

7663004



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United States Patent and Trademark Office

January 07, 2018

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APPLICATION NUMBER: 62/566,254
FILING DATE: *September 29, 2017*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US62/566,254



Certified by

Nichelle K. Lee

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

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)

Inventor 1

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City

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Elena

K.

Mendoza Carranza

Lima

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All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Title of Invention

Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality

Attorney Docket Number (if applicable)

1511.23200

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number

☐ Firm or Individual Name

Customer Number

130961

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

• No.

Yes, the invention was made by an agency of the United States Government. The U.S. Government agency name is:

Yes, the invention was under a contract with an agency of the United States Government. The name of the U.S. Government agency and Government contract number are:

Entity Status

Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29

- ☐ Applicant asserts small entity status under 37 CFR 1.27
- ☐ Applicant certifies micro entity status under 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
- ☒ No

Warning

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	Joseph L. Morales/			Date (YYYY-MM-DD)	2017-09-29
First Name	Joseph	Last Name	Morales	Registration Number (If appropriate)	58835

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
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Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
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Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
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Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Lima	Country of Residence ⁱ	PE		
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Address 1	Av. Guillermo Dansey 1846				
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Postal Code		Country ⁱ	PE		
Inventor	3				Remove
Legal Name					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		

Prefix	Given Name	Middle Name	Family Name	Suffix
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Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
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Mailing Address of Inventor:

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Address 2	Cercado de Lima			
City	Lima	State/Province		
Postal Code		Country ⁱ	PE	
Inventor	4	Remove		
Legal Name				

Prefix	Given Name	Middle Name	Family Name	Suffix
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Mailing Address of Inventor:

Address 1	Av. Guillermo Dansey 1846			
Address 2	Cercado de Lima			
City	Lima	State/Province		
Postal Code		Country ⁱ	PE	
Inventor	5	Remove		
Legal Name				

Prefix	Given Name	Middle Name	Family Name	Suffix
	Elena	K.	Mendoza Carranza	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	Lima	Country of Residence ⁱ	PE	

Mailing Address of Inventor:

Address 1	Av. Guillermo Dansey 1846			
Address 2	Cercado de Lima			
City	Lima	State/Province		
Postal Code		Country ⁱ	PE	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

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Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence information of this application.

Customer Number	130961		
Email Address	imorales@moralesq.com	Add Email	Remove Email

Application Information:

Title of the Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		
Attorney Docket Number	1511.23200	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	

Filing By Reference :

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	130961		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status		Remove
Application Number	Continuity Type	Prior Application Number
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.		Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove
			Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. ☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
--

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices
If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application. In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application. In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.
--

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		

Applicant	1 Remove		
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear			
☒ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor :			
If the Applicant is an Organization check here. ☒			
Organization Name	AGP AMERICA S.A.		
Mailing Address Information For Applicant:			
Address 1	Edificio Mossfon		
Address 2	Segundo Piso Calle 54 Este		
City	Panamá	State/Province	
Country	PA	Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.	
Assignee	1 Remove
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.	
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.23200
		Application Number	
Title of Invention	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality		

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature	/Joseph L. Morales/		Date (YYYY-MM-DD)	2017-09-29
First Name	Joseph	Last Name	Morales	Registration Number
			58835	

Additional Signature may be generated within this form by selecting the Add button.

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

LAMINATE WITH THIN INSERT OBSCURATION HAVING SUPERIOR STRENGTH AND OPTICAL QUALITY

Abstract

5 The use of camera based safety systems is growing at a rapid rate in modern automobiles. At the same time, windshields, where many of the cameras are mounted, are becoming larger and more complex in shape. As the industry moves towards vehicles with full autonomous capability, the number of cameras required and the resolution of the cameras are both increasing. However, the optical quality of the windshield is less than optimal. One of the
10 problems is caused by the typical black enamel frit that is printed on the glass, prior to heating and bending, to hide or obscure the camera hardware. The abrupt thermal gradients during bending, caused by the heat absorbing black frit, result a high level of distortion in the camera field of view.

The object of this invention is to provide a laminated automotive glazing having an
15 obscuration area produced by creating the obscuration after heating and bending the glass by applying a thin substantially opaque insert to at least one of the surfaces of the plastic bonding layer, film or glass layers in or near the camera field of view which then serves as the obscuration rather than printing and firing an enamel frit on the glass.

This results in a laminate having superior optical quality, higher strength and a lower
20 probability of breakage as compared to a laminate with a black enamel frit obscuration.

