attorney is granted are comprised within the corporation
purposes set forth in the Charter/Articles of Incorporation/
this copy is a true and correct copy of the original
Corporation/Company, QUE HE TENIDO A LA VISTA

2.4. That Mr.(Messrs.) _____

is(are) authorized to grant the present Power of Attorney.

City _____

State _____

This _____ day of _____ 200__

03 AGO 2001
PABLO MENDES LARAJAS
NOTARIO

* Documents must be identified with date and origin

12618-801-001-6
12693-801-001-5
12697-801-001-8
12695-801-001-2
12693-801-001-7

APOSTILLE
(Convention de La Haye du 5 octobre 1961)

1. Country:

This public document

2. has been signed by

3. acting in the capacity of

4. bears the seal/stamp of

Certified

5. at 6. the

7. by

8. No.

9. Seal/stamp10. Signature

.....

.....



APOSTILLE

(Convention de La Haye du 5 octobre 1961)

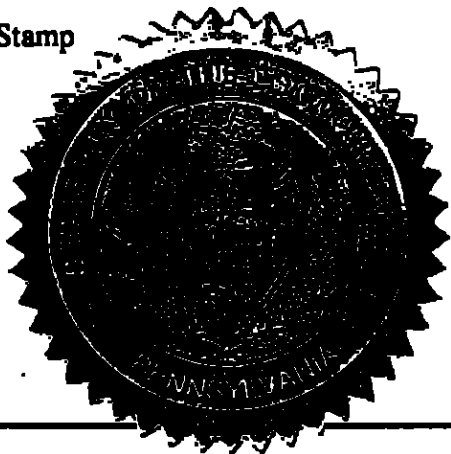
1. Country: United States of America
2. This public document has been signed by Catherine B. Boccuti
3. acting in the capacity of Notary Public, Montgomery County
4. bears the seal/stamp Catherine B. Boccuti, Notary Public, Commonwealth of Pennsylvania

Certified

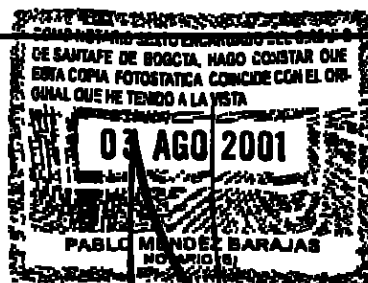
5. at Harrisburg, Pennsylvania
6. The 19th day of July, 2001
7. by Kim Pizzingrilli, Secretary of the Commonwealth of Pennsylvania
8. No. 0117702

9. Seal/Stamp

10. Signature:



Kim Pizzingrilli
Kim Pizzingrilli



Representación y Poder con autenticación notarial y Apostille para patentes, modelos de utilidad, diseños industriales, marcas de fábrica, nombres comerciales, enseññas, nombres de dominio, lemas comerciales, licencias.

Representation and Power-of-Attorney with notarial authentication and Apostille for patents, utility models, industrial designs, trademarks, commercial names, trade emblems, domain names, slogans, licenses.

REPRESENTACION Y PODER

REPRESENTATION AND POWER-OF-ATTORNEY

Yo (nosotros), abajo firmado (s)/I (we), the undersigned

John William HOOK III

domiciliado (s) en/or 410 Twin Streams Drive,
Warminster, PA 18794, United States
of America,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el parágrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso.

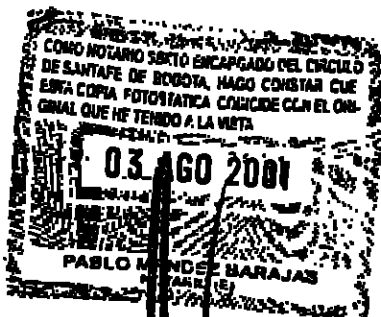
Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal; a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseññas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso-administrativos relacionados con

in due compliance with the terms of paragraph 1st. of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation shall be taken again in their absence, by the principal, the first or second alternate, even though they may be absent and the mere fact or its exercise will not constitute the exercise of the representation by the first, second or third alternate in their turn, shall end at such time. In addition, we grant a Power of Attorney to favor of the above named attorneys and also that they may obtain the protection of my (our) industrial property and against unfair competition, for which purpose I (we) authorize the said attorneys to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, administrative contentious and judicial, as well as before Arbitration Court, in all matters concerning the following: a) Obtainment of patents, utility models and industrial designs; the registration of trademarks, collective, defensive and service marks, slogans, commercial names, trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal and administrative suits relating to those rights; actions and suits

estos derechos; acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

instigated by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this June 1, 2001
en/in Montgomery County, PA
por/by John William Hook, III
Firma John William Hook Signature



CERTIFICADO NOTARIAL (INDIVIDUO)

A los _____ días del mes de _____
de 200__ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
John William HOOK III

a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

Notario Público o Funcionario Autorizado -Notary Public or Attesting Official

CERTIFICADO NOTARIAL (SOCIEDAD)

Hoy _____ de _____ de 200__
Compareció(eron) ante mí

quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

Certifico:

1. Que he visto los siguientes documentos:*

2. Que dichos documentos prueban lo siguiente:

2.1. Que _____

es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____

2.2. Que el domicilio de dicha Sociedad/Compañía es _____

2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

2.4. Que el(los) Sr.(Sres.) _____

está(n) autorizado(s) para otorgar el presente Poder.

Ciudad _____

Estado _____

Hoy _____ de 200__

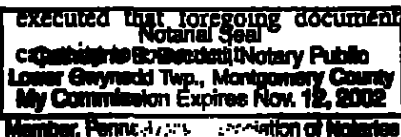
Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

* Los documentos deben identificarse con fecha y origen

NOTARIAL CERTIFICATE (INDIVIDUAL)

On this 1 day of June
200 1 before me, a Notary Public or Attesting Official of
Montgomery County, PA
personally appeared _____
John William HOOK III

to me known, and known to me to be the person(s) who
executed that foregoing document and who has(have) legal



Notary Public or Attesting Official

NOTARIAL CERTIFICATE (CORPORATION)

On this _____ day of _____ 200__
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

I certify:

1. That I have seen the following documents:*

2. That the above documents duly prove the following:

2.1. That _____

is a Corporation/Company legally constituted and in existence
in accordance with the laws _____

2.2. That the domicile of said Corporation/Company is _____

2.3. That the purpose or purposes for which the present Power
of Attorney is granted are _____ within the corporation
purposes set forth in the charter of the mentioned
Corporation/Company.

2.4. That Mr.(Messrs.) _____

is(are) authorized to grant the present Power of Attorney.

City _____

State _____

This _____ day of _____ 200__

* Documents must be identified with date and origin

11078-801-001-6
12697-801-001-8
12695-801-001-2
12673-801-001-7

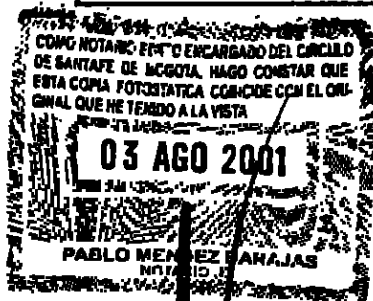
APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country:
This public document
2. has been signed by
3. acting in the capacity of
4. bears the seal/stamp of

Certified

5. at 6. the
7. by
8. No.
9. Seal/stamp 10. Signature



35

State of California

SECRETARY OF STATE APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: *United States of America*
This public document
2. *has been signed by Kerry Amundsen-Dow*
3. *acting in the capacity of Notary Public, State of California*
4. *bears the seal/stamp of Kerry Amundsen-Dow, Notary Public,
State of California*

CERTIFIED

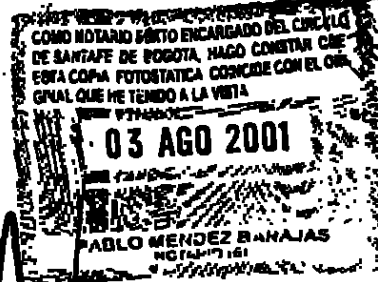
5. *At Sacramento, California*
6. *the 17th day of July 2001*
7. *by Deputy Secretary of State, State of California*
8. *No. 102181*
9. *Seal/Stamp:*



10. Signature:

Bill Jones
BILL JONES
Secretary of State

BY C. Cutha



REPRESENTACION Y PODER

REPRESENTATION AND POWER-OF-ATTORNEY

Yo (nosotros), abajo firmado (s)/I (we), the undersigned
Bernhard Helmut LIESER

domiciliado (s) en/or 818 S. Patton Avenue,
San Pedro, CA 90731, United States
of America,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el parágrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso.

Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseñas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso-administrativos relacionados con

in due compliance with the terms of paragraph 1st. of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their respective order by the principal, the first or second alternate, or the third, as the case may be, and the mere fact or its exercise will suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their respective order by the principal, the first or second alternate, or the third, as the case may be, and the mere fact or its exercise will suffice. In addition, we grant a Power of Attorney in favor of the above named attorneys at law, so that they may obtain the protection of my (our) industrial property and against unfair competition, for which purpose I (we) authorize the said attorneys to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, administrative contentious and judicial, as well as before Arbitration Court, in all matters concerning the following: a) Obtainment of patents, utility models and industrial designs; the registration of trademarks, collective, defensive and service marks, slogans, commercial names, trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal, and administrative suits relating to those rights; actions and suits

estos derechos, acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

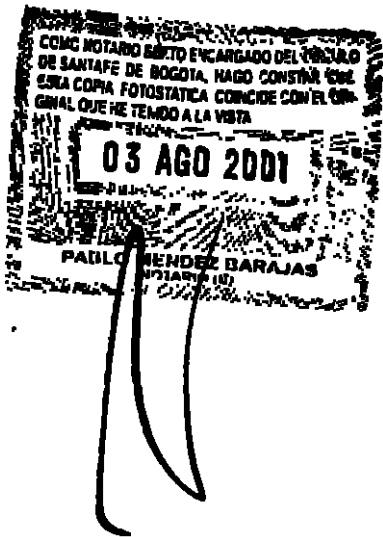
instituted by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this MARCH 11, 2001

en/in SANTA ANA, CA

por/by BERNARD: HELMUT LIESER

Firma Helmut Lieser Signature



35
37

CERTIFICADO NOTARIAL (INDIVIDUO)

A los _____ días del mes de _____
de 200__ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
Bernhard Helmut LIESER

a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

CERTIFICADO NOTARIAL (SOCIEDAD)

Hoy _____ de _____ de 200__
Compareció(eron) ante mí

quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

Certifico:

1. Que he visto los siguientes documentos:*

2. Que dichos documentos prueban lo siguiente:

2.1. Que _____

es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____

2.2. Que el domicilio de dicha Sociedad/Compañía es _____

2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

2.4. Que el(los) Sr.(Sres.) _____

está(n) autorizado(s) para otorgar el presente Poder.

Ciudad _____

Estado _____

Hoy _____ de 200__

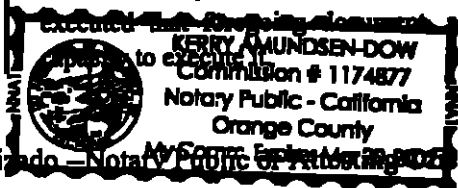
Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

* Los documentos deben identificarse con fecha y origen

NOTARIAL CERTIFICATE (INDIVIDUAL)

On this 14th day of June
200__ before me, a Notary Public or Attesting Official of _____
personally appeared Bernhard Helmut LIESER

to me known, and known to me to be the person(s) who
executed this foregoing document and who has(have) legal



NOTARIAL CERTIFICATE (CORPORATION)

On this _____ day of _____ 200__
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

I certify:

1. That I have seen the following documents:*

2. That the above documents duly prove the following:

2.1. That _____

is a Corporation/Company legally constituted and in existence
in accordance with the laws _____

2.2. That the domicile of said Corporation/Company is _____

2.3. That the purposes or purposes for which the present Power
of Attorney is granted are comprised within the Corporation
purposes set forth in the charter of the mentioned
Corporation/Company.

2.4. That Mr.(Messrs) _____

is(are) authorized to grant the present Power of Attorney.

City _____

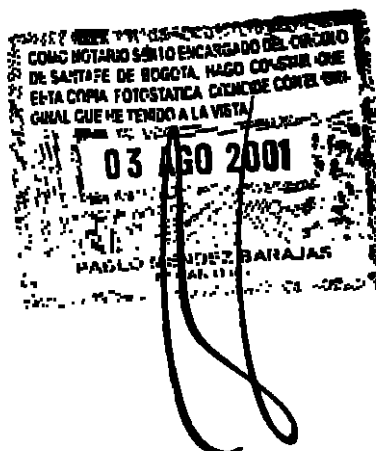
State _____

This _____ day of _____ 200__

* Documents must be identified with date and origin

12698 - 801 - 001 - 6
12697 - 801 - 001 - 7
12695 - 801 - 001 - 2

APOSTILLE (Convention de La Haye du 5 octobre 1961)	
1. Country:	
This public document	
2. has been signed by	
3. acting in the capacity of	
4. bears the seal/stamp of	
Certified	
5. at	6. the
7. by	
8. No.	
9. Seal/stamp	10. Signature
.....	



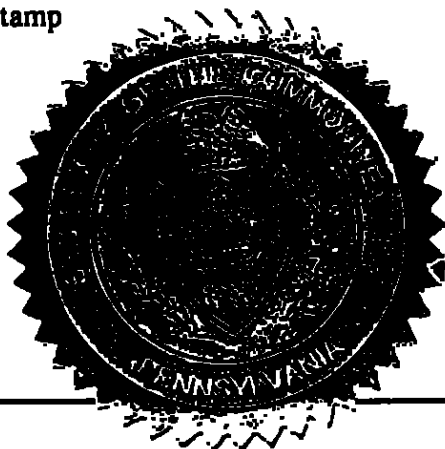
APOSTILLE

(Convention de La Haye du 5 octobre 1961)

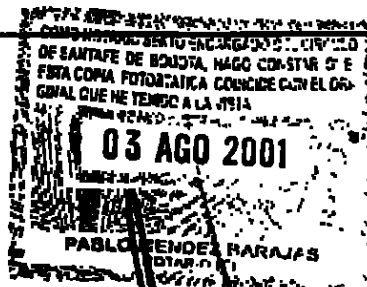
1. Country: United States of America
2. This public document has been signed by Catherine B. Boccuti
3. acting in the capacity of Notary Public, Montgomery County
4. bears the seal/stamp Catherine B. Boccuti, Notary Public, Commonwealth of Pennsylvania

Certified

5. at Harrisburg, Pennsylvania
6. The 19th day of July, 2001
7. by Kim Pizzingrilli, Secretary of the Commonwealth of Pennsylvania
8. No. 0117723
9. Seal/Stamp
10. Signature:



Kim Pizzingrilli
Kim Pizzingrilli



Representación y Poder con autenticación notarial y Apostille para patentes, modelos de utilidad, diseños industriales, marcas de fábrica, nombres comerciales, enseñas, nombres de dominio, lemas comerciales, licencias.

Representation and Power-of-Attorney with notarial authentication and Apostille for patents, utility models, industrial designs, trademarks, commercial names, trade emblems, domain names, slogans, licenses.

REPRESENTACION Y PODER

REPRESENTATION AND POWER-OF-ATTORNEY

Yo (nosotros), abajo firmado (s)/I (we), the undersigned

Jerry William WASHEL

domiciliado (s) en/ or 594 Quarry Road,
Harleysville, PA 19438, United States
of America,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el parágrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso.

Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseñas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso administrativos relacionados con

in due compliance with the terms of paragraph 1st. of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their sequence, by the principal, the first or second alternate depending on case, and the mere fact or its exercise will suffice. The exercise of the representation by the first, second or third alternates in their turn shall end at such time. In addition, we grant a Power of Attorney in favor of the above named attorneys at law, so that they may obtain the protection of my (our) industrial property, against unfair competition, for which purpose I (we) authorize (we) authorize them to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, judicial, and judicial, as well as before Arbitration Court, in all matters concerning the following: a) Obtainment of patents, utility models and industrial designs; the registration of trademarks, defensive, defensive and service marks, slogans, commercial names, trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal, and administrative suits relating to those rights; actions and suits

estos derechos; acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

instituted by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this June 4, 2001
en/in Montgomery County, PA
por/by Jeremy William Wokal
Firma [Signature] Signature



CERTIFICADO NOTARIAL (INDIVIDUO)

NOTARIAL CERTIFICATE (INDIVIDUAL)

A los _____ días del mes de _____
de 200__ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
Jerry William WASHEL
a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

On this 4 day of June
2001 before me, a Notary Public or Attesting Official of
Montgomery County PA
personally appeared
Jerry William WASHEL

to me known, and known to me to be the person(s) who
executed that foregoing document, and who has(have) legal

Notary Seal
Caroline B. Bocchi, Notary Public
Lower Gwynedd Twp., Montgomery County
My Commission Expires Nov. 12, 2002
Member, Pennsylvania Association of Notaries

Notario Público o Funcionario Autorizado – Notary Public or Attesting Official Caroline Bocchi

CERTIFICADO NOTARIAL (SOCIEDAD)

NOTARIAL CERTIFICATE (CORPORATION)

Hoy _____ de _____ de 200__
Compareció(eron) ante mí
quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

On this _____ day of _____ 200__
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

Certifico:

I certify:

1. Que he visto los siguientes documentos:*
2. Que dichos documentos prueban lo siguiente:
2.1. Que _____
_____ es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____
- 2.2. Que el domicilio de dicha Sociedad/Compañía es _____

- 2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

1. That I have seen the following documents:*
2. That the above documents duly prove the following:
2.1. That _____
_____ is a Corporation/Company legally constituted and in existence
in accordance with the laws _____
- 2.2. That the domicile of said Corporation/Company is _____

2.4. Que el(los) Sr.(Sres.) _____
está(n) autorizado(s) para otorgar el presente Poder.
Ciudad _____
Estado _____
Hoy _____ de 200__

2.3. That the purpose or purposes for which the present Power
of Attorney is granted are comprised within the corporation
purposes set forth in the charter of the mentioned
Corporation/Company
2.4. That Mr. (Messrs.) _____
is(are) authorized to grant the present Power of Attorney.
City _____
State _____
This _____ day of _____ 200__

Notario Público o Funcionario Autorizado – Notary Public or Attesting Official

* Los documentos deben identificarse con fecha y origen

* Documents must be identified with date and origin

12693-801-001-6

12694-801-001-5

12697-801-001-8

12695-801-001-2

12693-801-001-7

APOSTILLE

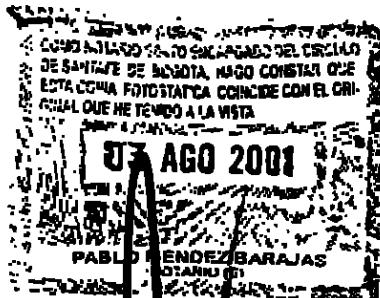
(Convention de La Haye du 5 octobre 1961)

1. Country:
This public document
2. has been signed by
3. acting in the capacity of
4. bears the seal/stamp of

Certified

5. at 6. the
7. by
8. No.
9. Seal/stamp 10. Signature

.....



APOSTILLE

(Convention de La Haye du 5 octobre 1961)

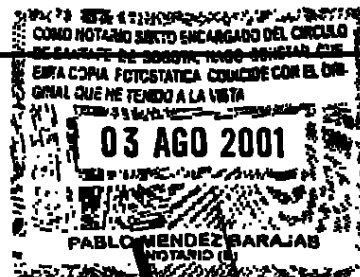
1. Country: United States of America
2. This public document has been signed by Catherine B. Boccuti
3. acting in the capacity of Notary Public, Montgomery County
4. bears the seal/stamp Catherine B. Boccuti, Notary Public, Commonwealth of Pennsylvania

Certified

5. at Harrisburg, Pennsylvania
6. The 19th day of July, 2001
7. by Kim Pizzingrilli, Secretary of the Commonwealth of Pennsylvania
8. No. 0117727
9. Seal/Stamp
10. Signature:



Kim Pizzingrilli
Kim Pizzingrilli



REPRESENTACION Y PODER

REPRESENTATION AND POWER-OF-ATTORNEY

Yo (nosotros), abajo firmado (s)/I (we), the undersigned
Dennis Paul LORAH

domiciliado (s) en/or 1962 Heebner Way
Lansdale, PA 19446, United States of
America,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el parágrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso. Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseñas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso administrativos relacionados con

in due compliance with the terms of paragraph 1st of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their sequence, by the principal, the first or second alternate depending on case, and the mere fact or its exercise will suffice. In addition, we grant a Power of Attorney in favor of the above named attorneys at law to obtain the protection of my (our) industrial property and against the unfair competition, for which purpose I (we) authorize the said attorneys to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, administrative contentious and judicial, as well as before Arbitration Court, in all matters concerning the following: a) Obtainment of patents, utility models and industrial designs; the registration of trademarks, collective, defensive and service marks, slogans, commercial names, trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal, and administrative suits relating to those rights; actions and suits

estos derechos; acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

instituted by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this June 1, 2001
en/in Montgomery County, PA, USA
por/by Dennis Paul Lorah
Firma Dennis Paul Lorah Signature

COMO NOTARIO ENCARGADO DEL CANTON DE SANTAFE DE BOGOTA, HAGO CONSTAR QUE ESTA COPIA FOTOSTATICA CONCIDE CON EL ORIGINAL QUE ME TENGO A LA VISTA
03 AGO 2001
PABLO MENDEZ BARAJAS

CERTIFICADO NOTARIAL (INDIVIDUO)

A los _____ días del mes de _____
de 200 _____ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
Dennis Paul LORAH

a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

Notario Público o Funcionario Autorizado

CERTIFICADO NOTARIAL (SOCIEDAD)

Hoy _____ de _____ de 200 _____
Compareció(eron) ante mí

quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

Certifico:

1. Que he visto los siguientes documentos:*

2. Que dichos documentos prueban lo siguiente:

2.1. Que _____

es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____

2.2. Que el domicilio de dicha Sociedad/Compañía es _____

2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

2.4. Que el(los) Sr.(Sres.) _____

está(n) autorizado(s) para otorgar el presente Poder.

Ciudad _____

Estado _____

Hoy _____ de 200 _____

Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

* Los documentos deben identificarse con fecha y origen

NOTARIAL CERTIFICATE (INDIVIDUAL)

On this _____ day of _____
200 _____ before me, a Notary Public or Attesting Official of _____
Montgomery County, PA
personally appeared _____
Dennis Paul LORAH

to me known, and known to me to be the person(s) who
executed that foregoing document, and who has(have) legal
capacity to execute it.

Notarial Seal
Catherine B. Boccia, Notary Public
Lower Merion Twp., Montgomery County
My Commission Expires Nov. 12, 2002
Member, Pennsylvania Notary Association

Notary Public or Attesting Official Catherine B. Boccia

NOTARIAL CERTIFICATE (CORPORATION)

On this _____ day of _____ 200 _____
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

I certify:

1. That I have seen the following documents:*

2. That the above documents duly prove the following:

2.1. That _____

is a Corporation/Company legally constituted and in existence
in accordance with the laws _____

2.2. That the domicile of said Corporation/Company is _____

2.3. That the purpose or purposes for which the present Power
of Attorney is granted are comprised within the corporation
purposes set forth in the _____ mentioned
Corporation/Company.