INVENTORS

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Elena K. Mendoza Carranza	Peruvian	Av. Guillermo Dansey 1846, Cercado de Lima, Lima, Perú,

Field of the invention

5 The presently disclosed invention is directed to a laminated automotive glazing having a camera obscuration which provides for a field of view having superior optical quality and strength as well as the method used to create said glazing.

Background of the invention

10 Black enamel frit obscurations are commonly printed on laminated and tempered automotive safety glazing. These obscurations have multiple functional and aesthetic requirements. The obscuration must be substantially opaque. This is needed to prevent the adhesive, used to mount the glazing to the vehicle, from being seen from the outside of the vehicle and to protect the adhesive from the harmful effects of ultra-violet. The obscuration also serves this
15 same function for components attached to the inside surface of the glazing. On heated and coated glazing, the obscuration is used to hide the edge of the coating, bus bars, leads and any other items that would detract from the appearance of the vehicle. The obscuration also has the additional aesthetic requirement that it have a dark black color and a reflective glossy appearance. It must last for the life of the glazing, without fading, leaking, having a reduction
20 in adhesion or otherwise failing.

The obscurations are usually printed on the number four surface **104** of glass on the inside of the vehicle but are sometimes also or alternately printed on the number two 102 surface of glass.

25

Obscurements have historically been black. One of the reasons for this comes from the limitations imposed by ceramic frits. It is difficult to produce frits, in colors other than black, that have the durability needed and for which the color can be reliably replicated from run to run. The other reason is that a black obscurement can be used with any color of paint.

5

Black enamel frits are comprised of pigments, a carrier, binders and finely ground glass. Other materials are also sometimes added to enhance certain properties: the firing temperature, anti-stick, chemical resistance, etc. The black frit is applied to the glass using a silk screen or ink jet printing process prior to heating and bending. During the bending process, the finely ground glass in the frit softens and fuses with the glass surface. The frit is said to be “fired” when this takes place. This is very similar to the process used to apply enamel finishes on bathroom fixtures, pottery, china and appliances.

Metals and many other types of materials have an ultimate yield strength at which point the material will fail. However, with glass we can only specify a probability of breakage for a given value of stress. Looking at glass at the molecular level, we would expect the strength to be very high. In fact, what we find in practice is that glass has a very high compressive strength, as expected, but very low tensile strength.

For a given set of glass test specimens, with identical loading, the point of failure at first glance might appear to be a random variable. In fact, the yield point follows a Weibull distribution and the probability of breakage can be calculated as a function of, stress, duration, surface area, surface defects and the modulus of glass.

To the naked eye, float glass appears to be near perfect. Any defects that may be present are so small as to not be visible. But, in fact, at the microscopic level, the surface appears rough and can be seen to be dotted with flaws. When the glass is placed in tension, these surface defects tend to open up and expand, eventually leading to failure. Therefore, laminated automotive glass almost always fails in tension. Even when not in tension, the surface

defects react with the moisture in the environment and slowly “grow” over time. This phenomenon is known as slow crack growth. As a result, glass weakens as it ages.

A fired black frit increases surface defects. This can be seen if the black pigment of a fired black obscuration is chemically dissolved. The surface of glass will have a frosted appearance, similar to sand blasted or chemically etched glass. The frosted appearance is due to the myriad surface defects present from the fused glass. This makes the surface weaker increasing the probability of breakage. Testing has shown that glass with black frit fails at a stress level that is substantially lower than glass that does not have black frit.

Another problem arises from the thermal gradients that occur during the bending process. As one would expect, the black frit absorbs more radiant heat than the clear glass. Radiant heat is the predominant heat source used for glass bending. The black frit areas of the glass run hotter than the adjacent clear areas. With glass being a poor conductor of heat, gradients in the tens of degrees centigrade can arise over a short distance. These high abrupt thermal gradient on the surface result in optical distortion and high residual along the inner edge of the black band. This is known as the “burn” line in the industry. This can often be seen along the edges of the black obscuration found along the edges of most windshields.

Obscurements used with glass mounted camera systems are forced to designate a “buffer” zone between the edge of the camera field of view and the edge of the black frit to exclude the burn line. This is an accommodation required due to the limitations of the black frit. The ideal would be to have no buffer zone as the larger obscuration reduces the driver field of view and the natural light entering the vehicle.

One method used to address the burn line problem is the dot fadeout. Starting at the inner solid edge of the black paint, rows of increasingly smaller dots are painted on the glass. This is the same principle as used in greyscale printing. This reduces the rate of change in the surface temperature, spreading it over a wider area. The dot fadeout also helps to hide the distortion. However, on some parts, even a wide dot fadeout is not sufficient to eliminate all

distortion. A wide dot fadeout also may not be possible depending upon the size of the opening and the regulatory requirements for driver vision. Dot fadeout patterns are also undesirable in that they increase the production cost of the glazing.

- 5 Another problem is surface mismatch. A laminate is comprised of at least two layers of glass. The frit is typically applied to only one of the glass layers. This can result in a slight difference in the shape of the surfaces. When the two surfaces are forced together during lamination, the mismatch results in residual stress in the laminate and optical distortion.
- 10 Even with these drawbacks, the area of the windshield with a black frit obscuration has increased in recent years.

As the electronic content of modern vehicles has increased, the area of the windshield, near the top center, has become increasingly crowded on many vehicles. Once the province of
15 just the rear-view mirror, we now find a wide array of electronic equipment mounted in this location.

- The use of cameras, requiring a wide field of view and a high level of optical clarity, is also growing at a rapid rate with the introduction of vehicles capable of various levels of
20 autonomous operation. The resolution of the cameras is also increasing at an equally fast rate. These typically must be mounted on the windshield in the wiper area. Early initial applications were for night-vision. Today, camera based systems are used to provide a wide array of safety functions including adaptive cruise control, obstacle detection, lane departure warning and support for autonomous operation. Many of these applications require the use
25 of multiple cameras. A clear undistorted field of view, with minimal double imaging and excellent MTF (Modulation Transfer Function, a measure of how well a lens maps an image to a sensor), is especially critical for camera based systems to perform as intended. It is essential for these systems to be able to quickly differentiate between objects, capture text, identify signage, and operate with minimal lighting. Further, as the resolution of the cameras
30 used increases the need for a clear distortion free field of view increases.

While covers and various styling methods can be used to obscure the components and cables from the inside, we also need to maintain clean lines and a good aesthetic when the vehicle is viewed from the exterior.

5

Standard practice has been to extend the black enamel frit band **32** to create an obscuration **8** on the number four **104** surface with openings in the obscuration **30** to provide for the required camera field of view.

- 10 When the black enamel frit band **32** is extended downward from the top center black band to create an obscuration **8** on the number two **102** or number four surface **104**, distortion and stress can become a major problem. This is because the black frit is extending further from the edge into the area that where more heat must be applied to bend the glass. The large surface area of the obscuration increases the probability of breakage due to the surface defects
- 15 and stress introduced by the frit. This is also a critical viewing area.

- A panoramic windshield is a windshield in which the top edge of glass has been extended to include at least a portion of the roof giving the driver an extended vertical field of vision. In the case of a panoramic windshield, the problem is even more pronounced as the obscuration
- 20 **8** extends or is located several cm from the top edge. This is the weakest point of the windshield. This is also where the highest temperatures are required to bend the glass which results in even higher thermal gradients and distortion.

- Having examined the drawback of using a black enamel frit to produce an obscuration,
- 25 especially in the area used for cameras on the windshield, it can be appreciated that it would be desirable to produce a windshield that did not have the limitations that result from a black enamel frit obscuration.

Brief description of the invention

30

The subject of the immediate invention is a laminated automotive glazing with a least one obscuration which is produced by creating the obscuration after heating and bending the glass by applying a thin substantially opaque insert to at least one of the surfaces of the plastic bonding layer, film or glass layers in or near the camera field of view which then serves as the obscuration as opposed to printing and firing an enamel frit onto the glass.

The insert may be fabricated of a thin substantially opaque plastic or other suitable material which is then adhered or placed in contact with at least one of the internal surfaces of the laminate including the glass surfaces, the plastic bonding layer surfaces or film surfaces. The insert located in or near the camera field of view serves as the obscuration rather as opposed to printing and firing an enamel frit onto the glass. The insert may be fabricated by means of CNC cutting (LASER, blade or ultrasonic), die cutting or any other method known in the art that is suitable for the material selected. The thin insert can be added during the assembly of the laminate. An adhesion promoter, such as PVB dissolved in alcohol or a plasticizer may be required to meet safety glazing regulations. Surface of the insert that are not hidden may require the use of an optical adhesive. Application of the adhesive or adhesion promoter may be made by brush, spray, roller, pad or any other convenient suitable means. The insert may be comprised of more than one segment. The thickness of the insert will depend upon the materials and thicknesses of the laminate as well as the lamination processing parameters. In general, it good results can be obtained with an insert thickness no greater than 1/3 of the total thickness of the plastic interlayer and preferably less than that. Thinner is always easier to laminate.