2.4. That Mr.(Messrs.) _____

is(are) authorized to grant the present Power of Attorney.

City _____

State _____

This _____ day of _____ 200 _____

PA NOTARY PUBLIC
COUNCIL OF NOTARIES
DE SALETTE DE BOGOTA, MAGO CONSENTE QUE
SE OTORGA EL PODER EN LA PRESENTE
FORMA QUE SE VE EN LA VISTA
03-AGO-2001
PABLO MENCEZ BARAJER
NOTARIO

* Documents must be identified with date and origin

12693 - 801-001-6
12697 - 801 001-3
12693 - 801 - 001-7

APOSTILLE	
(Convention de La Haye du 5 octobre 1961)	
1.	Country: This public document
2.	has been signed by
3.	acting in the capacity of
4.	bears the seal/stamp of
Certified	
5.	at
6.	the
7.	by
8.	No.
9.	Seal/stamp
10.	Signature
.....	



#21
44

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America
2. This public document has been signed by Catherine B. Boccuti
3. acting in the capacity of Notary Public, Montgomery County
4. bears the seal/stamp Catherine B. Boccuti, Notary Public, Commonwealth of Pennsylvania

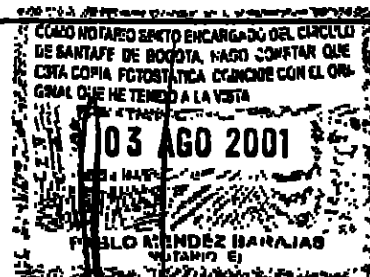
Certified

5. at Harrisburg, Pennsylvania
6. The 19th day of July, 2001
7. by Kim Pizzingrilli, Secretary of the Commonwealth of Pennsylvania
8. No. 0117728
9. Seal/Stamp
10. Signature: _____



Kim Pizzingrilli

Kim Pizzingrilli



Representación y Poder con autenticación notarial y Apostille para patentes, modelos de utilidad, diseños industriales, marcas de fábrica, nombres comerciales, enseñas, nombres de dominio, lemas comerciales, licencias.

Representation and Power-of-Attorney with notarial authentication and Apostille for patents, utility models, industrial designs, trademarks, commercial names, trade emblems, domain names, slogans, licenses.

REPRESENTACION Y PODER

REPRESENTATION AND POWER-OF-ATTORNEY

Yo (nosotros), abajo firmado (s)/I (we), the undersigned

Donald Craig SCHALL

domiciliado (s) en/or 120 Shady Lane,
Lansdale, PA 19446, United States of
America,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el parágrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso.

Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseñas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso administrativos relacionados con

in due compliance with the terms of paragraph 1st. of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their sequence, by the principal, the first or second alternate depending on case, and the mere fact or its exercise will suffice. The exercise of the representation by the first, second or third alternates in their turn shall end at such time. In addition, we grant a Power-of-Attorney in favor of the above named attorneys at law to obtain the protection of my (our) industrial property and against unfair competition, for which purpose I (we) authorize the said attorneys to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, administrative-contentious and judicial; as well as before Arbitration Courts in all matters concerning the following: a) Obtainment of patents, utility models and industrial designs; the registration of trademarks, collective, defensive and service marks, slogans, commercial names, trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal, and administrative suits relating to those rights; actions and suits

estos derechos; acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

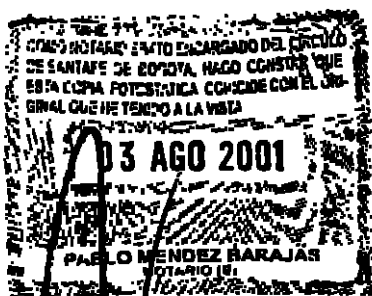
instituted by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this June 1, 2001

en/in Montgomery County, Pennsylvania

por/by DONALD CRAIG SCHULZ

Firma Donald Craig Schulz Signature



CERTIFICADO NOTARIAL (INDIVIDUO)

NOTARIAL CERTIFICATE (INDIVIDUAL)

A los _____ días del mes de _____
de 200 _____ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
Donald Craig SCHALL

a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

Notario Público o Funcionario Autorizado

CERTIFICADO NOTARIAL (SOCIEDAD)

Hoy _____ de _____ de 200 _____
Compareció(eron) ante mí

quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

Certifico:

1. Que he visto los siguientes documentos:*

2. Que dichos documentos prueban lo siguiente:

2.1. Que _____

es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____

2.2. Que el domicilio de dicha Sociedad/Compañía es _____

2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

2.4. Que el(los) Sr.(Sres.) _____

está(n) autorizado(s) para otorgar el presente Poder.

Ciudad _____

Estado _____

Hoy _____ de 200 _____

Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

On this 1 day of June
200 1 before me, a Notary Public or Attesting Official of
Montgomery County, PA
personally appeared Donald Craig SCHALL

to me known, and known to me to be the person(s) who
executed that foregoing document, and who has(have) legal
capacity to execute it.

Notarial Seal
Catherine B. Boccuti, Notary Public
Lower Gwynedd Twp., Montgomery County
Member, Pennsylvania Association of Notaries

Official Catherine B. Boccuti

NOTARIAL CERTIFICATE (CORPORATION)

On this _____ day of _____ 200 _____
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

I certify:

1. That I have seen the following documents:*

2. That the above documents duly prove the following:

2.1. That _____

is a Corporation/Company legally constituted and in existence
in accordance with the laws _____

2.2. That the domicile of said Corporation/Company is _____

2.3. That the purpose or purposes for which the present Power
of Attorney is granted are comprised within the corporation
purposes set forth in the Charter or the Articles of Incorporation of the mentioned
Corporation/Company.

2.4. That Mr.(Messrs) _____

is(are) authorized to grant the present Power of Attorney.

City _____

State _____

This _____ day of _____ 200 _____

* Los documentos deben identificarse con fecha y origen

* Documents must be identified with date and origin

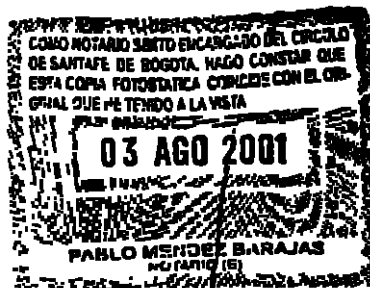
APOSTILLE**(Convention de La Haye du 5 octobre 1961)**

1. Country:
 This public document
 2. has been signed by
 3. acting in the capacity of
 4. bears the seal/stamp of

Certified

5. at 6. the
 7. by
 8. No.
 9. Seal/stamp 10. Signature

.....



APOSTILLE

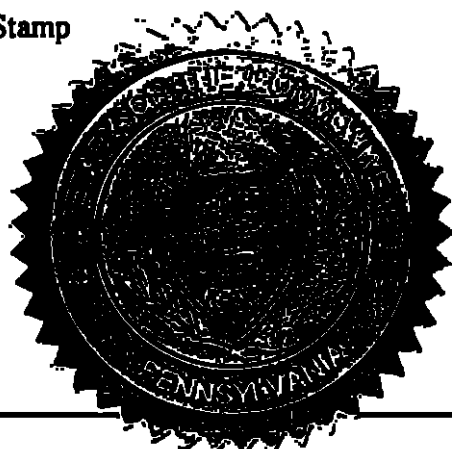
(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America
2. This public document has been signed by Catherine B. Boccuti
3. acting in the capacity of Notary Public, Montgomery County
4. bears the seal/stamp Catherine B. Boccuti, Notary Public, Commonwealth of Pennsylvania

Certified

5. at Harrisburg, Pennsylvania
6. The 19th day of July, 2001
7. by Kim Pizzingrilli, Secretary of the Commonwealth of Pennsylvania
8. No. 0117729

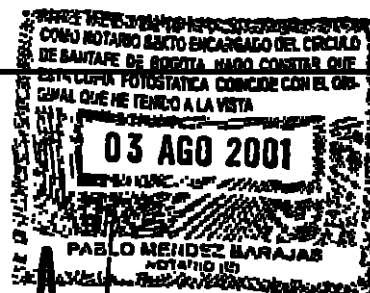
9. Seal/Stamp



10. Signature:

Kim Pizzingrilli

Kim Pizzingrilli



Representación y Poder con autenticación notarial y Apostille para patentes, modelos de utilidad, diseños industriales, marcas de fábrica, nombres comerciales, enseñas, nombres de dominio, lemas comerciales, licencias.

Representation and Power-of-Attorney with notarial authentication and Apostille for patents, utility models, industrial designs, trademarks, commercial names, trade emblems, domain names, slogans, licenses.

REPRESENTACION Y PODER

REPRESENTATION AND POWER-OF-ATTORNEY

Yo (nosotros), abajo firmado (s)/I (we), the undersigned

Ann Robertson HERMES

domiciliado (s) en/or **437 Edgewood Drive,**
Ambler, PA 19002, United States of
America,

por el presente nombramos a EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 y GERMAN CAVELIER, tpa. 832, domiciliados en la Carrera 4a N° 72-35, Bogotá, Colombia, en obediencia a lo dispuesto en el párrafo 1o del Artículo 543 del Código de Comercio, el primero como principal y los demás como suplentes, en su orden, como mis (nuestros) representantes en todos los asuntos de propiedad industrial con facultad para recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. El primer representante suplente reemplazará al principal en caso de ausencia o impedimento temporal o definitivo de aquél. La misma regla se aplicará cuando el segundo representante suplente haya de reemplazar al primero, o el tercero al segundo. En tales casos, el representante principal, o el primero, o segundo suplente, en su caso, o ambos, declararán su intención de no ejercer la representación mediante declaración autenticada por Notario Público en Colombia, o por Notario u otro Funcionario Público, o Cónsul de Colombia, en el extranjero; y si se tratare de impedimento, con el certificado respectivo. Si alguno de los nombrados faltare definitivamente, el siguiente tomará su lugar. Cuando cesare la ausencia o impedimento del representante principal, o de su primero o segundo suplentes, en su caso, podrán ejercer la representación, en su orden, uno u otros según el caso, asumiéndola por el solo hecho de ejercerla, cesando en ese momento el ejercicio de la representación por el primero, segundo o tercer suplente en su caso. Además, confiero (conferimos) poder a los abogados arriba nombrados, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera entidades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad y diseños industriales; el registro de marcas de fábrica, colectivas, defensivas, de servicio, lemas comerciales, nombres comerciales, enseñas, nombres de dominio, variedades vegetales y denominaciones de origen; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Las acciones de competencia desleal, protección del consumidor, oposiciones u observaciones, cancelación administrativa y judicial, nulidad, medidas cautelares, concesión de licencias, la tutela, la protección de secretos industriales, y en general los juicios civiles, penales, administrativos o contencioso administrativos relacionados con

in due compliance with the terms of paragraph 1st. of article 543 of the Commercial Code, do hereby appoint EMILIO FERRERO, tpa. 31929; GONZALO PERDOMO, tpa. 831; LUZ CLEMENCIA DE PAEZ, tpa. 23555 and GERMAN CAVELIER, tpa. 832, domiciled at Carrera 4a N° 72 35, Bogotá, Colombia, the first as principal and the others as alternates, in the order of their appointment, as our representatives for all industrial property matters with faculty to receive notifications and to appoint attorneys in and out of Court. The first alternate shall replace the principal in case of his absence or of temporal or definitive impediment. The same rule will apply when the second alternate representative is to replace the first one, or when the third is to replace the first or second alternates in their turn, or both of them, second. In such cases, the principal representative, or the first or second alternates in their turn, or both of them, shall state their intention not to act as representatives through a declaration given before a Notary Public in Colombia, or before a Notary or another Public Official or a Colombian Consul abroad; and in case of impediment, the appropriate certificate shall suffice. If any of the appointees were to be definitely absent, the following alternate shall take his place. When the absence or impediment of the principal representative, or of the first or second alternate in their turn ceases, the representation can be taken again in their sequence, by the principal, the first or second alternate depending on case, and the mere fact or its exercise will suffice. The exercise of the representation by the first, second or third alternate in their turn shall not at such time. In addition, we grant a power of attorney to the above named attorneys and to the one who may obtain the protection of my (our) industrial property and against the unfair competition, for which purpose I (we) authorize the said attorneys to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, administrative-contentious and judicial, as well as before Arbitration Courts in matters concerning the following: a) Obtainment of patents utility models and industrial designs; the registration of trademarks, collective, defensive and service marks, slogans, commercial names trade emblems, domain names, vegetal varieties and denominations of origin; its renewal, assignment, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Actions of unfair competition, protection to the consumer, oppositions or observations, administrative or Court cancellation, nullity, infringement, granting of licenses, the action for writ mandamus, the protection of trade secrets, and in general the civil, penal, and administrative suits relating to those rights; actions and suits

estos derechos; acciones y procesos que promovamos o se nos promuevan. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del proceso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

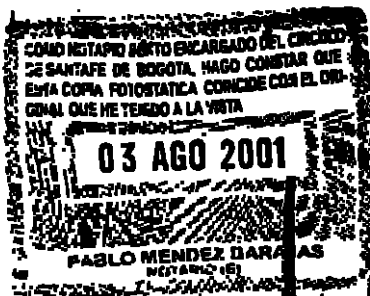
instituted by me (us) or against me (us). And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

Dado y firmado hoy/Given and signed this June 6, 2001

en/in Montgomery County, PA

por/by Anni Robertson Hermes

Firma Anni Robertson Hermes Signature



CERTIFICAD NOTARIAL (INDIVIDUO)

A los _____ días del mes de _____
de 200__ ante mí, Notario Público o Funcionario Autorizado
de _____
compareció(eron) personalmente _____
Ann Robertson HERMES

a quien(es) doy fe de conocer y me consta que es(son) la(s)
persona(s) firmante(s) del documento que precede, y quien(es)
tiene(n) capacidad legal para otorgarlo

Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official Catherine B. Brecourt

CERTIFICADO NOTARIAL (SOCIEDAD)

Hoy _____ de _____ de 200__
Compareció(eron) ante mí

quien(es) conozco personalmente y que firma(n) este
documento en representación de la Sociedad/compañía
denominada _____

ertifico:

1. Que he visto los siguientes documentos:*

2. Que dichos documentos prueban lo siguiente:

2.1. Que _____

es una Sociedad/Compañía legalmente constituida y existente
de acuerdo con las leyes de _____

2.2. Que el domicilio de dicha Sociedad/Compañía es _____

2.3. Que el objeto u objetos para los cuales se otorga el presente
poder están comprendidos dentro del objeto social de la
mencionada Sociedad/Compañía.

2.4. Que el(los) Sr.(Sres.) _____

está(n) autorizado(s) para otorgar el presente Poder.

Ciudad _____

Estado _____

Hoy _____ de 200__

Notario Público o Funcionario Autorizado -- Notary Public or Attesting Official

* Los documentos deben identificarse con fecha y origen

CAVELIER ABOGADOS
WPP0DE01-181 (MINUTA Nº 12.1.1.2.6 USA)

NOTARIAL CERTIFICATE (INDIVIDUAL)

On this 6 day of June 2001
before me, a Notary Public or Attesting Official of
Montgomery County PA
personally appeared Ann ROBERTSON HERMES

to me known, and known to me to be the person(s) who
executed that ~~Notarial Seal~~ document and who has/have legal
capacity to execute it. ~~Notary Public~~
Catherine B. Brecourt, Montgomery County
My Commission Expires Nov. 12, 2002
Montgomery County, PA

Notary Public or Attesting Official Catherine B. Brecourt

NOTARIAL CERTIFICATE (CORPORATION)

On this _____ day of _____ 200__
appeared before me

who(m) I know personally and who(m) signed this document as
representative(s) of the Corporation/Company named _____

I certify:

1. That I have seen the following documents:*

2. That the above documents duly prove the following:

2.1. That _____

is a Corporation/Company legally constituted and in existence
in accordance with the laws _____

2.2. That the domicile of said Corporation/Company is _____

2.3. That the purpose or purposes for which the present Power
of Attorney is granted is/are comprised within the corporation
purposes set forth in the Charter of the mentioned
Corporation/Company.

2.4. That Mr.(Messrs.) _____

is(are) authorized to grant the present Power of Attorney.

City _____

State _____

This _____ day of _____ 200__

* Documents must be identified with date and origin

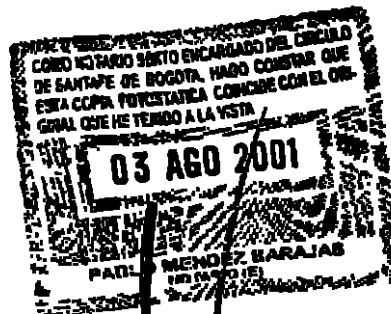
APOSTILLE**(Convention de La Haye du 5 octobre 1961)**

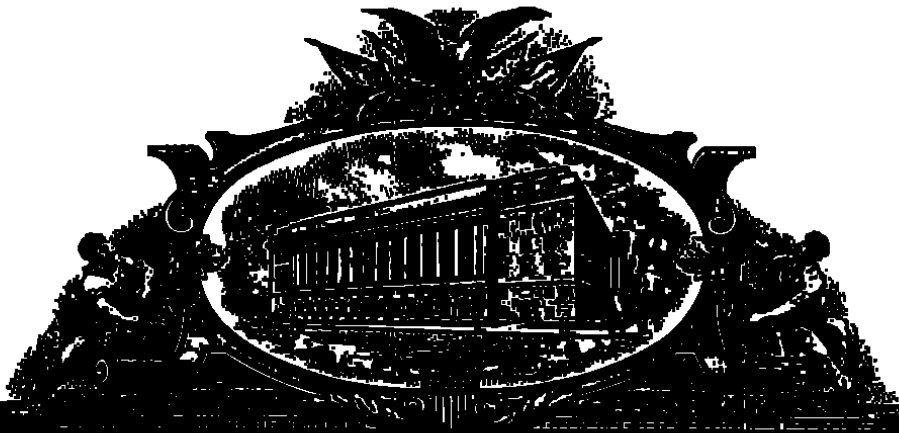
1. Country:
This public document
2. has been signed by
3. acting in the capacity of
4. bears the seal/stamp of

Certified

5. at 6. the
7. by
8. No.
9. Seal/stamp 10. Signature

.....





THE UNITED STATES OF AMERICA

~~TO ALL TO WHOM THESE PRESENTS SHALL COME:~~

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 12, 2001

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 60/247,639

FILING DATE: *November 10, 2000*



By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

M. K. Hawkins

M. K. HAWKINS
Certifying Officer

11-14-00

A/PKOV

51

Please type a plus sign (+) inside this box → ☐

Approved for use through 10/1/2002. OMB 0651-0032
 U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)					
Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)			
John M.	Friel	Warminster, PA			
John W.	Hook, III	Warminster, PA			
☒ Additional inventors are being named on the <u>1</u> separately numbered sheets attached hereto					
TITLE OF THE INVENTION (200 characters max) PREPRINTS AND METHODS OF PREPARING PAINTS FROM THE PREPRINTS					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
☐ Customer Number				Place Customer Number Bar Code Label here	
OR Type Customer Number here					
☒ Firm or Individual Name		Margaret B. Kelley, Clifford Chance Rogers & Wells, LLP			
Address		200 Park Avenue			
Address					
City	New York	State	NY	ZIP	10166
Country	United States	Telephone	212-878-3145	Fax	212-878-3079
ENCLOSED APPLICATION PARTS (check all that apply)					
☒ Specification Number of Pages		47		☐ CD(s), Number	
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Respectfully submitted,

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PREPAINTS AND METHODS OF PREPARING PAINTS FROM THE PREPAINTS

Background of The Invention

This invention relates to sets of prepaint compositions, a method of preparing paint lines from sets of prepaint compositions, and to a method of preparing a range of paints from sets of prepaint compositions.

Paints or coatings encompass, for example, latex paints, enamels, lacquers, varnishes, undercoats, surfacers, primers, sealers, fillers, and stoppers. Most paints contain a pigment, a polymer or binder which acts as a film-former to bind the pigment particles together, and a fluid medium in which the polymer is dissolved or dispersed. If the pigment is omitted, the paint is referred to as a clear, varnish, lacquer, or topcoat. Lacquers usually refer to thermoplastic coating compositions, whereas enamels refer to thermosetting paints.

Paint formulating involves the process of selecting and admixing appropriate paint ingredients in the correct proportions to provide a paint with specific processing and handling properties, as well as the desired final dry paint film properties. The major ingredients of many paint formulations are a binder, an opacifying pigment, optional pigment extenders, and a fluid medium, namely, water if the paint is a waterborne paint such as a latex paint, or solvent if the paint is a solvent-borne paint such as an oil-based paint. Common optional ingredients include defoamers, coalescents, plasticizers, thickeners, non-thickening rheology modifiers, solvents, driers, anti-skinning agents, surfactants, mildewcides, biocides and dispersants. After the paint is formulated and applied to a surface, the paint dries by evaporation of the solvent and/or the water, with or without the application of heat, and the binder forms a film containing therein the pigment and the extender particles, if any.

A paint line, as used herein, includes at least two different paints which offer dried film properties which differ materially from each other in at least one observable property such as sheen, outdoor durability, and color depth. A paint line may include, for example, three paints the dried films of which have different sheen levels, two paints the dried films of which have suitable interior or exterior performance, or four paints the dried films of which offer different

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quality or performance levels such as may be evidenced, for example, by different levels of scrub resistance.

A paint line could, more particularly, include four different paints, the dried films of which have different sheen levels, typically marketed as gloss; semi-gloss; eggshell, satin, or low lustre; and flat. The sheen is determined by the volume and type of the binder(s), pigment(s), and extender(s), if any, in the paint.

In addition to the various sheen levels, paints are commonly formulated to be untinted (white) or tinted to a wide variety of colors using different tint bases, including pastel or light tones, medium or mid-tones, and deep tones. This capability requires a paint line having four paints. Also, paints are formulated for exterior or interior use. And, paints are formulated to provide certain levels of performance properties, such as may be marketed as good/standard, better, and best/premium.

Paint manufacturers and retailers typically offer a range of paints, the range including at least two paint lines. By “the range including at least two paint lines”, herein it is meant that the discrete elected levels of the observable property defining a first paint line are combined with the discrete elected levels of the observable property defining a second paint line, etc. to define the paints in the range of paints.

For example, to prepare a range of paints including four paint lines may require preparing paints encompassing four sheen levels, four tint bases, interior and exterior use, and three quality levels, preferably all combinations thereof. Thus, 96 different paint formulations ($4 \times 4 \times 2 \times 3$) may be needed. Also encompassed, however, is a range of paints in which certain of the defined paints, up to 10% of the total number of paints, are selected to be omitted, for example, for commercial reasons. Further contemplated is a range of paints in which the observable properties of the dried paint films substantially, but not exactly, fulfill the definitions herein; for example, the sheen of a dried outdoor mid-tone gloss paint in the standard, better, and premium lines may differ by a few points without departing from the meaning of a range of paints of this invention.

Formulating these paints is complex – it is not simply a matter of mixing a few paint ingredients in different ratios. Rather, it involves the selection and mixing of different paint ingredients in different ratios depending on the type of paint desired. This requires paint

manufacturers to store many different paint ingredients and change paint ingredients during manufacture depending on the specific paint type being prepared.

Furthermore, it requires paint retailers to carry a large inventory of paints in order to offer a range of paints, such as various sheen levels, tint bases, paints for exterior use, paints for interior use, and paints of various quality. It would be desirable to make paints, either at a relatively large-scale industrial plant or at a relatively smaller-scale, point-of-sale or point-of-use location using a limited number of paint ingredients to prepare all of these different paint formulations, thus, minimizing the number and type of paint ingredients to make a range of paints.

Summary of the Invention

In order to minimize the number of paint ingredients needed to prepare a range of paints, one needs to consider the extremes of key properties required by the range of paints and formulate prepaint compositions which are capable of being blended in various combinations and proportions to provide the key properties required at their extreme values and at intermediate points as well.. Specific properties may also be improved by adding paint additives which enhance the desired property.

We have discovered that we are able to achieve this goal by employing a set of prepaints sufficient to formulate at least one paint line, including:

1. at least one fluid prepaint x, including at least one opacifying pigment;
2. at least one fluid prepaint y, including at least one extender pigment ; and
3. at least one fluid prepaint z, including at least one polymeric binder;

wherein the number of prepaints is preferably 3-15; wherein the prepaints are different from each other; and wherein the prepaints are mutually compatible.

We have also discovered a method of forming at least one paint line including:

1. providing a set of prepaints sufficient to formulate at least one paint line, including:
 - a. at least one fluid prepaint x, including at least one opacifying pigment;
 - b. at least one fluid prepaint y, including at least one extender pigment; and
 - c. at least one fluid prepaint z, including at least one polymeric binder;

wherein the total number of prepaints is preferably 3-15; wherein each of the prepaints is different from each other; and wherein the prepaints are mutually compatible; and

2. dispensing predetermined amounts of prepaint(s) x, prepaint(s) y, and prepaint(s) z into containers or application devices to form at least one paint line.

The method may further include the step of mixing prepaint(s) x, prepaint(s) y, and prepaint(s) z before, while, or after they are dispensed into the container or before or while they are dispensed into the application device.

We have also discovered a method of forming a range of paints, the range including at least two paint lines, including:

1. providing a set of prepaints sufficient to formulate the range of paints, including:
 - a. at least one fluid prepaint x, including at least one opacifying pigment;
 - b. at least one fluid prepaint y, including at least one extender pigment;
 - c. at least one fluid prepaint z, including at least one polymeric binder; and
 - d. at least one additional fluid prepaint x', y', or z',wherein the total number of prepaints is preferably 4-15;
wherein each of the prepaints is different from each other; and
wherein the prepaints are mutually compatible; and
2. dispensing predetermined amounts of prepaint(s) x, prepaint(s) y, and prepaint(s) z and the at least one additional prepaint into containers or application devices to form a range of paints.

The methods may further include the step of mixing prepaint(s) x, prepaint(s) y, prepaint(s) z, and the at least one additional prepaint before, while, or after they are dispensed into the container or before or while they are dispensed into the application device.

The methods may further include the step of adjusting the viscosity of dispensed prepaints before, while, or after they are dispensed into the container or before or while they are dispensed into the application device using a thickener, water, or a mixture thereof.

The methods may further include the step of adding additional materials may be added to the prepaints and/or paints that enhance the application or final performance properties of the paint.

The methods may further include the step of adding at least one colorant to the dispensed prepaints.

The methods may be carried out at a paint manufacturing facility, at the point-of-sale, or at the point-of-use and may be controlled by a computer.

If one paint line is desired, i.e., if one key property is varied (for example, sheen level, tint base, use type, or quality type), then the complete paint line can be made from one each of prepaint x, prepaint y and prepaint z.

If a range of paints including two paint lines is desired, i.e., if two key properties are varied (for example, two selected from sheen level, tint base, use type, and quality type), then the range of paints may be made from at least one each of prepaint x, prepaint y, and prepaint z and least one additional prepaint x', y', or z', depending on which key properties are to be varied. By "additional prepaint x', y', or z'" is meant herein a prepaint different from prepaint x, y, or z, respectively, but otherwise meeting the limitations associated with prepaint x, y, or z.

If a range of paints including three paint lines is desired, i.e., if three key properties are varied (for example, three selected from sheen level, tint base, use type, and quality type), then the range of paints can be made from at least one each of prepaint x, prepaint y and prepaint z and at least two additional prepaints x', y', or z', depending on which key properties are to be varied.

If a range of paints including four paint lines is desired, i.e., if four key properties are varied (for example, sheen level, tint base, use type, and quality type), then the complete range of paints can be made from at least one each of prepaint x, prepaint y and prepaint z and at least three additional prepaints x', y', or z', depending on which key properties are to be varied.

This technique may be continued to vary as many additional key properties as desired.

A paint line includes two or more different paints the dried films of which differ materially from each other in at least one observable property. The paints are different from each other and must meet at least one of the following criteria: 1) the pigment volume concentration (PVC) of the paints of the lines which are most different from each other in PVC must differ from each other by at least 2% or 2) the volume solids content ("VS") of the paints of the line which are most different from each other in VS must differ from each other by at least 2%.

The pigment volume concentration ("PVC") is a measure of how "binder-rich" a paint formulation. It is calculated herein by the following formula:

$$\text{PVC (\%)} = \frac{(\text{volume of pigment(s)} + \text{volume extender(s)})}{(\text{volume of pigment(s)} + \text{volume extender(s)} + \text{volume binder})} \times 100$$

The volume solids content ("VS" herein) is the dry volume (dry vol.) of pigment(s) plus the dry volume (dry vol.) of extender (s) plus the dry volume (dry vol.) of binder(s). It is calculated herein by the following formula:

$$\text{VS (\%)} = \frac{\text{dry vol. of pigment(s)} + \text{dry vol. of extender(s)} + \text{dry vol. of binder(s)}}{\text{total volume of paint}} \times 100.$$

If additives are present, their volume is not included in determining the total dry volume.

In each of the above embodiments, the preprint compositions are selected so that they cover a wide formulation space so that the desired final paint properties lie within the blend space defined with the preprints at the extremes. In many cases the preprints will not by themselves be practical paints. But by pushing the preprints to these extremes one can maximize the blend space available for the system. When the preprints, additives, and colorants are all fully compatible, they can be blended at desired ratios, without inducing colloidal instability, to achieve the desired paint line(s) and range of paints.

This technique is similar to the design principles used in statistical experimental design and analysis of mixture component designs; however, instead of designing a mixture space to explore the response surface within it, one is designing the boundaries of the mixture space to maximize the flexibility of the paint system. The key to success is to have mutual compatibility of the individual ingredients and preprints across the mixture space.

Paint properties can be predicted in a number of ways. One approach is to develop response surface models of the blend space using standard Mixture Component experimental design statistical tools. These simple statistical models can then be used by a linear optimization program, by a massive grid search, or by a graphical analysis tool. Another approach is to simply use empirical methods to determine which blends are needed for specific paint lines, then incorporate those simple empirical recipes in the of the software paint making machine.

An extension of the techniques is to have the paint machine automatically pretest certain key properties (e.g., viscosity, forced dry gloss, or color) and make minor adjustments during the formulating of the paint from the preprints. Having feedback loops in the paint machine can provide more precise matching of color, gloss, and viscosity targets.

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As used herein, prepaints are mutually compatible if the paints formed by admixing the prepaints do not evidence signs of colloidal instability such as flocculation. Preferably, the paints formed from the prepaints exhibit less than 5 g of residue such as gel and grit per liter of paint when the paint is passed through a 325 mesh screen. More preferably, the paints formed from the prepaints exhibit less than 1 g of residue per liter of paint when the paint is passed through a 325 mesh screen. Preferably, the prepaints exhibit less than 5 g. of residue per liter of prepaint when the prepaint is passed through a 325 mesh screen. More preferably, the prepaints exhibit less than 1 g of residue per liter of prepaint when the prepaint is passed through a 325 mesh screen. If the prepaints, optional additives included to enhance specific paint properties, and colorants are fully compatible, *i.e.*, they can be blended at any ratio without inducing colloidal instability, then they can be blended in any combination falling within the formulation space needed to achieve the desired property profile in the final paint. It is sufficient, however, for the prepaints, optional additives included to enhance specific paint properties, and colorants to be compatible, *i.e.*, they can be blended at desired ratios without inducing colloidal instability to achieve the desired property profile in the range of paints.

As used herein, compatible paint ingredients include ingredients which can be combined in the various prepaints, and the paints formed from the prepaints to provide the properties characteristic for the amount of and type ingredient(s) used.

It is preferred that the all fluid prepaints employed in the methods of the invention have the same or similar viscosities to aid in mixing.

The water-resistance properties, including blister resistance, wet adhesion, and scrub resistance, of the paints prepared by the method of the invention, are expected to be improved because of the use of lower amounts of stabilizing materials such as surfactants which may be used relative to conventional formulating techniques. Further, a line of paints or a range of paints prepared by the methods of this invention may react more predictably to added colorants, making color matching easier and facilitating the use of software for color matching. In addition, viscosity fluctuation in the final paint formulation is expected to be reduced because of the prior equilibration of ingredients in the prepaints.

The prepaints are formulated to maximize the flexibility of paint manufacturing. Rather than purchasing individual paint ingredients, paint manufacturers, and even buyers at point-of-sale and point-of-use (paint stores, paint departments, and contractors), can purchase a set of

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prepaints to prepare a desired range of paints. These sets of prepaints will contain at least one each of prepaints x, y and z and possibly additional prepaints depending upon the formulating flexibility desired. Optionally, the above prepaints are mixed with an additional prepaint which includes at least one colorant, such as a colored pigment or dye.

The method of the present invention is not limited to preparing only latex paints *per se*, but may also be extended to preparing any water-borne or solvent-borne coating, or related building product requiring mixing of ingredients, including, sealants, caulks, mastics, adhesives and other building-related products.

Description of Preferred Embodiments

One embodiment of prepaint x is a fluid titanium dioxide prepaint including at least one opacifying pigment, at least one dispersant, at least one thickener, and water; wherein the dispersant(s) and the thickener(s) are compatible with the pigment(s) and with other optional paint ingredients, and wherein the prepaint has a volume solids content of about 30% to about 70%, preferably about 35% to about 50% and a Stormer viscosity of about 50 to about 250 Krebs Units (KU) preferably about 60 to about 150 KU.

In an alternate embodiment of prepaint x, it is a fluid titanium dioxide prepaint useful for formulating a one pack, pigmented latex paint containing other paint ingredients, which prepaint includes at least one opacifying pigment, at least one dispersant, at least one thickener, at least one film-forming or nonfilm-forming polymeric binder, and water, wherein the dispersant(s), the thickener(s), and the polymer(s) are compatible with the pigment(s) and with the other optional paint ingredients, and wherein the prepaint has a volume solids content of about 30% to about 70%, preferably about 35% to about 50%, a PVC of about 35% to 100%, preferably about 50% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. Preferably, the prepaint is stable to sedimentation, by which is meant herein that the pigment does not settle out after 10 days at about 25 °C. Optionally, the polymeric binder is adsorbed onto the opacifying pigment.

In one embodiment of prepaint y, it is a fluid pigment extender prepaint which includes at least one mineral extender, at least one thickener, an optional polymeric binder, and water; wherein the pigment extender prepaint has a volume solids content of about 30% to about 70%, preferably about 35% to about 65%, a PVC of about 35% to 100%, preferably about 40% to

100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU; and wherein the prepaint ingredients are compatible with each other and with the ingredients of the other prepaints desired to be used therewith.

In one embodiment of prepaint z, it is a fluid polymeric binder prepaint which includes a water-borne polymeric binder having a glass transition temperature (T_g) of about -30°C to about 70°C, preferably about -10°C to about 60°C, and water; wherein the binder prepaint has a volume solids content of about 25% to about 70%, preferably about 30% to about 65%, and a Brookfield viscosity of less than about 100,000 centipoise (CPS), preferably about 100 to about 50,000 centipoise, at a shear rate of 1.25 reciprocal seconds; and wherein the prepaint ingredients are compatible with each other and with the ingredients of the other prepaints desired to be used therewith.

In the embodiments of prepaints x, y and z, it is optional to include minor amounts, *i.e.*, less than about 10% by weight, based on the total weight of the prepaint, of conventional paint additives including acid, base, defoamer, coalescent, cosolvent, mildewcide, biocide, antifreeze agent and the like. These additives must be compatible with the other paint ingredients in the prepaint and the prepaints employed in the methods of this invention.

Opacifying pigments useful in the methods and preprints of the invention include white pigments which impart white scattering power to the paint across all visible wave lengths without a high degree of absorption. Pigment extenders are inorganic solids or opaque polymers which do not impart the primary color or hiding power to the paint although they may have secondary influences on those properties. The tint bases used for deep tone paints typically contain no or only very low levels of opacifying pigments.

Suitable opacifying pigments include titanium dioxide (TiO₂) or a combination of titanium dioxide and auxiliary hiding pigments such as voided latex polymer particles, zinc oxide, lead oxide, a synthetic polymer pigment and mixtures thereof. Rutile and anatase grades of titanium dioxide are suitable for use herein. Rutile titanium dioxide is preferred. The surface of these titanium dioxides may be treated with various organic surface treatments and/or inorganic surface treatments, e.g., as the oxides of silica, alumina, and zirconia. Fumed titanium oxide is also useful herein.

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The voided latex particles useful in the method of the invention have a particle size diameter of about 100 nm to about 2,500 nm and a void fraction and prepaints of about 10% to about 75%. Preferably, the voided latex particles useful in the method of the invention have a particle size of about 500 nm to about 1,100 nm. The voided latex particles have at least one void but may have multiple voids, non-spherical voids, interconnected voids, voids having channels connected to the outside of the particles, and further encompass structures described as vesiculated and sponglike. Preferably, the voided latex particles have a single void. The voided latex particles have a glass transition temperature (T_g), as measured by differential scanning calorimetry at a rate of about 20°C/min, of at least about 20°C, preferably at least 50°C. The higher the (T_g), the harder the particle is and the less likely it is to collapse. If the voided latex particles collapse, they are unable to contribute to hiding. They may be prepared by conventional polymerization processes known in the art, such as those disclosed in U.S. Patent Nos. 3,784,391, 4,798,691, 4,908,271, 4,972,000, 5,041,464, 5,157,084, and 5,216,044, the disclosures of which are incorporated herein by reference, as well as Japanese Patent Applications 60/223,873, 61/62510, 61/66710, 61/86941, 62/127336, 62/156387, 01/185311, and 02/140272. Preferably, the voided latex particles are prepared according to U.S. Patent Nos. 4,427,836, 4,469,825, 4,594,363, 4,880,842 and 5,494,971, the disclosure of which are incorporated herein by reference.

Extender pigments useful herein include exterior and interior extender pigments optimized for the intended end use. Exterior extender pigments are not soluble in water and have a low absorption number. They are optimized for exterior durability in the particular market where the paint will be sold, and do not detract from the desired non-cracking, non-chalking, and non-dirt-retaining properties of the dried paint. They also provide low cost volume. Interior extender pigments are optimized for hiding, gloss, and low cost. Suitable extender pigments include barium sulfate (about 1 - about 15 microns), Blanc Fixe (about 0.5 - about 5 microns), calcium carbonate (about 0.05 - about 35 microns), silica (about 0.001 - about 14 microns), magnesium silicate (about 0.5 - about 15 microns), aluminum silicate (about 0.2 - about 5 microns), mica, bentonite, magnesium alumino-silicate, fumed alumina, colloidal attapulgite, synthetic amorphous sodium alumino-silicate, and sodium potassium alumino-silicate, and the like.

Polymeric binders are polymers or prepolymers which form the primary film of the paint. Binders bind the pigment and/or extenders, provide the required paint flow, and determine the

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gloss and hardness of the final paint film. The binders selected for the prepaints will depend upon the final use of the formulated paints. Binders suitable for exterior paints are generally suitable for interior paints, but binders suitable for interior paints may not be suitable for exterior paints.

Suitable polymeric binders include, but are not limited to, homopolymers, copolymers or terpolymers having compositions such as, for example, acrylic and/or methacrylic, polyvinyl acetate, styrene-acrylic, styrene-butadiene, vinyl acetate-acrylic, ethylene-vinyl acetate, vinyl acetate-vinyl versatate, vinyl acetate-vinyl maleate, vinyl acetate-vinyl chloride-acrylic, ethylene-vinyl acetate-acrylic, and urethane polymers, optionally containing up to about 10% by weight of functional and other monomers, and mixtures thereof. Polymeric binders optionally incorporated in prepaints x, y, x', y', or other prepaints may be the same as or different from the polymeric binder of prepaint z.

Thickener is a general term which includes any material added to a paint to modify its rheological profile. Preferred thickeners are associative thickeners. Suitable thickeners for use herein include polyvinyl alcohol (PVA); hydrophobically-modified, alkali soluble emulsions, known in the art as HASE emulsions; alkali soluble or alkali swellable emulsions, known in the art as ASE emulsions; hydrophobically modified ethylene oxide-urethane polymers known in the art as HEUR thickeners; and cellulosic thickeners such as hydroxymethyl cellulose (HMC), hydroxyethyl cellulose (HEC), hydrophobically-modified hydroxy ethyl cellulose (HMHEC), sodium carboxymethyl cellulose (SCMC), sodium carboxymethyl 2-hydroxyethyl cellulose, 2-hydroxypropyl methyl cellulose, 2-hydroxyethyl methyl cellulose, 2-hydroxybutyl methyl cellulose, 2-hydroxyethyl ethyl cellulose, 2-hydroxypropyl cellulose, and the like. Also useful as thickeners are fumed silica, attapulgite clay and other types of clay, titanate chelating agents, and the like.

Suitable dispersants for use herein include non-ionic, anionic and cationic dispersants such as 2-amino 2-methyl 1-propanol (AMP), dimethyl amino ethanol (DMAE), potassium tripolyphosphate (KTPP), trisodium polyphosphate (TSPP), citric acid and other carboxylic acids, and the like. Anionic polymers such as homopolymers and copolymers based on polycarboxylic acids, including those that have been hydrophobically- or hydrophilically-modified, e.g., polyacrylic acid or polymethacrylic acid or maleic anhydride with various monomers such as styrene, acrylate or methacrylate esters, diisobutylene, and other hydrophilic

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or hydrophobic comonomers are also suitable for use as dispersants, further including salts of the aforementioned dispersants, and mixtures thereof.

Suitable defoamers include silicone-based and mineral oil-based defoamers, and the like.

Coalescents are not necessary if solvent-free polymeric binders are used in the binder prepaints. Solvent-free binders typically have a low T_g and low minimum film-forming temperature so that they are film-forming at ambient temperatures, such as about 20 °C. If a coalescent is required, preferably it is incorporated in each of prepaint z and any other prepaints containing polymeric binders..

Suitable coalescents, plasticizers, and other optional solvents include ethylene glycol, propylene glycol, hexylene glycol, 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate (TEXANOLTM), glycol ethers, mineral spirits, methyl carbitol, butyl carbitol, phthalates, adipates, and the like.

Suitable mildewcides and biocides include zinc oxide, isothiazolones, triazoles, and the like.

Suitable surfactants include cationic, anionic, and non-ionic surfactants.

EXAMPLES

Test Procedures

The Stormer viscosity of the prepaints is measured using ASTM method D562.

The Brookfield viscosity of the binder prepaints and final paints is measured using spindle #4 of a Brookfield viscometer at 6 rpm at room temperature (about 70°F).

The ICI viscosity of the prepaints and paints is measured using ASTM method D3205-77.

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Example 1

This example describes the preparation of a white prepaint which was prepared by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment – Titanium Dioxide Slurry (76.5% solids) (Ti-Pure™ R-746 – DuPont)	1152.25
Dispersant (Tamol™ 1124 – Rohm and Haas)	7.06
Defoamer (Drewplus™ L-475)	1.00
Binder Acrylic (50% solids – Tg 28 °C) (Rhoplex™ SG – 10M – Rohm and Haas)	166.32
Opacifer – Voided Latex Particles (Ropaque™ OP-96 – Rohm and Haas)	151.80
Coalescent (Texanol™)	12.95
Rheology Modifier (Acrysol™ RM-8W – Rohm and Haas)	12.76
Base – Ammonia (28%)	1.65

The prepaint was prepared using a laboratory mixer having a 45° pitch stirring blade. The water, dispersant, and defoamer, were combined and mixed. The titanium dioxide slurry was slowly added and the mixture was stirred for 15-20 minutes. The binder, coalescent, rheology modifier, ammonia, and additional water if necessary were then added.

The resulting prepaint had a total volume of 100 gallons, total weight of 1,505.8 lbs., total PVC of 80.0%, volume solids of 44.0%, weight solids of 67.1%, density of 15.058 lbs./gallon, 0.40% dispersant on pigment solids, and 10.0% coalescent on latex solids. Its initial and equilibrated Stormer viscosities were 88 and 90 KU. Its initial and equilibrated pH values were 8.8 and 8.6.

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Example 2

This example describes the preparation of an exterior pigment extender prepaint. It was prepared as above by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment - Nephilene Syenite (7.5 μ) (Minex TM 4)	784.30
Dispersant (Tarnol TM 1124 - Rohm and Haas)	7.84
Defoamer (Drewplus TM L-475)	2.00
Binder Acrylic (53.5% solids - Tg 18 °C) (Rhoplex TM ML-200 - Rohm and Haas)	157.49
Coalescent (Texanol TM)	5.90
Rheology Modifier (Acrysol TM RM-8W - Rohm and Haas)	2.55
Water	368.86

The resulting prepaint had a total volume of 100 gallons, total weight of 1,328.9 lbs., total PVC of 80.0%, volume solids of 45.0%, weight solids of 65.4%, density of 13.29 lbs./gallon, 0.50% total dispersant on pigment solids and 7.0% total coalescent on binder solids. The initial and equilibrated Stormer viscosities were 90 and 93. The initial and equilibrated pH values were 8.9 and 8.7.

DDT-RES-425

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Example 3

This example describes the preparation of an interior pigment extender preprint which was prepared as described above by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment - Calcium Carbonate (12 μ) (Omyacarb TM 12)	405.67
Pigment - Calcium Carbonate (3.2 μ) (Vicron TM 15-15)	203.59
Pigment - Aluminum Silicate (1.4 μ) (Optiwhite TM)	165.41
Dispersant (Tamol TM 1124 -Rohm and Haas)	7.75
Defoamer (Drewplus TM L-475)	1.00
Binder - Vinyl Acetate/Acrylic (55% solids - Tg 14 °C) (RES TM 3803- Rohm and Haas)	157.61
Coalescent (Texanol TM)	6.07
Rheology Modifier - HEUR (Acrysol TM RM-2020-NPR)	17.53
Base - Ammonia (28%)	0.87
Water	356.59

The resulting preprint had a total volume of 100 gallons, total weight of 1,322.1 lbs., total PVC of 80%, volume solids of 45%, weight solids of 65.15%, density of 13.2210 lbs./gallon, 0.50% dispersant on pigment solids, and 7.00% coalescent on binder solids, Its initial and equilibrated Stormer viscosities were 94 and 97. Its initial and equilibrated pH values were both 9.2.

DDOTTT-EE92hede

Example 4

This example describes a vinyl acetate/acrylic polymeric binder prepaint which was prepared as described above except that the binder, defoamer, coalescent, ammonia, water, and rheology modifier were combined and mixed. The ingredients and amounts were as follows:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Drewplus™ L-475)	8.00
Binder - Vinyl Acetate/Acrylic (55% solids - Tg 14 °C) (RES™ 3803- Rohm and Haas)	788.06
Coalescent (Texanol™)	30.34
Rheology Modifier -HEUR (Acrysol™ SCT-275 - Rohm and Haas)	3.02
Base - Ammonia (28%)	1.95
Water	60.08

The resulting prepaint had a total volume of 100 gallons, total weight of 891.5 lbs., volume solids of 45.0%, a weight solids of 48.6%, a density of 8.91 lbs./gallon and 7.0% coalescent on binder solids. Its initial and equilibrated Stormer viscosities were 88 and 90. Its initial and equilibrated pH values were 8.6 and 8.4. Its equilibrated Brookfield viscosity should be less than 10,000 cps.

Example 5

This example describes a flat acrylic binder prepaint which was prepared as above by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Drewplus™ L-475)	8.00
Binder – Acrylic (53.5% solids – Tg 18°C) (Rhoplex™ ML-200 - Rohm and Haas)	769.96
Coalescent (Texanol™)	28.83
Rheology Modifier (HEUR) (Acrysol™ RM-8W - Rohm and Haas)	1.15
Base – Ammonia (28%)	.57
Solvent – Propylene Glycol	60.00
Water	12.84

The resulting prepaint had a total volume of 100 gallons, total weight of 881.4 lbs., volume solids of 44.0%, weight solids of 46.7%, density of 8.81 lbs./gallon, and 7.0% coalescent on binder solids. Its initial and equilibrated Stormer viscosities were 91 and 89. Its initial and final pH values were both 8.9/9.0. Its equilibrated Brookfield viscosity should be less than 10,000 cps.

Example 6

This example describes a gloss acrylic binder prepaint which was prepared as described above by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Drewplus™ L-475)	.8.00
Binder – Acrylic (50% solids – Tg 28°C) (Rhoplex™ SG-10M - Rohm and Haas)	737.08
Coalescent (Texanol™)	36.85
Rheology Modifier – HEUR (Acrysol™ RM 8W - Rohm and Haas)	11.62
Base – Ammonia (28%)	.35
Solvent – Propylene Glycol	60.00
Water	21.26

The resulting prepaint had a total volume of 100 gallons, a total weight of 875.2 lbs., volume solids of 39.0%, a weight solids of 42.11%, a density of 8.75 lbs./gallon and 10.0% coalescent on binder solids. . Its initial and equilibrated Stormer viscosities were 97 and 98. The initial and equilibrated pH values were 9.0. Its equilibrated Brookfield viscosity should be less than 10,000 cps.

Example 7

This example describes the preparation of a white pigment prepaint including a solvent-free acrylic binder and without the use of a coalescent. The ingredients are mixed as described in Example 1 using the ingredients and amounts set out below.

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment -Titanium Dioxide (Ti-Pure™ R-706 - DuPont)	734.49
Opacifier - Voided Latex Particles (Ropaque™ OP-96 - Rohm and Haas)	164.43
Dispersant (Tamol™ 731 - Rohm and Haas)	29.38
Non-ionic Surfactant (Triton™ CF-10)	2.00
Biocide (Kathon™ LX (1.5%) - Rohm and Haas)	2.00
Defoamer (Foamaster™ VL)	3.00
Binder - Acrylic copolymer (43.5% solids - Tg -2 °C) (Rhoplex™ SF-012 - Rohm and Haas)	165.96
Rheology Modifier - HEUR (Acrysol™ RM-825 - Rohm and Haas)	5.00
Rheology Modifier - HEUR (Acrysol™ RM-2020 NPR - Rohm and Haas)	42.69
Base - Ammonia (28%)	.49
Water	250.13

The resulting prepaint should have a total volume of 100 gallons, total weight of 1,401.3 lbs., total PVC of 80.0%, volume solids of 40.0%, weight solids of 61.1% density of 14.01 lbs./gallon, and 1.0% dispersant on pigment solids. Its estimated Stormer viscosity is 102 KU. Its pH should be 8.5 - 9.0.

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Example 8

This example describes the preparation of an exterior pigment extender prepaint with a solvent-free acrylic binder without the use of a coalescent. The ingredients are mixed as described in Example 1 using the ingredient amounts set out below.

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment – Nephiline Syenite (7.5μ) (Minex™ 4)	697.16
Dispersant (Tarnol™ 731 - Rohm and Haas)	27.89
Non-ionic Surfactant (Triton™ CF-10)	2.00
Biocide (Kathon™ LX (1.5%) - Rohm and Haas)	2.00
Defoamer (Foamaster™ VL)	3.00
Binder – Acrylic (46.5% solids – Tg 1 °C) (Primal™ SF-015 Rohm and Haas)	160.84
Rheology Modifier HEUR (Acrysol™ RM-2020 NPR - Rohm and Haas)	101.80
Water	284.47

The resulting prepaint should have a total volume of 100 gallons, total weight of 1,280.9 lbs., total PVC of 80.0%, volume solids of 40.0%, weight solids of 60.27%, density of 12.81 lbs./gallon, and 1.0% dispersant on pigment solids. Its Stormer viscosity should be 95 KU. Its pH should be 8.5 – 9.0. If not, the pH is adjusted as described in Example 7.

Example 9

This example describes the preparation of an interior pigment extender prepaint including a solvent-free vinyl acetate/acrylic binder without the use of a coalescent. The ingredients are mixed as described in Example 1 using the ingredient amounts set out below.

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<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment – Calcium Carbonate (3.2μ) (Snowflake™)	451.20
Pigment – Aluminum Silicate (1.4μ) (Optiwhite™)	220.37
Dispersant (Tamol™ 1254 - Rohm and Haas)	19.19
Non-ionic Surfactant (Triton™ CF-10)	2.00
Biocide (Kathon™ LX (1.5%))	2.00
Defoamer (Foamaster™ VL)	3.00
Binder – Vinyl Acetate/Acrylic (55% solids) (Rovace™ 9900)	139.86
Rheology Modifier HASE (Acrysol™ DR-3)	9.00
Base – Ammonia (28%)	0.86
Water	405.69

The resulting prepaint should have a total volume of 100 gallons, a total weight of 1,254.9 lbs., total PVC of 80.0%, volume solids of 40.0%, weight solids of 59.65%, density of 12.55 lbs./gallon, and 1.0% dispersant on pigment solids. Its Stormer viscosity should be 95 KU. Its pH should be 8.5 - 9.0.

Example 10

This example describes the preparation of a vinyl acetate/acrylic polymeric binder prepaint including a solvent-free vinyl acetate/acrylic binder without a coalescent. The ingredients are mixed as described in Example 4 using the ingredient amounts set out below.

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Binder – Vinyl Acetate/Acrylic (55% solids – Tg 10 °C) (Rovace™ 9900 - Rohm and Haas)	699.25
Defoamer (Foamaster™ VL)	3.00
Rheology Modifier HASE (Acrysol™ DR-3 - Rohm and Haas)	12.96
Base –Ammonia (28%)	2.90
Water	405.69

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The resulting prepaint should have a total volume of 100 gallons, total weight of 885.2 lbs, volume solids of 40.0%, a weight solids of 43.5%, and density of 8.85 lbs/gallon. Its Stormer viscosity should be 99 KU. Its Brookfield viscosity should be less than 10,000 cps. Its pH should be 8.5-9.0.

Example 11

This example describes the preparation of a flat polymeric binder prepaint including a solvent-free acrylic binder and no coalescent. The ingredients are mixed as described in Example 4 using the ingredient amounts set out below.

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Foamaster™ VL)	8.00
Binder – Acrylic Copolymer (43.5% solids – Tg -2 °C) (Rhoplex™ SF -012 - Rohm and Haas)	723.77
Rheology Modifier – HEUR (Acrysol™ RM -2020 NPR - Rohm and Haas)	3.00
Water	133.75

The resulting prepaint should have a total volume of 100 gallons, a total weight of 868.5 lbs, volume solids of 36.0%, weight solids of 38.8% and density of 8.69 lbs./gallon. Its Stormer viscosity should be 99 KU. Its Brookfield viscosity should be less than 10,000 cps. Its pH should be 8.5 - 9.0 and, if not, it is adjusted as discussed above.

Example 12

This example describes the preparation of a gloss polymeric binder prepaint using a solvent-free acrylic binder and no coalescent. The ingredients are mixed as described in Example 4 using the ingredient amounts set out below.

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Foamaster™ VL)	8.00
Binder – Acrylic Copolymer (43.5% solids – Tg -2 °C) (Rhoplex™ SF-012 - Rohm and Haas)	767.57
Rheology Modifier – HEUR (Acrysol™ RM-2020 NPR - Rohm and Haas)	23.00
Water	61.62

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The resulting prepaint should have a total volume of 100.0 gallons, total weight of 860.4 lbs, volume solids of 37.0%, a weight solids of 38.8% and a density of 8.60 lbs/gallon. Its Stormer viscosity should be 99 KU. Its Brookfield viscosity should be less than 10,000 cps. Its pH should be 8.5 - 9.0 and, if not, it should be adjusted as described above.

Example 13

This example describes the preparation of a white pigment prepaint using an interior gloss grade titanium dioxide which was prepared by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs/100 gallons)</u>
Pigment -Titanium Dioxide	734.49
(Ti-Pure™ R-900 - DuPont)	
Opacifier - Voided Latex Particles (30.5% solids)	164.43
(Ropaque™ Ultra-Rohm and Haas)	
Dispersant	20.99
(Tamol™ 1254 - Rohm and Haas)	
Non-ionic Surfactant	2.00
(Triton™ CF-10)	
Biocide	2.00
(Kathon™ LX (1.5%) - Rohm and Haas)	
Defoamer	3.00
(Foamaster™ VL - source)	
Binder - Vinyl Acetate/Acrylic (55% solids - Tg 14 °C)	140.10
(RES 3083 - Rohm and Haas)	
Coalescent	11.37
(Texanol™)	
Rheology Modifier)HASE	11.47
(Acrysol™ DF3	
Base - Ammonia (28%)	1.20
Solvent - Propylene Glycol	50.00
Water	264.38

The resulting prepaint had a total volume of 100 gallons, a total weight of 1405.4 lbs, total PVC of 80%, volume solids of 40%, weight solids of 61.25%, density of 14.05 lbs/gallon, 1.0% dispersant on pigment solids, and 9.0% coalescent on binder solids. The Stormer viscosity was 100 KU. The Brookfield viscosity was 15,300 cps. The pH was 8.8.

Example 14

This example describes the preparation of a white pigment prepaint using an exterior gloss grade titanium dioxide which was prepared by combining the following ingredients:

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<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment – Titanium Dioxide (Ti-Pure™ R-706-DuPont)	734.56
Opacifier – Voided Latex Particles (30.5% solids) (Ropaque™ Ultra-Rohm and Haas)	164.44
Dispersant (Tamol™ 731- Rohm and Haas))	29.38
Non-ionic Surfactant (Triton™ CF-10)	2.00
Biocide (Kathon™ LX (1.5%) - Rohm and Haas)	2.00
Defoamer (Foamaster™ VL)	3.00
Binder – Acrylic Copolymer (50% solids – Tg 28 °C) (Rhoplex™ SG-10 - Rohm and Haas)	151.20
Coalescent (Texanol™)	12.49
Rheology Modifier)HEUR (Acrysol™ RM-2020 NPR - Rohm and Haas)	42.69
Base – Ammonia (28%)	.49
Solvent – Propylene Glycol	50.00
Water	211.34

The resulting prepaint had a total volume of 100 gallons, a total weight of 1403.6 lbs, total PVC of 80%, volume solids of 40%, weight solids of 61.2%, density of 14.04 lbs/gallon, 1.0% dispersant on pigment solids, and 9.0% coalescent on binder solids. The Stormer viscosity was 100 KU. The Brookfield viscosity was 4,010 cps. The pH was 8.8.

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Example 15

This example describes the preparation of an exterior pigment extender prepaint. It was prepared by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment – Nephilene Syenite (7.5μ) (Minck™ 4)	697.16
Dispersant (Tamol™ 731 –Rohm and Haas)	27.89
Non-ionic Surfactant (Triton™ CF-10)	2.00
Biocide Kathon™ LX (1.5%) – Rohm and Haas)	2.00
Defoamer (Foamaster™ VL)	3.00
Binder – Acrylic (53.5% solids – Tg 18 °C) (Rhoplex™ Multilobe 200 – Rohm and Haas)	139.98
Coalescent (Texanol™)	5.24
Rheology Modifier – HEUR (Acrysol™ RM – 2020 – Rohm and Haas)	101.80
Solvent –Propylene Glycol	50.00
Water	254.40

The resulting prepaint had a total volume of 100 gallons, a total weight of 1281.5 lbs, total PVC of 80.0%, volume solids of 40.0%, weight solids of 60.3%, density of 12.81 lbs/gallon, 1.0% dispersant on pigment solids, and 7.0% total coalescent on binder solids. The Stormer viscosity was 96 KU. The Brookfield viscosity was 7,210 cpa. The pH was 9.8.

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Example 16

This example describes the preparation of an interior pigment extender prepaint. It was prepared by combining the following ingredients:

<u>Ingredients</u>	<u>Amounts (lbs./100 gallons)</u>
Pigment - Calcium Carbonate (5 μ) (Snowflake™)	451.20
Pigment - Aluminum Silicate (1.4 μ) (Optiwhite™)	220.37
Dispersant (Tamol™ 1254 - Rohm and Haas)	19.19
Non-ionic Surfactant (Triton™ CF-10)	2.00
Biocide (Kalthon™ LX (1.5%) - Rohm and Haas)	2.00
Defoamer (Foamaster™ VL)	3.00
Binder - Vinyl Acetate/Acrylic (55% solids - Tg 14 °C) (RES 3083 - Rohm and Haas)	140.10
Coalescent (Texanol™)	6.93
Rheology Modifier - HASE (Acrysol™ DR-3 - Rohm and Haas)	11.00
Base - Ammonia (28%)	0.86
Solvent - Propylene Glycol	50.00
Water	348.48

The resulting prepaint had a total volume of 100 gallons, a total weight of 1255.1 lbs, total PVC of 80.0%, volume solids of 40.0%, a weight solids of 59.7%, density of 12.55 lbs/gallon, 1.0% dispersant on pigment solids, and 9.0% total coalescent on binder solids. The Stormer viscosity was 102 KU. The Brookfield viscosity was 3,410 cps. The pH was 8.9.

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Example 17

This describes the preparation of a vinyl acetate/acrylic binder prepaint. It was prepared by combining the following ingredients:

<u>Ingredients</u>	<u>Amounts (lbs./100 gallons)</u>
Defoamer (Foamaster™ VL)	3.00
Binder – Vinyl Acetate/Acrylic (55% solids – Tg 14 °C) (RES 3083 – Rohm and Haas)	700.48
Coalescent (Texanol™)	34.67
Rheology Modifier – HASE (Acrysol™ DR-3 – Rohm and Haas)	12.96
Base – Ammonia (28%)	2.90
Solvent – Propylene Glycol	50.00
Water	83.48

The resulting prepaint had a total volume of 100 gallons, a total weight of 887.5 lbs, volume solids of 40.0%, a weight solids of 43.4%, a density of 8.88 lbs/gallon, and 9.0% coalescent on binder solids. Its Stormer viscosity was 98.0. The Brookfield viscosity was 13,600 cps. Its pH was 9.0.

Example 18

This example describes the preparation of a flat acrylic binder prepaint. It was prepared by combining the following ingredients:

<u>Ingredients</u>	<u>Amounts (lbs./100 gallons)</u>
Defoamer (Foamaster™ VL)	3.00
Binder – Acrylic (53.5% solids – Tg 18 °C) (Rhoplex™ Multilobe 200 – Rohm and Haas)	699.92
Coalescent (Texanol™)	26.21
Rheology Modifier – HEUR (Acrysol™ RM-2020 NPR – Rohm and Haas)	1.44
Base – Ammonia (28%)	0.35
Solvent – Propylene Glycol	50.00
Water	96.59

The resulting prepaint had a total volume of 100 gallons, a total weight of 877.5 lbs, volume solids of 40.0%, weight solids of 42.7%, density of 8.78 lbs/gallon, and 7.0% coalescent

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on binder solids. Its Stormer viscosity was 94.0. The Brookfield viscosity was 4,900 cps. Its pH was 8.9.

Example 19

This example describes the preparation of a gloss acrylic binder prepaint. It was prepared by combining the following ingredients:

<u>Ingredients</u>	<u>Amounts (lbs./100 gallons)</u>
Defoamer (Foamaster™ VL)	3.00
Binder – Acrylic Copolymer (50% solids – Tg 28 °C) (Rhoplex™ SG-10M – Rohm and Haas)	755.99
Coalescent (Texanol™)	37.80
Rheology Modifier – HEUR (Acrysol™ RM-2020 NPR – Rohm and Haas)	11.62
Base – Ammonia (28%)	0.35
Solvent – Propylene Glycol	50.00
Water	17.68

The resulting prepaint had a total volume of 100 gallons, a total weight of 876.4 lbs, volume solids of 40.0%, weight solids of 43.1%, a density of 8.76 lbs/gallon, and 10.0% coalescent on binder solids. Its Stormer viscosity was 96. The Brookfield viscosity was 5,000 cps. Its pH was 8.8.

Example 20

This example describes the preparation of a white prepaint by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigment – Titanium Dioxide (Ti-Pure™ R-706 – DuPont)	1001.66
Dispersant (Tamol™ 1124 – Rohm and Haas)	20.03
Defoamer (Drewplus™ L-475)	1.00
Binder Acrylic (50% solids – Tg 28 °C) (Rhoplex™ SG – 10M – Rohm and Haas)	189.00
Opacifer – Voided Latex Particles (Ropaque™ OP-96 – Rohm and Haas)	172.50
Coalescent (Texanol™)	14.72

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Rheology Modifier (Acrysol™ RM-8W – Rohm and Haas)	2.00
Base – Ammonia (28%)	1.65
Water	200.44

The resulting prepaint should have a total volume of 100 gallons, a total weight of 1,603.0 lbs, total PVC of 80.0%, volume solids of 50.0%, weight solids of 71.7%, a density of 16.03 lbs/gallon, 1% dispersant on pigment solids, and 10.0% coalescent on latex solids.

Example 21

This example describes the preparation of a white pigment prepaint with pigmented vesiculated polymeric beads. The pigmented vesiculated polymeric beads have a particle size of 12.5 microns, approximately 7% (s/s) titanium dioxide, and a void volume of approximately 77%. The ingredients are mixed as described in Example 1 using the ingredient amounts set out below.

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Pigmented Vesiculated Polymeric Bead (Spindrift™ 25)	733.00
Dispersant (Tamol™ 1124 - Rohm and Haas)	0
Defoamer (Drewplus™ L-475)	2.00
Binder Acrylic (53.5% solids – Tg 18 °C) (Rhoplex™ ML-200 - Rohm and Haas)	154
Coalescent (Texanol™)	5.90
Rheology Modifier (Acrysol™ RM-8W - Rohm and Haas)	2.55
Water	15.89

The resulting prepaint should have a total volume of 100 gallons, total weight of 913.3 lbs, total PVC of 80.0%, volume solids of 44.0%, weight solids of 28.28%, and density of 9.13 lbs/gallon. Its Stormer viscosity should be 91 KU. Its pH should be 8.5 – 9.0. If not, the pH is adjusted as described in Example 7.

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The resulting preprint should have a total volume of 100 gallons, total weight of 1,382.5 lbs, total PVC of 80.0%, volume solids of 50.0%, weight solids of 69.8%, density of 13.82 lbs/gallon, 0.5% dispersant on pigment solids, and 7.0% coalescent on latex solids.

This example describes the preparation of an interior pigment extender prepaint by combining the following ingredients:

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The resulting prepaint should have a total volume of 100 gallons, total weight of 1376.0 lbs, total PVC of 80.0%, volume solids of 50.0%, weight solids of 69.5%, density of 13.76 lbs/gallon, 0.5% dispersant on pigment solids, and 7.0% coalescent on latex solids..

Example 24

This example describes the preparation of a vinyl acetate/acrylic binder prepaint by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Drewplus™ L-475)	2.00
Binder – Vinyl Acetate/Acrylic (55% solids – Tg 14 °C) (RES 3803)	875.62
Coalescent (Texanol™)	13.00
Rheology Modifier –HEUR (Acrysol™ SCT-275 - Rohm and Haas)	9.29

The resulting prepaint should have a total volume of 100 gallons, total weight of 899.9 lbs, a total PVC of 0.0%, volume solids of 50.0%, weight solids of 53.2%, density of 8.99 lbs/gallon, and 10.0% coalescent on latex solids.

Example 25

This example describes the preparation of a flat acrylic prepaint by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Defoamer (Drewplus™ L-475)	8.00
Binder Acrylic (60.5% solids – Tg 16 °C) (Rhoplex™ AC-264 - Rohm and Haas)	773.67
Coalescent (Texanol™)	23.40
Rheology Modifier (HEUR) (Acrysol™ RM-8W - Rohm and Haas)	13
Base – Ammonia (28%)	0.50
Solvent – Propylene Glycol	60.00
Water	1.84

The resulting prepaint should have a total volume of 100 gallons, total weight of 880.4 lbs., total PVC of 0.0%, volume solids of 50.0%, weight solids of 53.2%, density of 8.80 lbs./gallon, and 5.0% coalescent on latex solids.

Example 26

This example describes the preparation of a gloss acrylic binder by combining the following ingredients:

<u>Ingredient</u>	<u>Amount (lbs./100 gallons)</u>
Binder - Acrylic (50% solids - Tg 28°C) (Rhoplex™ SG-10M - Rohm and Haas)	836.85
Coalescent (Texanol™)	41.84

The resulting prepaint should have a total volume of 100 gallons, a total weight of 878.7 lbs, total PVC of 0.0%, volume solids of 44.3%, weight solids of 47.4%, density of 8.78 lbs./gallon, and 10.0% coalescent on latex solids.

Example 27

This example describes the preparation of nine exterior flat latex paints of varying quality and tone using different combinations of the white pigment prepaint of Example 14, the exterior pigment extender prepaint of Example 15, the vinyl acetate-acrylic (PVA) binder prepaint of Example 17, and the flat acrylic binder prepaint of Example 18. The paints are formulated by adding the white pigment prepaint and exterior pigment extender prepaint to the binder prepaints and mixing well.

Paint			Prepaints (wt.)				Water
No.	PVC (%)	Volume Solids (%)	White	Exterior Extender	PVA Binder	Flat Acrylic Binder	(wt.)
			(Ex 14)	(Ex 15)	(Ex 17)	(Ex 18)	
27-1	45.0	35.0	395.53	269.60	—	335.92	104.34
27-2	50.0	30.0	317.19	311.10	—	246.80	208.68
27-3	50.0	30.0	263.69	359.94	197.64	51.38	208.68
27-4	42.5	35.0	197.77	415.12	—	359.92	104.34
27-5	47.5	30.0	158.60	425.86	—	267.37	208.68
27-6	47.5	30.0	131.84	450.28	214.11	55.67	208.68
27-7	40.0	35.0	—	560.64	—	383.91	104.34
27-8	45.0	30.0	—	540.62	—	287.93	208.68
27-9	45.0	30.0	—	540.62	230.58	59.95	208.68

Paints 27-1, 27-4 and 27-7 are premium quality light, mid and deep tone paints; paints 27-2, 27-5 and 27-8 are first quality light, mid and deep tone paints; and paints 27-3, 27-6 and 27-9 are second quality light, mid and deep tone paints.

Example 28

This example describes the preparation of nine exterior satin latex paints of varying quality and tone using different combinations of the white pigment prepaint and exterior pigment extender prepaint of Examples 14 and 15, respectively, and the vinyl acetate/acrylic binder (PVA) and flat acrylic binder prepaings of Examples 17 and 18. The paints are formulated as described above.

Paint			Prepaints (wt.)				Water
No.	PVC (%)	Volume Solids (%)	White	Exterior Extender	PVA Binder	Flat Acrylic Binder	(wt.)
			(Ex 14)	(Ex 15)	(Ex 17)	(Ex 18)	
28-1	35.0	35.0	395.53	129.44	—	431.90	104.34
28-2	37.0	30.0	351.59	123.51	—	353.75	208.68
28-3	40.0	26.0	263.69	175.73	228.35	59.41	292.15
28-4	32.5	36.0	197.77	287.98	—	468.92	83.47
28-5	34.5	30.0	175.75	253.98	—	374.31	208.68
28-6	37.5	26.0	131.84	270.07	242.63	63.12	292.12
28-7	30.0	36.0	—	432.50	—	493.60	83.47
28-8	32.0	30.0	—	384.44	—	394.88	208.68
28-9	35.0	26.0	—	364.42	256.87	66.86	292.15

Paints 28-1, 28-4 and 28-7 are premium quality light, mid and deep tone paints; paints 28-2, 28-5 and 28-8 are first quality light, mid and deep tone paints; and paints 28-3, 28-6 and 28-9 are second quality light, mid and deep tone paints.

Example 29

This example describes the preparation of nine exterior gloss latex paints of varying quality and tone using different combinations of the white pigment and exterior extender preprints of Examples 14 and 15 and vinyl acetate/acrylic binder (PVA) and gloss acrylic binder preprints of Examples 17 and 19. The paints are formulated as described above.

Paint			Prepaints (wt.)			Water
No.	PVC (%)	Volume Solids (%)	White (Ex 14)	PVA Binder (Ex 17)	Gloss Acrylic Binder (Ex 19)	(wt.)
29-1	26.0	35.0	435.66	—	494.85	104.34
29-2	30.0	30.0	460.50	—	413.60	166.94
29-3	30.0	30.0	429.93	304.15	88.51	208.68
29-4	13.0	35.0	217.83	—	630.87	104.34
29-5	15.0	30.0	230.25	—	557.38	166.94
29-6	15.0	30.0	214.96	409.14	119.06	208.68
29-7	—	35.0	—	—	766.89	104.34
29-8	—	30.0	—	—	701.15	166.94
29-9	—	30.0	—	514.12	149.61	208.68

Paints 29-1, 29-4 and 29-7 are premium quality light, mid and deep tone paints; paints 29-2, 29-5 and 29-8 are first quality light, mid and deep tone paints; and paints 29-3, 29-6 and 29-9 are second quality light, mid and deep tone paints.

Example 30

This example describes the preparation of nine interior flat latex paints using different combinations of the white pigment and interior extender preprints of Examples 14 and 16 and the vinyl acetate/acrylic (PVA) and flat acrylic binder preprints of Examples 17 and 18. The paints are formulated as described above.

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Paint No.	PVC (%)	Volume Solids (%)	Prepaints (wt.)				Water (wt.)
			White	Interior Extender	PVA Binder	Flat Acrylic Binder	
			(Ex 14)	(Ex 16)	(Ex 17)	(Ex 18)	
30-1	50.0	30.0	351.59	273.94	197.64	51.38	208.68
30-2	60.0	30.0	263.69	470.21	166.40	—	208.68
30-3	75.0	25.0	128.02	620.95	34.67	—	313.02
30-4	47.5	15.0	175.79	401.73	214.11	55.67	208.68
30-5	57.5	30.0	131.84	558.69	187.20	—	208.68
30-6	72.5	25.0	64.01	653.67	52.00	—	313.02
30-7	45.0	30.0	—	529.51	230.58	59.95	208.68
30-8	55.0	30.0	—	647.18	208.01	—	208.68
30-9	70.0	25.0	—	686.40	69.34	—	313.02

Paints 30-1, 30-4 and 30-7 are premium quality light, mid and deep tone paints; paints 30-2, 30-5 and 30-8 are first quality light, mid and deep tone paints; and paints 30-3, 30-6 and 30-9 are second quality light, mid and deep tone paints.

Example 31

This example describes the preparation of nine interior satin latex paints using the white pigment and interior extender prepaints of Examples 14 and 16 and the vinyl acetate/acrylic (PVA) and flat acrylic binder prepaints of Examples 17 and 18. The paints are formulated as described above.

Paint No.	PVC (%)	Volume Solids (%)	Prepaints (wt.)				Water (wt.)
			White	Interior Extender	PVA Binder	Flat Acrylic Binder	
			(Ex 14)	(Ex 16)	(Ex 17)	(Ex 18)	
31-1	35.0	36.0	395.53	140.51	355.75	92.49	83.47
31-2	37.0	30.0	351.59	120.98	357.77	—	208.68
31-3	40.0	20.0	263.69	172.12	288.43	—	292.15
31-4	32.5	36.0	197.77	282.06	375.51	97.96	83.47
31-5	34.5	30.0	175.79	248.76	378.57	—	208.68
31-6	37.5	26.0	131.84	264.52	306.46	—	292.15
31-7	30.0	36.0	—	423.61	395.28	102.77	83.47
31-8	32.0	30.0	—	376.54	399.37	—	208.68
31-9	35.0	26.0	—	356.93	324.49	—	292.15

Paints 31-1, 31-4 and 31-7 are premium quality light, mid and deep tone paints; paints 31-2, 31-5 and 31-8 are first quality light, mid and deep tone paints; and paints 31-3, 31-6 and 31-9 are second quality light, mid and deep tone paints.

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Example 32

This example describes the preparation of nine interior gloss latex paints using the white pigment prepaint of Example 14 and the vinyl acetate/acrylic (PVA) and gloss acrylic binder prepaints of Examples 17 and 19. The paints are formulated as described above.

Paint No.	PVC (%)	Volume Solids (%)	Prepaints (wt.)			Water (wt.)
			White	PVA Binder	Gloss Acrylic Binder	
			(Ex 14)	(Ex 17)	(Ex 19)	
32-1	26.0	35.0	435.66	—	494.85	104.34
32-2	30.0	38.0	429.93	304.15	88.51	208.68
32-3	30.1	28.0	403.18	366.31	—	250.42
32-4	13.0	35.0	217.83	—	630.87	104.34
32-5	15.0	30.0	214.96	409.14	119.06	208.68
32-6	15.0	28.0	201.59	493.78	—	250.42
32-7	—	35.0	—	—	766.89	104.34
32-8	—	30.0	—	514.12	149.61	208.68
32-9	—	28.0	—	621.24	—	250.42

Paints 32-1, 32-4 and 31-7 are premium quality light, mid and deep tone paints; paints 32-2, 32-5 and 32-8 are first quality light, mid and deep tone paints; and paints 32-3, 32-6 and 32-9 are second quality light, mid and deep tone paints.

Example 33

This example describes the preparation of a latex paint useful for architectural coatings which can be prepared using the white prepaint of Example 20, the exterior pigment extender of Example 22, and the flat acrylic binder prepaint of Example 25. The paint is formulated as described above.

Paint		Prepaints (wt.)			Water (wt.)
PVC (%)	Volume Solids (%)	White	Exterior Extender	Flat Acrylic Binder	
		(Ex 20)	(Ex 22)	(Ex 25)	
35	48	331.27	294.95	475.42	33.39

The resulting paint should be a premium paint having a satin finish and a light tone.

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Example 34

This example describes the preparation of a low solids interior flat paint using the white pigment prepaint of Example 20, the interior pigment extender of Example 23, and the vinyl acetate/acrylic (PVA) binder prepaint of Example 24.

Paint		Prepaints (wt.)			Water (wt.)
PVC (%)	Volume Solids (%)	White (Ex 20)	Interior Extender (Ex 23)	PVA Binder (Ex 24)	
75	15	107.22	294.97	16.87	584.31

Example 34

This example describes the preparation of paints using the prepaints of Examples 1 to 6. The paints were prepared by mixing the pigment prepaint(s) with the binder prepaint(s), then adding the thickeners, water and colorants and mixing well. The Stormer viscosity, ICI viscosity, and pH were the equilibrated measured values.

Part A – Exterior Flat Paints (Best and Good)

Paint No.	Prepaint (lbs.)				Thickener (lbs.)		Water (lbs.)	Colorant (lbs.)
	White Pigment	Exterior Extender Pigment	PVA Binder	Flat Acrylic Binder	Acrysol SCT-275	Acrysol RM 2020 NPR		
	(Ex 1)	(Ex 2)	(Ex 4)	(Ex 6)				
34-1 ^a	353.86	278.01	—	306.97	10.40	14.00	149.68	—
34-2 ^b	235.96	351.50	177.30	46.09	26.40	11.20	237.06	—
34-3 ^a	—	516.00	—	351.00	32.68	—	146.45	162
34-4 ^b	—	500.00	206.58	53.70	48.48	—	237.06	162

- a. Best light tone and deep tone paints
- b. Good light tone and deep tone paints

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Measured Equilibrated Values				Calculated Properties					
Paint No.	Stormer Viscosity (KU)	ICI Viscosity (cp)	pH	Volume ^a (gallons)	Weight ^b (lbs)	PVC (%)	Volume Solids (%)	Weight Solids (%)	Density (lb/gal)
34-1 ^a	102	1.15	8.76	100	1112.92	45.05	35.08	50.66	11.13
34-2 ^d	101	0.87	8.30	100	1085.52	50.04	30.05	45.68	10.86
34-3 ^e	110	1.90	9.02	100	1046.13	39.94	35.00	47.92	10.46
34-4 ^f	121	1.80	8.70	100	1045.82	45.09	29.76	43.25	10.36

- c. There was 0.44% dispersant based on dry pigment and 7.48% coalescent based on dry polymer.
d. There was 0.46% dispersant based on dry pigment and 7.40% coalescent based on dry polymer.
e. There was 0.50% dispersant based on dry pigment and 7.00% coalescent based on dry polymer.
f. There was 0.50% dispersant based on dry pigment and 7.00% coalescent based on dry polymer.

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Part B - Exterior Satin Paint (Better)

Paint No.	Prepaint (lbs.)				Thickener (lbs.)		Water (lbs.)	Colorant (lbs.)
	White Pigment	Exterior Extender Pigment	PVA Binder	Flat Acrylic Binder	Acrysol SCT-275	Acrysol RM 2020 NPR		
	(Ex 1)	(Ex 2)	(Ex 4)	(Ex 6)				
34-5	314.56	137.00	—	323.00	17.82	17.58	234.22	—

Measured Equilibrated Values				Calculated Properties					
Paint No.	Stormer Viscosity (KU)	ICI Viscosity (cp)	pH	Volume (gallons)	Weight (lbs)	PVC (%)	Volume Solids (%)	Weight Solids (%)	Density (lbs/gal)
34-5	104	1.19	8.95	100.00	1044.18	36.94	29.96	43.26	10.44

There was 0.43% dispersant based on dry pigment and 7.43% coalescent based on dry polymer.

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Part C - Exterior Semigloss (Best and Good)

Paint No.	Prepaint (lbs.)				Thickener (lbs.)		Water (lbs.)	Colorant (lbs.)
	White Pigment	Exterior Extender Pigment	PVA Binder	Gloss Acrylic Binder	Acrysol SCT-275	Acrysol RM 2020 NPR		
	(Ex 1)	(Ex 2)	(Ex 4)	(Ex 5)				
34-6 ^a	389.40	—	—	530.37	—	15.20	98.44	—
34-7 ^b	383.98	—	85.33	294.89	22.40	26.00	217.67	—

a. Best
b. Good

Measured Equilibrated Values				Calculated Properties					
Paint No.	Stormer Viscosity (KU)	ICI Viscosity (cp)	pH	Volume (gallons)	Weight (lbs)	PVC (%)	Volume Solids (%)	Weight Solids (%)	Density (lbs./gal)
34-6 ^a	99	1.19	8.54	100.00	1033.41	26.00	35.00	46.91	10.33
34-7 ^b	102	1.05	8.20	100.00	1030.27	30.00	29.90	42.43	10.30

There was a 0.40% dispersant based on dry pigment solids and a 10.00% coalescent base on dry polymer
There was a 0.40% dispersant based on dry pigment solids and a 7.97% coalescent base on dry polymer

Part D - Interior Flat

Paint No.	Prepaint (lbs.)				Thickener (lbs.)		Water (lbs.)	Colorant (lbs.)
	White Pigment	Interior Extender Pigment	PVA Binder	Flat Acrylic Binder	Acrysol SCT-275	Acrysol RM 2020 NPR		
	(Ex 1)	(Ex 3)	(Ex 4)	(Ex 5)				
34-8 ^a	314.56	280.69	177.31	46.09	24.00	20.80	230.22	—
34-9	115.95	590.05	30.04	—	34.60	—	336.19	—
34-10 ^a	—	496.07	206.55	53.67	41.92	—	236.60	162
34-11	—	643.99	62.04	—	51.36	—	320.17	162

a. Paints 34-8 and 34-10 were best light and deep tone paints.
Paints 34-9 and 34-11 were good light and deep tone paints.

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Measured Equillibrated Values				Calculated Properties					
Paint No.	Stormer Viscosity (KU)	ICI Viscosity (cp)	pH	Volume (gallons)	Weight (lbs)	PVC (%)	Volume Solids (%)	Weight Solids (%)	Density (lbs/gal)
34-8	99	1.05	8.45	100.00	1093.67	50.00	30.00	45.88	10.94
34-9	84	0.70	8.50	100.00	1106.83	75.15	24.99	43.08	11.07
34-10	120	1.90	8.60	100.00	1034.81	45.04	29.99	43.36	10.35
34-11	108	1.88	8.80	100.00	1077.56	70.00	25.05	41.74	10.78

The percentage dispersant on dry pigment was 0.45%, 0.48%, 0.50%, and 0.50% for paint nos. 34-8 to 34-11, respectively. The percentages of Coalescent was 7.53%, 47%, 7.00% and 7.00% for paint nos. 34-8 to 34-11, respectively.

Part E - Interior Satin Paint

Paint No.	Prepaint (lbs.)				Thickener (lbs.)		Water (lbs.)	Colorant (lbs.)
	White Pigment	Interior Extender Pigment	PVA Binder	Flat Acrylic Binder	Acrysol SCT-275	Acrysol RM 2020 NPR		
	(Ex 1)	(Ex 3)	(Ex 4)	(Ex 5)				
34-12	314.56	138.00	319.00	—	24.96	21.40	229.76	—

The paint was a better light tone paint.

Measured Equillibrated Values				Calculated Properties					
Paint No.	Stormer Viscosity (KU)	ICI Viscosity (cp)	pH	Volume (gallons)	Weight (lbs)	PVC (%)	Volume Solids (%)	Weight Solids (%)	Density (lbs/gal)
34-12	93	0.91	8.37	100.00	1047.68	37.05	29.99	43.54	10.48

The dispersant in dry pigment was 0.43%.
The coalescent in dry polymer was 7.42%.

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Part F – Semi-Gloss Paint

Paint No.	Prepaint (lbs.)				Thickener (lbs.)		Water (lbs.)	Colorant (lbs.)
	White Pigment	Interior Extender Pigment	PVA Binder	Gloss Acrylic Binder	Acrysol SCT-275	Acrysol RM 2020 NPR		
	(Ex 1)	(Ex 3)	(Ex 4)	(Ex 6)				
34-13	383.98	—	294.89	85.33	22.40	26.00	217.67	—
34-14	359.89	—	347.58	—	28.80	28.00	255.70	—

Paint nos. 34-13 were better and good light tone paints.

Measured Equilibrated Values				Calculated Properties					
Paint No.	Stormer Viscosity (KU)	ICI Viscosity (cp)	pH	Volume (gallons)	Weight (lbs)	PVC (%)	Volume Solids (%)	Weight Solids (%)	Density (lbs/gal)
34-13	102	1.05	8.20	100.00	1030.27	30.01	29.91	42.43	10.30
34-14	101	1.19	7.90	100.00	1019.97	30.02	28.02	40.22	10.20

The dispersant was 0.40% on dry pigment for paints 34-13 and 34-14.

The coalescents were 7.97% and 7.47%, respectively for paints 34-13 and 34-14.

Supplier Information

Material Name	Material Type	Supplier
Tamol™ 1124	Dispersant	Rohm and Haas Company (Philadelphia, PA)
Tamol™ 1254	Dispersant	Rohm and Haas Company (Philadelphia, PA)
Tamol™ 731	Dispersant	Rohm and Haas Company (Philadelphia, PA)
Acrysol™ DR-3	Thickener/Rheology Modifier	Rohm and Haas Company (Philadelphia, PA)
Acrysol™ RM-2020 NPR	Thickener/Rheology Modifier	Rohm and Haas Company (Philadelphia, PA)
Acrysol™ RM-8W	Thickener/Rheology Modifier	Rohm and Haas Company (Philadelphia, PA)
Acrysol™ RM-825	Thickener/Rheology Modifier	Rohm and Haas Company (Philadelphia, PA)

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Rhoplex™ Multilobe 200	Binder	Rohm and Haas Company (Philadelphia, PA)
Rhoplex™ SG-10M	Binder	Rohm and Haas Company (Philadelphia, PA)
RES 3083	Binder	Rohm and Haas Company (Philadelphia, PA)
Kathon™ LX 1.5%	Biocide	Rohm and Haas Company (Philadelphia, PA)
Triton™ CF-10	Surfactant	Union Carbide Corporation (Danbury, CT)
Foamaster™ VL	Defoamer	Henkel Corporation
Drewplus™ L-475	Defoamer	Drew Chemical Corporation
Ti-Pure™ R-746	Titanium Dioxide Slurry	E.I. Dupont de Nemours and Co., Inc. (Wilmington, DE)
Ti-Pure™ R-706	Titanium Dioxide	E.I. Dupont de Nemours and Co., Inc. (Wilmington, DE)
Ti-Pure™ R-900	Titanium Dioxide	E.I. Dupont de Nemours and Co., Inc. (Wilmington, DE)
Ti-Pure™ R-902	Titanium Dioxide	E.I. Dupont de Nemours and Co., Inc. (Wilmington, DE)
Minex™ 4	Extender	Indusmin, Inc.
Optiwhite™	Extender	Burgess Pigment Company
Snowflake™	Extender	ECC America, Inc.
Vicron™ 15-15	Extender	Pfizer
Omyacarb™	Extender	Omya
Texanol™	Coalescent	Eastman Chemical

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1. A set of prepaints sufficient to form at least one paint line, comprising:
 - a. at least one fluid prepaint x, comprising at least one opacifying pigment;
 - b. at least one fluid prepaint y, comprising at least one extender pigment; and
 - c. at least one fluid prepaint z, comprising at least one polymeric binder; wherein prepaints x, y, and z are different from each other; and wherein prepaints x, y, and z are mutually compatible.
2. The set of prepaints of claim 1, wherein the number of prepaints is from 3 to 15.
3. The set of prepaints of claim 1, wherein prepaint x further comprises at least one particulate polymeric binder adsorbed onto the opacifying pigment.
4. The set of prepaints of claim 1, wherein prepaint y further comprises at least one particulate polymeric binder adsorbed onto the extender pigment.
5. A method of forming at least one paint line, comprising:
 - a. providing a set of prepaints, comprising:
 - i. at least one fluid prepaint x, comprising at least one opacifying pigment;
 - ii. at least one fluid prepaint y, comprising at least one extender pigment ; and
 - iii. at least one fluid prepaint z, comprising at least one polymeric binder; wherein prepaints x, y, and z are different from each other; and wherein prepaints x, y, and z are mutually compatible; and
 - b. dispensing predetermined amounts of prepaint(s) x, prepaint(s) y, and prepaint(s) z into containers or application devices to form at least one paint line.
6. A method of forming a range of paints, the range comprising at least two paint lines, comprising the steps of:
 - a. providing a set of prepaints sufficient to formulate at least two paint lines, comprising:
 - i. at least one fluid prepaint x, comprising at least one opacifying pigment;
 - ii. at least one fluid prepaint y, comprising at least one extender pigment ;
 - iii. at least one fluid prepaint z, comprising at least one polymeric binder; and
 - iv. at least one additional fluid prepaint x', y', or z';

wherein prepaints x, y, and z are different from each other, and
 wherein prepaints x, y, and z are mutually compatible;

b. dispensing predetermined amounts of prepaint(s) x, prepaint(s) y, prepaint(s) z, and the at least one additional prepaint into containers or application devices to form a range of paints.

7. The method of claim 5 or claim 6, further comprising the step of mixing prepaint(s) x, prepaint(s) y, prepaint(s) z, and at least one additional prepaint x', y', or z' before, while, or after they are dispensed into the container.
8. The method of claim 5 or claim 6, further comprising the step of mixing prepaint(s) x, prepaint(s) y, prepaint(s) z, and at least one additional preppint x', y', or z' before or while they are dispensed into the application device.
9. The method of claim 5 or claim 6, further comprising the step of adjusting the viscosity of the dispensed prepaints before, while, or after they are dispensed into the container.
10. The method of claim 5 or claim 6, further comprising the step of adjusting the viscosity of the dispensed prepaints before or while they are dispensed into the application device.
11. The method of claim 5 or claim 6, further comprising the step of adding additional materials that enhance the application or final performance properties of the paints.
12. The method of claim 5 or claim 6, further comprising the step of adding at least one colorant to the dispensed prepaints.
13. The method of claim 5 or claim 6, wherein prepaint x further comprises at least one particulate polymeric binder absorbed onto the opacyfying pigment.
14. The method of claim 5 or claim 6, wherein prepaint y further comprises at least one particulate polymeric binder absorbed onto the extender pigment.
15. The method of claim 5 or claim 6, wherein the method is carried out at a paint manufacturing facility.
16. The method of claim 5 or claim 6, wherein the method is carried out at a point-of-sale.
17. The method of claim 5 or claim 6, wherein the method is carried out at a point-of-use.
18. The method of claim 5 or claim 6, wherein the method is controlled by a computer.
19. The method of claim 5 or claim 6, wherein the number of prepaints is from 4 to 15.

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- 20. A fluid titanium dioxide prepaint useful for formulating a one pack, pigmented latex paint containing other paint ingredients, which prepaint consists essentially of at least one opacifying pigment, at least one dispersant, at least one thickener, and water;
wherein the dispersant(s) and the thickener(s) are mutually compatible with the pigment(s) and with the latex paint ingredients, and
wherein the prepaint has a volume solids content of about 30% to about 70% and a Stormer viscosity of about 50 to about 250 KU.
- 21. The prepaint of claim 20, wherein the volume solids content is 35% to 50% and the Stormer viscosity is 60 to 150 KU.
- 22. A fluid titanium dioxide prepaint useful for formulating a one pack, pigmented latex paint containing other paint ingredients, which prepaint consists essentially of at least one opacifying pigment, at least one dispersant, at least one thickener, at least one film-forming or nonfilm-forming polymer, and water;
wherein the dispersant(s), the thickener(s), and the polymer(s) are compatible with the pigment(s) and with the other paint ingredients, and
wherein the prepaint has a volume solids content of about 30% to about 70%, a PVC of about 35% to 100%, a Stormer viscosity of about 50 to about 250 KU, and wherein the prepaint is stable to sedimentation.
- 23. The prepaint of claim 22, wherein the volume solids content is about 35% to about 50%, the PVC is about 50 to 100%, and the Stormer viscosity is about 60 to about 150 KU.
- 24. The prepaint of claim 22, wherein the polymer is adsorbed onto the opacifying pigment.
- 25. The prepaint of claim 20 or 22, wherein the opacifying pigment is a material selected from the group consisting of titanium dioxide, zinc oxide, lead oxide, a synthetic polymer pigment and mixtures thereof.
- 26. The prepaint of claim 25, wherein the opacifying pigment is rutile titanium dioxide.
- 27. The prepaint of claim 25, wherein the synthetic polymer pigment is voided latex polymer particles.
- 28. The prepaint of claim 20 or 22, wherein the dispersant is a material selected from the group consisting of 2-amino-2-methyl-1-propanol (AMP), dimethylaminoethanol (DMAE), potassium tripolyphosphate (KTPP), trisodium polyphosphate (TSPP), citric

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acid, polyacrylic acid, diolefin/maleic anhydride adducts, hydrophobically-modified polyacrylic acid, hydrophilically-modified polyacrylic acid salts, and mixtures thereof.

29. The prepaint of claim 20 or 22, wherein the thickener is a material selected from the group consisting of ASE, HASE, HEUR, cellulosic, hydrophobically-modified cellulosic, hydrophobically-modified polyacrylamide, polyvinyl alcohol, fumed silica, attapulgite clay, titanate chelating agent and mixtures thereof.
30. The prepaint of claim 22, wherein the polymer is selected from the group consisting of acrylic, polyvinyl acetate, styrene-acrylic, styrene-butadiene, vinyl acetate-acrylic, ethylene-vinyl acetate, vinyl acetate-vinyl versatate, vinyl acetate-vinyl maleate, vinyl acetate-vinyl chloride-acrylic, ethylene-vinyl acetate-acrylic polymers and mixtures thereof, further consisting essentially of up to about 10% by weight of the polymer of functional and other monomers.
31. The prepaint of claim 20 or 22, further consisting essentially of at least one additive selected from the group consisting of acid, base, defoamer, coalescent, cosolvent, mildewcide, biocide and antifreeze agent;
wherein the minor additive is present at a level of less than about 10% by weight, based on the total weight of the prepaint.
32. A fluid pigment extender prepaint useful for formulating a one pack, pigmented latex paint containing other paint ingredients, which prepaint consists essentially of at least one mineral extender, at least one thickener, an optional polymeric binder and water, wherein the pigment extender prepaint has a volume solids content of about 30% to about 70%, a PVC of about 35% to 100%, and a Stormer viscosity of about 50 to about 250 KU; and wherein the prepaint ingredients are compatible with each other and with the ingredients of the other prepaints desired to be used therewith.
33. A set of two prepaints useful for formulating a latex paint, comprising:
 - (a) the prepaint x of claim 20 or 22; and
 - (b) a fluid polymeric binder prepaint z which consists essentially of a water-borne polymeric binder having a Tg of about -30°C to about 70°C and water;
wherein prepaint z has a volume solids content of about 25% to about 70% and a Brookfield viscosity of less than about 100,000 centipoise at a shear rate of 1.25 reciprocal seconds; and

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wherein the prepaint ingredients are mutually compatible with each other and with the ingredients of the other prepaint in the set.

34. The set of prepaints of claim 33, wherein prepaint z consists essentially of a water-borne polymeric binder having a Tg of about -10 to about 60°C and water, a volume solids content of about 30 to about 65% and a Brookfield viscosity of about 100 to about 50,000 centipoise at a shear rate of 1.25 reciprocal seconds.

35. The set of prepaints of claim 33, wherein the polymeric binder prepaint further consists essentially of at least one additive selected from the group consisting of acid, base, defoamer, coalescent, cosolvent, mildewcide, biocide and antifreeze agent;

wherein the minor additive is present at a level of less than about 10% by weight, based on the total weight of prepaint.

36. A set of three prepaints useful for formulating a latex paint, comprising:

(a) the set of prepaints of claim 33; and

(b) a fluid pigment extender prepaint y which consists essentially of at least one mineral extender, at least one thickener, an optional polymeric binder, and water;

wherein the pigment extender prepaint has a volume solids content of about 30% to about 70%, a PVC of about 35% to 100%, and a Stormer viscosity of about 50 to about 250 KU; and

wherein the prepaint ingredients are mutually compatible with each other and with the ingredients of the other prepaints in the set.

37. The set of prepaints of claim 36, wherein the pigment extender prepaint y has a volume solids content of about 35% to about 65%, a PVC of about 40% to 100% and a Stormer viscosity of about 60 to about 150 KU.

38. The set of prepaints of claim 33, wherein the pigment extender prepaint further consists essentially of at least one additive selected from the group consisting of acid, base, defoamer, coalescent, cosolvent, mildewcide, biocide, and antifreeze agent;

wherein the minor additive is present at a level of less than about 10% by weight, based on the total weight of prepaint.

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ABSTRACT

Methods of providing a paint line and a range of paints using preprints are provided. A preprint containing opacifying pigment and sets of preprints including the preprint are also provided.

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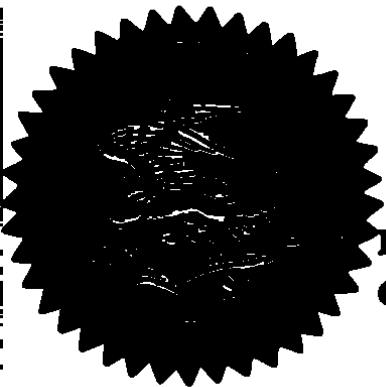
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June 27, 2001

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 09/785,637

FILING DATE: February 16, 2001



**By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS**


H. L. JACKSON

Certifying Officer

02/16/01
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CERTIFICATE OF EXPRESS MAILING
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Clifford Chance Rogers & Wells LLP

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09785637

Docket No. 6258-69

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION TRANSMITTAL

COMMISSIONER OF PATENTS
BOX PATENT APPLICATION
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is a utility patent application

Of: John M. Friel

For: PREPAINTS AND METHOD OF PREPARING ROAD-MARKING PAINTS FROM

PREPAINTS

ENCLOSED are the following:

1. ☒ Specification, abstract and claims (26 pages)
2. ☐ _____ sheets of ☐ formal ☐ informal drawings (Figs. _____)
Suggested Figure for Publication: _____
3. ☒ Declaration
☐ signed ☒ unsigned
☐ Copy from a prior application (for continuation/divisional)
4. ☐ Application Data Sheet
5. ☐ Preliminary Amendment
6. ☐ Information Disclosure Statement and PTO-1449
7. ☐ Assignment and Assignment Recordation sheet (Fee calculated separately)
8. ☐ The prior application is assigned to: _____
The assignment was recorded on _____ at reel _____ and frame _____.
☐ A copy of the assignment from the prior application is enclosed.
9. ☐ Non-Publication Request
10. ☐ Other:

NOTE the following:

11. ☐ This application is made under 37 C.F.R. § 1.53 (b) and is a
☐ Continuation ☐ Continuation-In-Part ☐ Divisional
of Prior Application No. _____ filed _____

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12. ☐ An Extension of time is filed concurrently herewith for the parent application.
13. Small Entity Status:
- ☐ Applicant is a small entity
- ☐ Small entity status claimed in the parent application is no longer proper
14. ☒ Applicants claim priority from the following applications(s) under 35 U.S.C. § 119:

Serial Number	Country	Filing Date	Certified Copy Encl
60/183,655	US	2/18/00	
60/183,656	US	2/18/00	
60/247,639	US	11/10/00	

15. ☐ Cancel claims _____ prior to calculation of the filing fee.

FILING FEE: calculated below (after accounting for any preliminary amendment or claims cancellations if noted above):

Basic Filing Fee			\$710.00
Total No. Claims	Extra Claims(Total-20)	Fee / claim	
99	79	\$18.00	\$1,422.00
Total No. Independent Claims	Extra Independ.(No.-3)	Fee / claim	
6	3	\$80.00	\$240.00
Multiple dependant claim? + \$270			\$270.00
Sub-Total			\$2,642.00
TOTAL FEE DUE			\$2,642.00

16. ☐ A check in the amount of _____ is enclosed (must at least cover the basic fee).
- ☒ The Commissioner is authorized to charge \$2,642.00 in connection with this communication to Deposit Account No. 50-0521.

In the event that a petition for extension of time is required to be submitted in the pending prior application, and in the event that a separate petition for the pending prior application is not filed on even date, applicant hereby petitions under 37 C.F.R.1.136(a) for an extension of time in the pending prior application of as many months as are required to render this submission timely. The Commissioner is authorized to charge any fees due in connection with such a petition to Deposit Account No. 50-0521.

The Commissioner is authorized to charge any fee or additional fee due in connection with this communication to Deposit Account No. 50-0521.

A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Date: February 15, 2001

Margaret B. Kelley
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**APPLICATION
FOR
UNITED STATES LETTERS PATENT**

**TITLE: PREPAINTS AND METHOD OF PREPARING ROAD-MARKING
 PAINTS FROM PREPAINTS**

**APPLICANTS: John M. Friel, John W. Hook III, Bernhard H. Lieser,
 Jerry W. Washel , Dennis P. Lorah, Donald C. Schall, and
 Ann R. Hermes**

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<u>James Porter</u>	
<u>James Porter</u>	

PREPAINTS AND METHOD OF PREPARING ROAD-MARKING PAINTS FROM PREPAINTS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Applications Ser. Nos. 60/183,655 filed February 18, 2000, 60/183,656 filed February 18, 2000, and 60/247,639 filed November 10, 2000.

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to sets of prepaints, a method of preparing road-marking paint lines from the sets of prepaints and to a method of preparing a range of road-marking paints from the sets of prepaints.

Description of Related Art

Paint formulation involves the process of selecting and admixing appropriate paint ingredients in the correct proportions to provide a paint with specific cost, processing and handling properties, as well as the desired final dry paint film properties. The major ingredients of many paint formulations are a binder, an opacifying pigment, an optional pigment extender, and a fluid medium, e.g., water if the paint is a water-borne paint such as a latex paint or a solvent if the paint is a solvent-borne paint such as an oil-based paint. Typically, optional ingredients are included such as defoamers, coalescents, plasticizers, thickeners, non-thickening rheology modifiers, solvents, driers, anti-skinning agents, surfactants, mildewcides, biocides, and dispersants. After the paint is formulated and applied to a surface, the paint dries by evaporation of the water and/or solvent, with or without the application of heat or radiation, and the binder forms a film containing therein the pigment and the extender particles, if any.

Formulating paints is complex. It is not simply a matter of mixing a few paint ingredients in different ratios. Rather, it involves the selection and mixing of different paint ingredients in different ratios depending on the type of paint desired. This requires paint manufacturers to store many different paint ingredients and change paint ingredients during manufacture depending on the specific paint type being prepared.

Furthermore, it requires those involved in the supply chain and, in particular, paint retailers to carry a large inventory of paints in order to offer a range of paints having various sheen levels, tint bases, particular end uses (i.e., exterior or interior), and various qualities. It

would be desirable to make paints, either at a relatively large-scale industrial plants or on a relatively smaller-scale, at point-of-sale or at point-of-use locations using a limited number of paint ingredients to prepare all of these different paint formulations, thus minimizing the number and type of paint ingredients required to make a range of paints.

In general, road-marking paint formulations are less complex than architectural paint formulations and typically are only tinted to a limited range of colors (white, yellow, light blue, red and black) rather than to the extremely wide palette of colors available for many architectural paint formulations. However, a number of different ingredients must be combined to form the final road-marking paint. Road-marking paint formulations may also require quick-setting which further complicates their formulation because the manufacturer, seller, or user must balance the advantages of quick-setting with the inherent limited pot-life that such paints exhibit. In addition, road-marking paints may need to be applied, due to road safety requirements, under different conditions than are typically experienced when an architectural paint is applied. For example, road-marking paints may need to be applied over a temperatures range of from just above 0°C to greater than 40°C and in different humidities. In addition, road-marking paints are exposed to rigorous conditions immediately after application, such as heavy traffic flow and deteriorating and unexpected weather conditions.

Thus, there is a need for a road-marking paint which can be used at the point of application under the ambient conditions, including temperature, humidity, traffic flow and the like, in addition to the other benefits offered by delayed product differentiation.

SUMMARY OF THE INVENTION

Paint manufacturers and retailers typically offer a range of paints, which includes at least two paint lines. As used herein, "the range including at least two paint lines" is meant that discrete elected levels of an observable property defining a first paint line are combined with discrete elected levels of an observable property defining a second paint line to define the paints in the range of paints. For example, to prepare a range of paints including four paint lines it may be necessary to prepare paints encompassing four sheen levels, four tint bases, two use areas — interior use and exterior use, and three quality levels, and preferably all combinations thereof which means 96 different paint formulations ($4 \times 4 \times 2 \times 3$) may be needed. Also encompassed, however, is a range of paints in which certain of the defined paints, up to 10-60% of the total number of paints, are selected to be omitted, for example, for commercial reasons. Further contemplated is a range of paints in which the observable properties of the dried paint films

substantially, but not exactly, fulfill the definition herein; for example, the sheen of a dried outdoor mid-tone gloss paint in the standard, better, and premium lines may differ by a few points without departing from the meaning of a range of paints of this invention.

A "paint line," as used herein, includes at least two different paints which offer dried film properties which differ materially from each other in at least one observable property such as color and outdoor durability.

As used herein, prepaints are "mutually compatible" if the paints formed by admixing the prepaints do not evidence signs of colloidal instability such as flocculation. Preferably, prepaints, as well as the paints formed from the prepaints, exhibit less than 5 g of residue such as gel and grit per liter of paint when the paint is passed through a 200 mesh screen, more preferably less than 1 g of residue.

The present invention provides a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line useful for road-marking applications. The prepaints include at least one fluid prepaint including at least one opacifying pigment, at least one fluid prepaint including at least one extender pigment, and at least one fluid prepaint including at least one polymeric binder. Preferably, the number of prepaints is 3-15.

Also provided is a method of forming at least one paint line useful for road-marking applications, which method comprises the steps of:

- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line, which set comprises (i) at least one opacifying prepaint comprising at least one opacifying pigment; (ii) at least one extender prepaint comprising at least one extender pigment, and (iii) at least one binder prepaint comprising at least one polymeric polymer binder; and
- (b) dispensing a predetermined amount of each of the prepaints into containers or an applicator to form the paint line.

Further provided is a method of forming a range of paints, which range includes at least two paint lines useful for road-marking applications, which method comprises the steps of:

- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate a range of road-making paints, which set comprises (i) at least one opacifying prepaint comprising at least one opacifying pigment; (ii) at least one extender prepaint comprising at least one extender pigment; (iii) at least one binder prepaint comprising at least one polymeric binder; and (iv) at least one additional different prepaint selected from the group consisting of prepaints (i), (ii), and (iii); and

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(b) dispensing a predetermined amount of each of the prepaints into containers or applicators to form the paints. The total number of prepaints is preferably 4-15.

The above methods may further include the step of mixing the prepaints before, while, or after they are dispensed into the containers or before or while they are dispensed into the applicators.

In another embodiment, the above goal is achieved by employing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line useful for road-marking applications. The set comprises (i) at least one opacifying/binder prepaint which comprises at least one opacifying pigment and at least one polymeric binder; and (ii) at least one extender pigment which comprises at least one extender pigment. The number of prepaints is preferably 2-15, also provided is a method of forming at least one paint line useful for road-marking applications, comprises the steps of:

- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least one paint line, which set comprises (i) at least one opacifying binder prepaint comprising at least one opacifying pigment and at least one polymeric binder; and (ii) at least one extender/binder prepaint including at least one extender pigment and at least one polymeric binder; and
- (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the paint line.

A method of forming a range of paints is provided. The range includes at least two paint lines useful for road-marking applications. The method comprises the steps of:

- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate the range of road-marking paints, which set comprises (I) at least one opacifying/binder prepaint comprising at least one opacifying pigment and at least one polymeric binder, (II) at least one extender prepaint comprising at least one extender pigment, and (III) at least one additional different opacifying/binder prepaint or one extender prepaint selected from (I) or (II); and
- (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the range of paints.

The above methods may further comprise the step of mixing the prepaints before, while, or after they are dispensed into the containers or before or while they are dispensed into the applicator(s). The total number of prepaints is preferably 3-15.

The method may further include the step of adjusting the viscosity of the dispensed prepaints before, while, or after they are dispensed into the containers or before or while they are

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dispensed into the applicator(s) using a thickener, water, or mixtures thereof. The methods may be carried out at a paint manufacturing facility, a point-of-sale or a point-of-use and may be controlled by a computer.

Additives may be used to enhance the application of the road making paints or final performance properties of the road-making paints. In addition, at least one colorant, typically white or yellow, may be added the dispensed prepaints. Alternatively, the opacifying prepaint may further comprise at least one colorant. The colorants are preferably white or yellow.

The prepaints may comprise a polymeric binder that is a latex polymer. They may further comprise at least one quick-setting fluid prepaint. Alternatively, the set of prepaints may contain a polymeric binder that is a quick-setting binder. Alternatively, the quick-setting component may be added as a separate ingredient. Furthermore, a combination of the above may be utilized.

One or more paint lines can be prepared. A paint line includes two or more different paints whose dried films differ materially from each other in at least one observable property.

If only one paint line is desired, *i.e.*, if one key property is to be varied (*e.g.*, sheen level, tint base, use type, or quality type), then the complete paint line can be made from one each of the opacifying prepaint, (i) extender prepaint (ii) and binder prepaint (iii) or one each of opacifying/binder prepaint (I) and prepaint extender (II).

If a range of paints including two paint lines is desired, *i.e.*, if two key properties are varied (*e.g.*, two properties selected from sheen level, tint base, use type, and quality type), this range of paints may be made from: at least one each of the opacifying prepaint, (i) the extender prepaint, (ii) and the binder prepaint (iii) and at least one additional different prepaint selected from the group consisting of opacifying prepaint (i) extender prepaint (ii), and binder prepaint (iii); and opacifying/binder (I), at least one each of prepaint (I), extender prepaint (II) and at least one additional different prepaint selected from the group consisting of the opacifying/binder prepaint I and the extender prepaint II; and depending on which key properties are to be varied. By "additional different prepaints" selected from prepaints (i), (ii), and (iii) or "additional different prepaints" selected from prepaints (I) and (II) is meant a prepaint different from prepaint (i), (ii), and (iii) or (I) and (II), respectively, but otherwise meeting the limitations associated with prepaint (i), (ii), and (iii) or prepaints (I) and (II).

If a range of paints including three paint lines is desired, *i.e.*, if three key properties are varied (for example, three properties selected from sheen level, tint base, use type, and quality type), then the range of paints can be made from at least one each of the opacifying prepaint (i) its extender prepaint (ii) and the binder prepaint (iii) and at least two additional different prepaints

selected from the opacifying prepaint (i) the extender prepaint (ii), and the binder prepaint (iii); or at least one each of the opacifying/binder prepaint (I), the extender prepaint (II), and at least two additional prepaits selected from the group consisting of prepaits I and II; depending on which key properties are to be varied.

If a range of paints including four paint lines is desired, i.e., if four key properties are varied (for example, sheen level, tint base, use type, and quality type) then the complete range of paints can be made from at least one each of the opacifying prepaint (i), the extender prepaint (ii), the binder prepaint (iii) and at least three additional different prepaits selected from the group consisting of prepaits (i), (ii), and (iii) or at least one each of opacifying/binder prepaint (I), extender prepaint (II), and at least one additional prepaint selected from the group consisting of prepaits I and II; depending on which key properties are to be varied.

The technique described above may be repeated to vary as many additional key properties as desired.

The pigment volume concentration (hereafter "PVC") is a measure of how "binder-rich" a formulation is. It is calculated using the following formula:

$$PVC (\%) = \frac{\text{volume of pigment(s)} + \text{volume extender(s)}}{\text{volume of pigment(s)} + \text{volume extender(s)} + \text{volume binder(s)}} \times 100$$

The volume solids content (hereafter "VS") is the dry volume of pigment(s) plus dry volume of extender(s) plus dry volume of binder(s). It is calculated using by the following formula:

$$VS (\%) = \frac{\text{dry volume of pigment(s)} + \text{dry volume of extender(s)} + \text{dry volume of binder(s)}}{\text{total volume of formulation}} \times 100.$$

If additives are present, their volume is not included in determining the total dry volume.

In each of the above embodiments, the prepaits are selected so they provide a wide formulation space so that the desired final paint properties lie within the blend space defined when the prepaits are at the extremes. In many cases, the prepaits will not by themselves be practical paints; however, by pushing the prepaits to these extremes one can maximize the blend space available for the paint line. When the prepaits, additives, and colorants are all fully compatible, they can be blended at the desired ratios to achieve the desired paint line(s) and range of paints without inducing colloidal instability.

This technique is similar to the design principles used in statistical experimental design and analysis of mixture component designs; however, instead of designing a mixture space to explore the response surface within it, one is designing the boundaries of the mixture space to

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maximize the flexibility of the paint system. The key to success is to have mutual compatibility of the individual ingredients in each prepaint and of the prepaints across the mixture space.

Paint properties can be predicted in a number of ways. One approach is to develop response surface models of the blend space using standard mixture component experimental design statistical tools. These simple statistical models can then be used by a linear optimization program, by a massive grid search, or by a graphical analysis tool. Another approach is to simply use empirical methods to determine which blends are needed for specific paint lines, then incorporate those simple empirical recipes in the paint making machine software.

An extension of these techniques is to have the paint machine automatically pretest certain key properties (e.g., viscosity, drying speed, opacity or color) and make minor adjustments during the formulating of the paint from the prepaints. Having feedback loops in the paint machine can provide more precise matching of viscosity, drying speed, opacity, and color targets.

If colorants and optional additives are included in the prepaints to enhance specific paint properties and the additives and/or colorants are fully compatible, i.e., they can be blended at any ratio without inducing colloidal instability, then they can be blended in any combination falling within the formulation space needed to achieve the desired profile in the final paint. It is sufficient, however, for the colorants and optional additives to be compatible, i.e., they can be blended at desired ratios to achieve the desired property profile in the range of paints without inducing colloidal instability.

As used herein, "compatible paint ingredients" may be combined in the various prepaints and the paints formed from the prepaints provide the properties characteristic of the amount of ingredient used.

Preferably, all the fluid prepaints used in the methods of the present invention have the same or similar viscosities. This aids in mixing. Viscosity fluctuations in the final paints is expected to be reduced because of the prior equilibration of ingredients in the prepaints.

The prepaints are formulated to maximize the flexibility of paint manufacturing. Rather than purchasing individual paint ingredients, paint manufacturers, and even buyers at point-of-sale and point-of-use (paint stores, paint departments, and contractors) can purchase the set of prepaints required to prepare a desired range of paints. These prepaint sets will contain at least one each of the opacifying prepaint, the extender prepaint, and the binder prepaint and possibly additional prepaints depending upon the formulating flexibility desired. Optionally, the above

prepaints are mixed with an additional prepaint which includes at least one colorant such as a colored pigment or dye.

The method of the present invention is not limited to preparing only latex paints *per se* but may also be extended to preparing any water-borne or solvent-borne coating, or related building product requiring mixing of ingredients, including, sealants, caulks, mastics, adhesives and other building-related products.

DETAILED DESCRIPTION OF THE INVENTION

In one embodiment, the prepaint is a fluid titanium dioxide prepaint which comprises at least one titanium dioxide opacifying pigment, at least one dispersant, at least one thickener, and water. The prepaint ingredients and other optional paint ingredients are mutually compatible with each other and in the final paint. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 65%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. Preferably, the prepaint is stable to sedimentation, *i.e.*, the pigment does not settle out after 10 days at 25°C.

In another embodiment, the prepaint is a fluid titanium dioxide prepaint useful for formulating a one pack, pigmented latex paint containing other paint ingredients. The prepaint includes at least one opacifying pigment, at least one dispersant, at least one thickener, at least one film-forming or nonfilm-forming polymeric binder, and water. The prepaint ingredients are mutually compatible with each other and with other optional paint ingredients. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 65%, a PVC of about 35% to 100%, preferably about 45% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. Preferably, the prepaint is stable to sedimentation, *i.e.*, it does not settle out after 10 days at 25°C. Optionally, the polymeric binder is adsorbed onto the titanium dioxide opacifying pigment or other opacifier of present.

In one embodiment of prepaint, the pigment, the extender, the prepaint includes at least one mineral extender, at least one thickener, an optional polymeric binder and water. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 70%, a PVC of about 35% to 100%, preferably about 40% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. The prepaint ingredients are compatible with each other and with the ingredients of the other prepaits and should be compatible with ingredients of the other prepaits with which it will be used.

In one embodiment of extender prepaint (II), the fluid pigment extender prepaint includes at least one mineral extender, at least one thickener, a polymeric binder and water. The prepaint has a volume solids content of about 30% to about 80%, preferably about 40% to about 70%, a PVC of about 35% to 100%, preferably about 40% to 100%, and a Stormer viscosity of about 50 to about 250 KU, preferably about 60 to about 150 KU. The prepaint ingredients are compatible with each other and with the ingredients of the other prepaints and should be compatible with the ingredients of the other prepaints with which it will be used.

In one embodiment, fluid latex polymer binder prepaint includes a water-borne latex polymer binder having a Tg of about -30°C to about 70°C, preferably about -10°C to about 60°C, and water. The binder prepaint has a volume solids content of about 25% to about 70%, preferably about 30% to about 65%, and a Brookfield viscosity of less than about 100,000 centipoise, preferably about 100 to about 50,000 centipoise, at a shear rate of 1.25 reciprocal seconds. The prepaint ingredients are compatible with each other and with the ingredients of the other prepaints that they will be used with.

In the embodiments where prepaints I, II, i, ii, and iii are used, minor amounts, *i.e.*, less than about 20% by weight, based on the total weight of the prepaint, of conventional paint additives an acid, a base, a defoamer, a coalescent, a cosolvent, a dispersing resins, a mildewcide, a biocide, an antifreeze agent, a durability enhancer (including water-miscible or emulsified epoxies, waterborne isocyanates and silanes), and the like may be included. These additives must be compatible with the other paint ingredients in the prepaints and the other prepaints used in the methods of this invention. Furthermore, if durability enhancers are employed, the road-marking paint may have a pot-life of less than about 8 hours and thus would need to be applied in this time frame.

Opacifying pigments useful herein include white pigments which impart white scattering power to the paint across all visible wavelengths without a high degree of absorption. Pigment extenders are inorganic solids or opaque polymers which do not impart the primary color or hiding power to the paint although they may have secondary influences on those properties. The tint bases used for deep tone paints typically contain no or only very low levels of opacifying pigments.

Suitable opacifying pigments include titanium dioxide (TiO₂) or a combination of titanium dioxide and auxiliary hiding pigments such as voided latex polymer particles, zinc oxide, lead oxide, a synthetic polymer pigment, and mixtures thereof. Rutile and anatase grades of titanium dioxide are suitable for use herein. Rutile titanium dioxide is preferred. The surface

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of the titanium dioxides may be treated with various organic and/or inorganic surface treatments, e.g., as the oxides of silica, alumina, and zirconia. Fumed titanium oxide is also useful herein.

The voided latex particles useful herein have a particle size diameter of about 100 nm to about 2,500 nm, preferably about 500 nm to 1,100 nm and a void fraction of about 10% to about 75%. The voided latex particles have at least one void but may have multiple voids, non-spherical voids, interconnected voids, voids having channels connected to the outside of the particles, and void structures described as vesiculated and sponge-like. Preferably, the voided latex particles have a single void. The voided latex particles have a glass transition temperature (T_g), as measured by differential scanning calorimetry at a rate of 20°C/min, of at least about 20°C, preferably at least about 50°C. The higher the glass transition temperature, the harder the particle is and the less likely it is to collapse. If the voided latex particles collapse, they are unable to contribute to hiding. The voided latex particles may be prepared by conventional polymerization processes known in the art, such as those disclosed in US-A-3,784,391, US-A-4,798,691, US-A-4,908,271, US-A-4,972,000, US-A-5,041,464, US-A-5,157,084, US-A-5,216,044 and US-6,020,435, as well as Japanese Patent Applications 60/223,873, 61/62510, 61/66710, 61/86941, 62/127336, 62/156387, 01/185311, and 02/140272. Preferably, the voided latex particles are prepared according to US-A-4,427,836, US-A-4,469,825, US-A-4,594,363, US-A-4,880,842, US-A-5,494,971 and US-A-6,020,435.

Extender pigments provide low cost volume, are not soluble in water, and have a low absorption number. Extender pigments used in road-marking paints are optimized for dispersion viscosities, brightness, and low cost. Suitable extender pigments include barium sulfate (about 1 to about 15 microns), Blanc Fixe (about 0.5 to about 5 microns), calcium carbonate (about 0.05 to about 35 microns), silica (about 0.001 to about 14 microns), magnesium silicate (about 0.5 to about 15 microns), aluminum silicate (about 0.2 to about 5 microns), mica, bentonite, magnesium alumino-silicate, fumed alumina, colloidal attapulgite, synthetic amorphous sodium alumino-silicate, sodium potassium alumino-silicate, and the like including combinations thereof. Glass, ceramic, polymeric beads or microspheres and combinations thereof may also be used.

Latex polymeric binders are polymers or prepolymers which form the primary film of the paint. Binders bind the pigment(s) and/or extender(s), provide the required paint flow, and determine the durability and drying properties of the final paint film. The binders selected for the prepaints will depend upon the final use of the formulated paints. It may be necessary and desirable to use binders which may be either quick-setting or non-quick-setting and which have the ability to achieve quick-setting times between the slowest and fastest setting times. For

example, it may be desirable to include binders which are quicker setting when the paints are applied on a humid or rainy day, but not desirable from a cost perspective when the paints are applied on a dry day. It is within the scope of the present invention to utilize both types of binders in the system by:

- (1) separating the component(s)/ingredient(s) that cause the quick-setting ("quick-setting component") from the component(s)/ingredient(s) that form the binder as a separate prepaint;
- (2) separating the component(s)/ingredient(s) that cause the quick-setting ("quick-setting component") from the component(s)/ingredient(s) that form the binder into separate prepaints;
- (3) employing a quick-setting binder in the binder prepaints (when a quick-setting binder is not required as a separate quick-setting component);
- (4) adding the quick-setting component separately from any of the prepaints; and
- (5) combinations thereof

In the method of the invention, the quick-setting component is added as a separate component or prepaint, as described in Example 4 below. By controlling the presence and level of either the quick-setting component or the quick-setting binder, one can "dial-in" exactly the formulation that one wants depending upon cost structure and environmental conditions.

As used herein, the term "quick-setting," means a coating that has a drying time of no greater than about 10 minutes as measured by a modified ASTM D1640 dry time test. The test used is similar to ASTM D1640 which is a standard test for drying of organic coatings at room temperature in which the test films are applied on a non-porous substrate (e.g., a glass plate or metal panel) by a suitable means to give a wet film thickness of 0.012 +/- 0.001 inches. The ASTM test method is modified in that only minimal thumb pressure is applied. The thumb is turned through an angle of 90° while in contact with the test film. The drying time at which this rotation does not break the film is recorded.

A number of these quick-setting binder systems are known in the art. Suitable quick-setting systems (with either quick-setting binders or components) include, but are not limited to:

- (a) an aqueous dispersion including an anionically-stabilized polymer having a Tg of at least about -10°C, a non-protonated or partially protonated polyamine functional polymer formed from either an amine or an imine monomer (quick-setting component), and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;
- (b) an aqueous dispersion including a polyamine functional polymer that is a latex polymer having pendant amine-functional groups and a Tg of at least about -10°C (i.e., quick-setting

binder or component) and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;

(c) an aqueous dispersion including a polyamine functional polymer that is a latex polymer having pendant amine-functional groups and pendant acid-functional groups where the ratio of amine-functional groups to acid-functional groups is greater than about 3 to 1 and where the polymer has a Tg of at least about -10°C and pendant acid-functional groups (*i.e.*, quick-setting binder or component); and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;

(d) an aqueous dispersion including a polyamine functional polymer having a Tg of at least about -10°C and that is a latex polymer having pendant amine-functional groups (*i.e.*, quick-setting component), and a latex polymer that has a Tg of at least about -10°C pendant acid-functional groups (*i.e.*, quick-setting component), and a volatile base in an amount sufficient to deprotonate the conjugate acid of the polyamine functional polymer;

(e) an aqueous dispersion including an aqueous emulsion containing a polyamine functional polymer (*i.e.*, quick-setting binder or component) having a Tg of at least about -10°C, formed from polymerizable monomers including (a) alkyl esters of acrylic or methacrylic acid where the alkyl ester is a C₁-C₁₈ alkyl ester; (b) from about 0.1 to about 5% by weight, based on the acrylic or methacrylic film forming polymer of at least one secondary or tertiary aminoacrylate monomer, or secondary or tertiary aminomethacrylate monomer, and (c) from about 0.1 to about 5% by weight, based on the acrylic or methacrylic film forming polymer of a crosslinkable monomer selected from the group consisting of acrylamide, methacrylamide, and N-alkylol acrylamide; and said polyamine functional polymer having less than 3 percent by weight, based on said film forming polymer of hydrophilic monomer incorporated therein, and a volatile base in an amount sufficient to deprotonate the conjugate acid of said polyamine functional polymer;

(f) a composition including an aqueous dispersion including a polymer having a Tg of at least about -10°C pendant strong cationic groups (*i.e.*, quick-setting component); an aqueous dispersion including a polymer having a Tg equal to or greater than about -10°C pendant weak acid groups;

(g) an aqueous dispersion including a polymer having a Tg of at least about -10°C and both pendant strong cationic groups and pendant weak acid groups (quick-setting binder), wherein the polymer has.

Suitable polymeric binders include, but are not limited to, latex polymers such as homopolymers, copolymers, or terpolymers such as acrylic and/or methacrylic, polyvinyl acetate,

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styrene-acrylic, styrene-butadiene, vinyl acetate-acrylic, ethylene-vinyl acetate, vinyl acetate-vinyl versatate, vinyl acetate-vinyl maleate, vinyl acetate-vinyl chloride-acrylic, ethylene-vinyl acetate-acrylic, and urethane polymers, optionally containing up to 10% by weight of functional monomers such as carboxylic acid, phosphate, sulfate, sulfonate, amide and like functional monomers and combinations thereof. Polymeric binders optionally incorporated in opacifying prepaint (i) and extender prepaint (ii) and the different prepaits selected from (i) and (ii), prepaits, or other prepaits, may be the same as or different from the polymeric binder incorporated in binder prepaint (iii). Likewise, polymeric binders incorporated in opacifying/binder prepaint I and extender prepaint II and the different prepaits selected from I and II, or other prepaits, may be the same as or different from each other. Other binders such as alkyds and their blends with chlorinated rubber, solvent-borne thermoplastic acrylics, unsaturated polyesters, two-part epoxies and the like may be included in the prepaits.

Thickener is a general term which includes any material added to a paint to modify its rheological profile. Preferred thickeners for use herein are associative thickeners. Suitable thickeners for use herein include polyvinyl alcohol (PVA), hydrophobically-modified, alkali soluble emulsions known in the art as HASE emulsions, alkali-soluble or alkali-swellable emulsions known in the art as ASE emulsions, hydrophobically-modified ethylene oxide-urethane polymers known in the art as HEUR thickeners, and cellulosic thickeners such as hydroxymethyl cellulose (HMC), hydroxyethyl cellulose (HEC), hydrophobically-modified hydroxy ethyl cellulose (HMHEC), sodium carboxymethyl cellulose (SCMC), sodium carboxymethyl 2-hydroxyethyl cellulose, 2-hydroxypropyl methyl cellulose, 2-hydroxyethyl methyl cellulose, 2-hydroxybutyl methyl cellulose, 2-hydroxyethyl ethyl cellulose, 2-hydroxypropyl cellulose, and the like. Also useful as thickeners are fumed silica, attapulgite clay and other types of clay, titanate chelating agents, and the like.

Suitable dispersants for use herein include non-ionic, anionic, and cationic dispersants such as 2-amino 2-methyl 1-propanol (AMP), dimethyl amino ethanol (DMAE), potassium tripolyphosphate (KTPP), trisodium polyphosphate (TSPP), citric acid and other carboxylic acids, and the like. Anionic polymers such as homopolymers and copolymers based on polycarboxylic acids, including those that have been hydrophobically- or hydrophilically-modified, e.g., polyacrylic acid or polymethacrylic acid or maleic anhydride with various monomers such as styrene, acrylate or methacrylate esters, diisobutylene, and other hydrophilic or hydrophobic comonomers. Also, included are salts of the aforementioned polymers, as well as mixtures of these dispersants.

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Suitable defoamers include silicone-based and mineral oil-based defoamers, and the like.

Coalescents are not necessary if solvent-free latex polymeric binders are used in the binder prepaints. Solvent-free binders typically have a low Tg and low minimum film-forming temperature so that they are film-forming at ambient temperatures, such as about 20°C. If a coalescent is required, preferably it is incorporated in each of binder prepaint (iii) and any other prepaints containing latex polymeric binders. Suitable coalescents, plasticizers, and other optional solvents include ethylene glycol, propylene glycol, hexylene glycol, 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate (TEXANOL™), glycol ethers, mineral spirits, methyl carbitol, butyl carbitol, phthalates, adipates, and the like.

Suitable mildewcides and biocides include zinc oxide, isothiazolones, triazoles, and the like.

Suitable surfactants include cationic, anionic, and non-ionic surfactants.

As used herein, the term "road" is used as a generic term and includes any indoor or outdoor solid surface which is or may be exposed to pedestrians, moving vehicles, tractors, or aircrafts constantly or intermittently. Some non-limiting examples of a "road" include highways, streets, driveways, sidewalks, runways, taxiing areas, tarmac areas, parking lots, rooftops, indoor floors (such as in factories or shopping malls), and like surfaces. The surface material may be masonry, tar, asphalt, resins, concrete, cement, plaster, stone, stucco, tiles, wood, polymeric materials, metals such as aluminum, stainless steel, or carbon steel), and combinations thereof. All of the substrates may already have one or more layers of existing coating or paint which may be fresh or aged.

The road-marking paint may be applied to the surface by a number of ways known to those having ordinary skill in the art, including, but not limited to, spraying, rolling, brushing, extrusion, and combinations thereof.

Any of the prepaints may optionally contain absorbers that accelerate the drying of the road-marking paint, provided that the absorbers are added to the prepaint in a time frame that will permit the application of the paint. The addition of an absorber to a prepaint will cause a rapid increase in viscosity that may make it difficult or impossible to apply. Thus, the absorber may need to be added immediately prior to application to the road surface. In addition, the absorbers may be added separately. Suitable absorbers include organic superabsorbent polymers, ion-exchange resins, hollow sphere polymers, molecular sieves, talcs, inorganic absorbers such as inorganic superabsorbent gels and Sumica gel, porous and non-porous carbonaceous materials, encapsulated, alkali-swellaable polymers, and mixtures thereof. The level of absorber used is in

the range of from about 0.01% by weight to about 90% by weight, preferably from about 0.1% by weight to about 70% by weight, more preferably from about 1% by weight to about 30% by weight, based on the total weight of the latex polymer in the final paint.

Postponement of road-marking paint production can be particularly advantageous when techniques are used to accelerate the drying of the paint. Such techniques include the addition of optional additives, such as absorbers that accelerate the drying of the road-marking paint, or the use of reactive ingredients that crosslink/cure or "quick-set," as defined herein. Because such systems have a limited pot-life and must be utilized soon after preparation, formulating the road-marking paint at the point-of-use provides an improved manufacturing technique. It becomes much more practical to utilize such techniques because the paint is used shortly after it is formulated. Such techniques are further enhanced by producing the road-marking paint in the applicator(s) itself, shortly before or while the road-marking paint is applied. Production in the applicator(s), such as one mounted on the back of a vehicle used for road striping, avoids the problems normally associated with the use of quick-setting paints systems, *i.e.*, the instability or rapid absorption of water that provides the quick-setting character but requires application of the paint sometimes within a very short time (*e.g.*, from a few minutes to a few hours) after activation of the quick-setting character (*i.e.*, by mixing or addition).

Such quick-drying systems have very short dry times on the road and/or produce highly durable markings. To achieve formulation of the paint in the applicator(s), the prepaints, pumps and applicator(s) are advantageously mounted on vehicles that then applies the markings.

Crosslinking of water-borne road-marking paint may be achieved by adding water-miscible or emulsified epoxies, water-borne isocyanates, silanes and the like. Quick-setting binder systems, as described herein, also represent a type of crosslinking or curing (*i.e.*, ionic) and their use also benefits from postponement of the paint manufacture to the paint-of-use. This allows the use of quick-setting components that would have very limited pot life in the road-making paint. For example, a polyamine with a pKa that results in a protonated amine with very little loss of the volatile base which will deprotonate it, will have poor stability, but dry very rapidly on the road. Such quick-setting and crosslinking systems benefit from postponing preparation of the paint up to and including preparation of the paint in the applicator(s) because of their short pot life.

The prepaints herein permit the production of the final road-marking paint at many locations beyond the conventional paint manufacturing facility and may include production at the point-of-use, such as in an on-line painting vehicle or on the job site, at a distributor, at a

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government transportation facility, and at point-of-sale (for example, manufacturer's retail store or large retail building-products facility).

In order to minimize the number of paint ingredients needed to prepare a range of road-marking paints one needs to consider the extremes of key properties required for the range of paints and then formulate prepaints which are capable of being blended in various combinations and amounts to provide the key properties required at their extreme values as well as at intermediate points. Specific properties may also be improved by adding paint additives which enhance the desired property.

All ranges disclosed herein are inclusive and the minimums and maximums of the nested ranges are combinable.

EXAMPLES

Example 1

The following ingredients are mixed to form a white opacifying prepaint which should have PVC of 50.8%, a VS of 57.43%, and a weight solids of 79.0%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Opacifying pigment - TiO ₂ (TiPure R-900, E.I. DuPont and Company, Wilmington, DE)	1000.0
Dispersant - Tamol 901 30% (Rohm and Haas Company, Philadelphia, PA)	28.0
Wetting Aid - Surfynol CT 136 (Air Products, Inc., Allentown, PA)	12.0
Defoamer - Drew L-493 (Drew Chemical Company, Kearny, NJ)	10.0
Acrylic Emulsion Polymer Binder 50% solids (Rhoplex AC-630, (Rohm and Haas Company, Philadelphia, PA)	532.7
Coalescent - Texanol (Eastman Chemical, Kings Port, TN)	20.0
Water	14.2
Ammonium hydroxide (28% NH ₃)	6.0
HEUR Thickener - Acrysol SCT-275 (Rohm and Haas Company, Philadelphia, PA)	1.5

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The prepaint is prepared using a laboratory mixer having a 45° pitch stirring blade. The binder, water, dispersant, wetting aid, and defoamer are combined and mixed. The titanium dioxide is slowly added and the mixture is stirred for 15-20 minutes. The coalescent, thickener, ammonium hydroxide, and additional water, if necessary, are then added.

Example 2

The following ingredients are mixed to form a yellow opacifying pigment prepaint which should have a PVC of 51.7%, a VS of 57.7%, and a weight solids of 67.5%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Opacifying pigment - TiO ₂ (TiPure R-900, E.I. DuPont and Company, Wilmington, DE)	181.8
Yellow Pigment - Hansa Yellow (Engelhard Corp., New Jersey)	291.0
Wetting Aid - Surfynol CT136 (Air Products Inc., Allentown, PA)	10.9
Dispersant - Tamol 901 30% (Rohm and Haas Company, Philadelphia, PA)	26.0
Defoamer - Drew L-493 (Drew Chemical Company, Kearny, NJ)	9.1
Acrylic Emulsion Binder 50% solids (Rhoplex AC-630) (Rohm and Haas Company, Philadelphia, PA)	525.4
Coalescent - Texanol (Eastman Chemical, Kings Port, TN)	20.9
Water	18.8
Ammonium Hydroxide (28% NH ₃)	5.4
HEUR Thickener Acrysol SCT-275 (Rohm and Haas Company, Philadelphia, PA)	1.4

The prepaint is prepared using a laboratory mixer having a 45° pitch stirring blade. The binder, water, dispersant, wetting aid and defoamer, are combined and mixed. The titanium dioxide and yellow pigment are slowly added and the mixture is stirred for 15-20 minutes. The coalescent, thickener, ammonium hydroxide, and additional water, if necessary, are then added.

Example 3

The following ingredients are mixed to form an extender pigment prepaint which should have a PVC of 61.0%, a VS of 61.4%, and a weight solids of 77.4%:

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<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Calcium Carbonate Extender - Omyacarb 5 (Omya, Proctor, VT)	845.1
Dispersant - Tamol 901 30% (Rohm and Haas Company, Philadelphia, PA)	4.9
Wetting Agent- Surfynol CT-136 (Air Products Inc., Allentown, PA)	1.8
Defoamer - Drew L-493 (Drew Chem. Corp., Kearny, NJ)	5.0
Acrylic Binder - (Rhoplex AC-630, 50% solids (Rohm and Haas Company, Philadelphia, PA)	452.0
Methanol	33.3
Coalescent - Texanol (Eastman Chemical, Kings Port, TN)	23.3
Water	14.0
Ammonium Hydroxide (28% NH ₃)	3.7
HEUR Thickener - Acrysol SCT-275 (Rohm and Haas Company, Philadelphia, PA)	0.2

The prepaint is prepared using a laboratory mixer having a 45° pitch stirring blade. The binder, water, dispersant, wetting aid and defoamer are combined and mixed. The extender pigment is slowly added and the mixture is stirred for 15-20 minutes. The methanol, coalescent, thickener, ammonium hydroxide, and additional water, if necessary, are then added.

Example 4

The following ingredients are mixed to form polyamine prepaint which should be quick-setting. It should have a PVC of 0%, a VS of 27.4%, and a weight solids of 28.8%:

<u>Ingredients</u>	<u>Amount</u> (lbs/100 gallons)
Polyamine (29.8%)*	837.54
Water	12.5
Methanol	20.0

* As described in US 6,013,721, example 3.

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Example 5

White road-marking paints are formed by combining the prepaints described above in the following manner:

<u>Paint No.</u>	<u>Prepaints (lbs.)</u>			<u>Water</u>
	<u>White</u>	<u>Extender</u>	<u>Polyamine</u>	
	<u>(Ex. 1)</u>	<u>(Ex. 3)</u>	<u>(Ex. 4)</u>	
5-1	160.44	1244.88	—	15.4
5-2	112.31	1286.38	—	15.4
5-3	160.44	1244.88	8.0	7.7
5-4	112.31	1286.38	8.0	7.7
5-5	160.44	1244.88	16.0	—
5-6	112.31	1286.38	16.0	—

The resulting paints should have the following properties:

<u>Paint No.</u>	<u>Paint Properties</u>		
	<u>PVC (%)</u>	<u>VS (%)</u>	<u>WS (%)</u>
5-1	60.0	60.0	76.7
5-2	60.3	60.0	76.7
5-3	60.0	60.1	76.9
5-4	60.3	60.1	76.9
5-5	60.0	60.2	77.1
5-6	60.3	60.2	77.1

Paint No. 5-1 is a slower dry white traffic paint. Paint No. 5-2 is a lower cost, slower dry white traffic paint. Paint No. 5-3 is a fast dry white traffic paint. Paint No. 5-4 is a lower cost, fast dry white traffic paint. Paint No. 5-5 is a faster dry, white traffic paint. Paint No. 5-6 is a lower cost, faster dry white traffic paint.

Example 6

Yellow road-marking paints may be formed by combining the prepaints described above in the following manner:

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Paint No.	Prepaints (lbs.)			Water
	<u>Yellow</u>	<u>Extender</u>	<u>Polyamine</u>	
	<u>(Ex. 2)</u>	<u>(Ex. 3)</u>	<u>(Ex. 4)</u>	
6-1	119.98	1231.05	—	15.4
6-2	76.35	1286.38	—	15.4
6-3	119.98	1231.05	8.0	7.7
6-4	76.35	1286.38	8.0	7.7
6-5	119.98	1231.05	16.0	—
	76.35	1286.38	16.0	—

The resulting paints should have the following properties:

Paint No.	<u>Paint Properties</u>		
	<u>PVC (%)</u>	<u>VS (%)</u>	<u>WS (%)</u>
6-1	60.0	60.0	75.7
6-2	60.3	60.0	76.0
6-3	60.0	60.1	75.9
6-4	60.3	60.1	76.2
6-5	60.0	60.2	76.1
6-6	60.3	60.2	76.4

Paint No. 6-1 is a slower dry yellow traffic paint. Paint No. 6-2 is a lower cost, slower dry yellow traffic paint. Paint No. 6-3 is a fast dry yellow traffic paint. Paint No. 6-4 is a lower cost, fast dry yellow traffic paint. Paint No. 6-5 is a faster dry, yellow traffic paint; and Paint No. 6-6 is a lower cost, faster dry yellow traffic paint.

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WHAT IS CLAIMED IS:

1. A set of different, but mutually compatible, fluid prepaints, which set comprises:
 - (i) at least one opacifying prepaint comprising at least one white opacifying pigment;
 - (ii) at least one extender prepaint comprising at least one extender pigment; and
 - (iii) at least one binder prepaint comprising at least one polymeric binder.wherein the prepaints are sufficient to form at least one road-marking paint line.
2. A set of different, but mutually compatible, fluid prepaints, which set comprises:
 - (I) at least one opacifying/binder prepaint comprising at least one white opacifying pigment and at least one polymeric binder; and
 - (II) at least one extender/binder prepaint comprising at least one extender pigment and at least one polymeric binder;wherein the prepaints are sufficient to form at least one road-marking paint line.
3. The set of prepaints of claim 1 or claim 2, which further comprises at least one fluid prepaint comprising a quick-setting ingredient.
4. The set of prepaints of claim 1, wherein the prepaints further comprise a quick-setting ingredient.
5. The set of prepaints of claim 1 or claim 2, wherein the polymeric binder is a quick-setting binder.
6. The set of prepaints of claim 1 or claim 2, wherein the polymeric binder is a latex polymer.
7. The set of prepaints of claim 1 or claim 2, wherein the number of prepaints is from 3 to 15.
8. The set of prepaints of claim 1 or claim 2, wherein the opacifying prepaint further comprises at least one colorant.

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9. The set of prepaints of claim 8, wherein the colorant is white or yellow.
10. A method of forming at least one road-marking paint line, which method comprises the steps of:
- (a) providing a set of different, but mutually compatible, fluid prepaints which set comprises:
 - (i) at least one opacifying prepaint comprising at least one white opacifying pigment;
 - (ii) at least one extender prepaint comprising at least one extender pigment; and
 - (iii) at least one fluid binder prepaint comprising at least one polymeric binder; and
 - (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the road-marking paint line.
11. A method of forming a range of road-marking paints, which range comprises at least two paint lines, which method comprises the steps of:
- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least two paint lines, which set comprises:
 - (i) at least one opacifying prepaint comprising at least one white opacifying pigment;
 - (ii) at least one extender prepaint comprising at least one extender pigment;
 - (iii) at least one binder prepaint comprising at least one polymeric binder; and
 - (iv) at least one additional different fluid prepaint selected from the group consisting of prepaints (i), (ii), or (iii); and
 - (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the road-marking paint liner.
12. A method of forming at least one road-marking paint line, which method comprises the steps of:
- (a) providing a set of different, but mutually compatible, fluid prepaints, which set comprises:

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- (I) at least one opacifying/binder prepaint comprising at least one white opacifying pigment and at least one polymeric binder; and
 - (II) at least one extender binder prepaint comprising at least one extender pigment and at least one polymeric binder; and
 - (b) dispensing a predetermined amount of each of the prepaints into containers or applicator(s) to form the road-marking paint line.
13. A method of forming a range of road-marking paints, the range comprising at least two paint lines, which method comprises the steps of:
- (a) providing a set of different, but mutually compatible, fluid prepaints sufficient to formulate at least two paint lines, which set comprises:
 - (i) at least one opacifying/binder prepaint comprising at least one white opacifying pigment and at least one polymeric binder;
 - (ii) at least one fluid extender/binder prepaint comprising at least one extender pigment and at least one polymeric binder; and
 - (iii) at least one additional different fluid prepaint selected from the group consisting of prepaints (I) and (II); and
 - (b) dispensing a predetermined amount of each of the prepaints into containers or applicator to form the road-marking paint lines.
14. The method of claim 10, 11, 12 or 13, wherein the set of prepaints further comprises at least one fluid prepaint comprising a quick-setting component.
15. The method of claim 10, 11, 12 or 13, wherein the opacifying prepaint (i), the binder prepaint (ii), the opacifying/binder prepaint (I), or extender/binder prepaint (II) further comprises a quick setting component.
16. The method of claim 10, 11, 12 or 13, wherein the polymeric binder is a quick-setting binder.
17. The method of claim 10, 11, 12 or 13, wherein the polymeric binder is a latex polymer.
18. The method of claim 10, 11, 12 or 13, wherein the number of prepaints is from 4 to 15.

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19. The method of claim 10 or claim 11, which further comprises the step of mixing the prepaints before, while, or after they are dispensed into the containers.
20. The method of claim 10 or claim 11, which further comprises the step of mixing the prepaints before or while they are dispensed into the applicator(s).
21. The method of claim 12 or claim 13, which further comprises the step of mixing the prepaints before, while, or after they are dispensed into the containers.
22. The method of claim 12 or claim 13, which further comprises the step of mixing the prepaints before or while they are dispensed into the applicator(s).
23. The method of claim 10, 11, 12 or 13, which further comprises the step of adjusting the viscosity of the prepaints before, while, or after they are dispensed into the containers.
24. The method of claim 10, 11, 12 or 13, which further comprises the step of adjusting the viscosity of the prepaints before or while they are dispensed into the applicator(s).
25. The method of claim 10, 11, 12 or 13, which further comprises the step of adding additional ingredients that enhance the application or final performance properties of the road-marking paint.
26. The method of claim 10, 11, 12 or 13, which further comprises the step of adding at least one colorant to the dispensed prepaints.
27. The method of claim 26, wherein the colorant is white or yellow.
28. The method of claim 10, 11, 12 or 13, wherein the opacifying prepaint (i) further comprises at least one colorant.
29. The method of claim 12 or 13, wherein the opacifying/binder prepaint (I) further comprises at least one colorant.

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30. The method of claim 29, wherein the colorant is white or yellow.
31. The method of claim 10, 11, 12 or 13, wherein the method is carried out at a paint manufacturing facility.
32. The method of claim 10, 11, 12 or 13, wherein the method is carried out at a point-of-sale.
33. The method of claim 10, 11, 12 or 13, wherein the method is carried out at a point-of-use.
34. The method of claim 10, 11, 12 or 13, wherein the method is controlled by a computer.
35. A device capable of carrying out the method of claim 10, 11, 12 or 13.
36. A vehicle which includes the device of claim 35 wherein the devices is mounted on said vehicle.

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ABSTRACT

Sets of prepaints useful for forming a road-marking paint line are provided. Also provided are methods which permit the person applying the road-marking paint to vary the properties of the road-marking paint at the application point to suit the ambient conditions, including temperature, humidity, traffic flow and the like.

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Docket No. 6258-69

DECLARATION AND POWER OF ATTORNEY

As below named inventors, We hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PREPAINTS AND METHODS OF PREPARING ROAD-MARKING PAINTS FROM PREPAINTS

the specification of which (check one) is:

☒ attached hereto

☐ was filed on
as Application Serial No.
and amended on _____ (if applicable).

☐ was described and claimed in PCT Application No.
filed on _____ and amended under Article 19 on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information I know to be material to patentability in accordance with Title 37, Code of Federal Regulation, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

<u>Serial Number</u>	<u>Country</u>	<u>Filing Date</u>	<u>Priority Claimed</u> (Y/N)
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I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

<u>Serial Number</u>	<u>Filing Date</u>	<u>Status</u>
60/183,655	2/18/00	pending
60/183,656	2/18/00	pending
60/247,639	11/10/00	pending

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint:

John E. Kidd	Reg. No. 19,916	Michael M. O'Shea	Reg. No. 35,631
Victor Siber	Reg. No. 25,149	Joel N. Bock	Reg. No. 36,456
Margaret B. Kelley	Reg. No. 29,181	Gerard P. Norton	Reg. No. 36,621
Philip E. Roux	Reg. No. 31,295	John T. Johnson	Reg. No. 37,363
Michael J. Pantuliano	Reg. No. 18,971	Frank C. Cimino	Reg. No. 39,945
Joseph P. Kincart	Reg. No. 43,716	Nada Jain	Reg. No. 41,431
James V. Mahon	Reg. No. 41,966	Mitchell S. Feller	Reg. No. 42,530
Joseph Levi	Reg. No. 41,152	David F. Ries	Reg. No. 43,046
Victor J. Geraci	Reg. No. 38,157	Anne M. Coughlin	Reg. No. 43,564
C. Joseph Laughon, II	Reg. No. 31,389	David S. Figatner	Reg. No. 44,106
Leora Ben-Ami	Reg. No. 32,455	Steven J. Lever	Reg. No. 46,871
Robert D. Schaffer	Reg. No. 33,775		

all of the firm of Clifford Chance Rogers & Wells LLP, 200 Park Avenue, New York, New York 10166-0153, my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Address all communications to:

Margaret B. Kelley, Esq.
Clifford Chance Rogers & Wells LLP
200 Park Avenue, New York, NY 10016
(212) 878-3145

Wherefore I request that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition.

Full name of inventor # 1	John Michael Friel		
Inventor's signature		Date	
Residence	341 Beech Street, Warminster, PA 18974		
Citizenship	U.S.A.		
Post Office Address	341 Beech Street, Warminster, PA 18974		

132

Full name of inventor # 2	John William Hook III		
Inventor's signature		Date	
Residence	410 Twin Streams Drive, Warminster, PA 18974		
Citizenship	U.S.A.		
Post Office Address	410 Twin Streams Drive, Warminster, PA 18974		

Full name of inventor # 3	Bernhard Helmut Lieser		
Inventor's signature		Date	
Residence	818 S. Patton Avenue, San Pedro, CA 90731		
Citizenship	Germany		
Post Office Address	818 S. Patton Avenue, San Pedro, CA 90731		

Full name of inventor # 4	Jerry William Washel		
Inventor's signature		Date	
Residence	594 Quarry Road, Harleysville, PA 19438		
Citizenship	U.S.A.		
Post Office Address	594 Quarry Road, Harleysville, PA 19438		

Full name of inventor # 5	Dennis Paul Lorah		
Inventor's signature		Date	
Residence	1692 Heebner Way, Lansdale, PA 19446		
Citizenship	U.S.A.		
Post Office Address	1692 Heebner Way, Lansdale, PA 19446		

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Full name of inventor # 6	Donald Craig Schall		
Inventor's signature		Date	
Residence	120 Shady Lane, Lansdale, PA 19446		
Citizenship	U.S.A.		
Post Office Address	120 Shady Lane, Lansdale, PA 19446		

Full name of inventor # 7	Ann Robertson Hermes		
Inventor's signature		Date	
Residence	437 Edgewood Drive, Ambler, PA 19002		
Citizenship	U.S.A.		
Post Office Address	437 Edgewood Drive, Ambler, PA 19002		

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134**Industria y Comercio**
SUPERINTENDENCIA

SUPERINDUSTRIA Y COMERCIO

Radicacion : 01064213 00000000

Folios: 134

Fecha (MM): 2001-08-09 17:42:15

Tramite : 002 PATENTES D 1 REGISTRO/ 411 PRESENTAC

Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 01 - 44,648
FECHA : JULIO 23 DE 2001

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CAVELIER ABOGADOS	CONSIGNACION	BANCO POPULAR	050-00110-6	3731693	23/07/2001	26,921,580.00

***** CONCEPTO *****

CANT.	RENTISTAS	CONCEPTO	TOTAL CONCEPTO
2	50000 01-01	SOLICITUDES	
		1 TRAMITES DE SOL. DE PATENTE DE IN	356,640.00
		TOTAL :	\$ 356,640.00

CON: TRESCIENTOS CINCUENTA Y SEIS MIL SEISCIENTOS CUARENTA PESOS

RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

Coto 12698-801-001-6

Carrera 13 No. 27-00 Pisos 5, 7 y 10
Conmutador 382 0840
Fax 350 5220
E-mail: Info@sic.gov.co
www.sic.gov.co
Bogotá, D.C., Colombia



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Industria y Comercio
SUPERINTENDENCIA

NIT : 800176039-2

SUPERINDUSTRIA Y COMERCIO
Radicacion : 01064213 00000000 Folios: 134
Fecha (AMD): 2001-08-09 17:42:15
Tramite : 002 PATENTES D Y REGISTRO/ 411 PRESENTAC
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

RECIBO OFICIAL DE CAJA : 01 - 40,364
FECHA : JULIO 4 DE 2001

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	Nº. PAGO	FECHA PGO	Vr. PAGO
CARLOS R ABOGADOS	CONSIGNACION	BANCO POPULAR	050-00110-6	0036576	04/07/2001	22,090,456.00

***** CONCEPTO *****

CANT. RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	82 INVOCACION DE UNA PRIORIDAD EN NU	100,000.00
	TOTAL :	100,000.00

SON: CIENTO MIL PESOS

RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

660 12698-B01-001-6

Carrera 13 No. 27-00 Pisos 5, 7 y 10
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E-mail: info@sic.gov.co
www.sic.gov.co
Bogotá, D.C., Colombia

136 134

Industria y Comercio
SUPERINTENDENCIA

SUPERINDUSTRIA Y COMERCIO
Radicacion : 01064213 00000000 Folios: 134
Fecha (IMP): 2001-08-09 17:42:15
Tramite : 002 PATENTES & 1 REGISTRAR/ 411 PRESENTAC
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

NIT : 800176009-2

RECIBO OFICIAL DE CAJA : 01 - 44,626
FECHA : JULIO 23 DE 2001

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CAVELIER ABOGADOS	CONSIGNACION	BANCO POPULAR	250 03119-6	3731693	23/07/2001	26,921,580.00

***** CONCEPTO *****

CANT. REGISTRADO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	82 INDICACION DE UNA PRIORIDAD EN MU	100,000.00
	TOTAL :	100,000.00

SOM: CIENTO MIL PESOS

RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

66 12698-801-001-6

Carrera 13 No. 27-00 Pisos 5, 7 y 10
Conmutador 382 0840
Fax 350 5220
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www.sic.gov.co
Bogotá, D.C., Colombia

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Industria y Comercio
SUPERINDUSTRIA Y COMERCIO

Folios: 134 1A

REQUISITOS NECESARIOS PARA PRESENTAR

Radicación : 01064213 00000000

Fecha (MM): 2001-08-09 17:42:13

Trámite : 002 PATENTES D 1 REGISTRO/ 411 PRESENTAC

Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

USUARIO RADICADOR

PATENTE DE INVENCION [✓]

MODELO DE UTILIDAD

- Indicación de que se solicita la concesión de una patente
- Datos de identificación del solicitante o de la persona que presenta la solicitud
- Descripción de la invención
- Dibujos de ser estos pertinentes
- Comprobante de Pago de las tasas establecidas

[] [✓]

[] [✓]

[] [✓]

[] [✓]

[] [✓]

[] [✓]

COMPLETA [✓]

INCOMPLETA

[] []

DISEÑO INDUSTRIAL []

- Indicación de que se solicita el registro de Diseño Industrial.
- Datos de identificación del solicitante o de la persona que presenta la solicitud.
- Representación gráfica y fotográfica del Diseño Industrial o muestra del material que incorpora el diseño.
- Comprobante de pago de las tasas establecidas.

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COMPLETA []

INCOMPLETA

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ESQUEMA DE TRAZADO []

- Indicación de que se solicita el registro de un Esquema de trazado.
- Datos de identificación del solicitante o de la persona que presenta la solicitud.
- Representación gráfica del esquema de trazado
- Comprobante de pago de las tasas establecidas.

[] []

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COMPLETA []

INCOMPLETA

[] []


Firma Responsable

Fecha: _____

• Carrera 13 No. 27-30 Piso 2 Medellín
• Computador, 7-7 05 36
• Fax: 50 52 20 e-mail: info@sic.gov.co
• Bogotá D.C. Colombia

Folio 138

2020
Bogotá, D. C.

Doctor(a)
EMILIO FERRERO
Apoderado(a)

REFERENCIA:	Radicación	01-64213
	Trámite	002
	Evento	001
	Actuación	430
	Oficio No.	2857
	Folios	001

Como resultado del examen de forma, realizado con fundamento en el artículo 38 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica que:

Debe allegar "documento en el que conste la cesión del derecho a la patente otorgado por el inventor al solicitante o a su causante..." (Art. 28-k, Dec 486/2000)

Traducción de al menos el capítulo reivindicatorio de la solicitud prioritaria.

Debe aportar la traducción de la solicitud presentada como solicitud colombiana

Para efectos de entendimiento, y posterior digitalización de la solicitud es importante que los documentos aportados se encuentren completos, por lo tanto se sugiere enviar un nuevo capítulo reivindicatorio, ya que el presentado con la solicitud contiene defectos en la numeración.

En cumplimiento del artículo 39 de la Decisión 486, en concordancia con el artículo 85 de la misma decisión, se le requiere para que dentro del término de dos (2) meses siguientes a la fecha de notificación del presente oficio, complete los requisitos anteriormente enunciados. En caso de no dar cumplimiento al presente requerimiento, la solicitud se considerará abandonada y perderá su prelación.

Notifíquese el presente oficio conforme a lo dispuesto en el artículo 8 de la Resolución 210 del 15 de enero del 2001.


ALIX CARMENZA CÉSPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones

El anterior requerimiento fue notificado por fijación en lista de fecha

22 NOV. 2001

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