Laminates made in this manner are stronger and have superior optical quality, especially in the areas of the laminate used by cameras.

Advantages

1. Best in class optics.
2. Frit induced surface defects are eliminated.
3. Residual stress caused by non-uniform heating of the frit is eliminated.

4. Residual stress caused surface mismatch due to the frit is eliminated.
5. Low distortion, comparable to ordinary clear glass.
6. Low double image, comparable to ordinary clear glass.
7. Lower probability of breakage.
- 5 8. Higher yield during bending due to elimination of non-uniform heating.
9. Higher yields during lamination due to higher strength, lower residual stress and less surface mismatch.

10 **Brief description of the drawings**

- 1 Isometric view of windshield with camera obscuration that overlaps the black band.
Isometric view of windshield with gap between the camera obscuration and the black
- 2 band.
- 3 Isometric view of panoramic windshield with camera obscuration and black band.
Front view of windshield with gap between the camera obscuration and the black
- 4A band.
- 4B Camera obscuration detail showing black and clear portions.
- 5A Double image without correction.
- 5B Double image with wedge/shaped interlayer correction.
- 6A Camera obscuration with "burn" line buffer.
- 6B Camera obscuration without burn line buffer.
- 7A Laminate with ordinary plastic interlayer.
Laminate with one ordinary plastic interlayer and one wedge/shaped plastic
- 7B interlayer.
- 7C Laminate with two wedge/shaped plastic interlayers.
- 8A Exploded view of windshield with thin insert camera obscuration on surface #3
Exploded view of windshield with two plastic layers and a PET film layer with thin insert
- 8B camera obscurations on #2 and #3 surfaces
Cross section of laminate with single plastic layer and thin insert camera obscuration on
- 9A the #2 surface.

Cross section of laminate with two plastic layers and a PET film layer with thin insert
9B camera obscuration on outboard side of PET film layer and on the #3 surface.

Reference Numerals

3	Wedge Plastic Interlayer
4	Plastic Interlayer
5	Glass
6	Sunshade
8	Obscuration (Insert, Printed, Inlay)
10	Cutout
15	Buffer
16	Field of view
17	Film
30	Openings in Camera Obscuration
32	Black Band Obscuration
40	Double image Angle
41	Observation point
42	Incident ray from image
43	Primary image
44	Secondary image
45	Wedge angle
46	Incident angle
48	Refracted ray
50	Surface normal
52	Angle of deviation
56	Inclination angle
101	First Surface of Glass
102	Second Surface of Glass
103	Third Surface of Glass
104	Fourth Surface of Glass

- 201 Outer glass layer
- 202 Inner glass layer

Detailed description of the invention

The invention eliminates the drawbacks associated with the fired black frit obscurations of the prior art by using the alternate method of the invention to provide the obscuration for the camera field of view after the glass has been heated and bent to shape. Removing the black frit from the glass during the bending process allows for a more uniform heat distribution across the part during bending which reduces residual stresses and the associated surface mismatch, warping and distortion caused by the thermal gradients.

Laminated safety glass is made by bonding two sheets (**201** & **202**) of annealed glass **2** together using a thin sheet of a transparent thermo plastic **4** (interlayer). Annealed glass is glass that has been slowly cooled from the bending temperature down through the glass transition range. This process relieves any stress left in the glass from the bending process. Annealed glass breaks into large shards with sharp edges. When laminated glass breaks, the shards of broken glass are held together, much like the pieces of a jigsaw puzzle, by the plastic layer helping to maintain the structural integrity of the glass. A vehicle with a broken windshield can still be operated. The plastic layer **4** also helps to prevent penetration by objects striking the laminate from the exterior and in the event of a crash occupant retention is improved.

In the drawings and discussion, the following terminology is used to describe the configuration of a laminated glazing. A typical automotive laminate is comprised of two layers of glass, the exterior or outer, **201** and interior or inner, **202** that are permanently bonded together by a plastic layer **4** (interlayer). The glass surface that is on the exterior of the vehicle is referred to as surface one **101** or the number one surface. The opposite face of the exterior glass layer **201** is surface two **102** or the number two surface. The glass **2** surface that is on the interior of the vehicle is referred to as surface four **104** or the number four

surface. The opposite face of the interior layer of glass **202** is surface three **103** or the number three surface. Surfaces two **102** and three **103** are bonded together by the plastic layer **4**.

5 The plastic bonding layer **4** (interlayer) has the primary function of bonding the major faces of adjacent layers to each other. The material selected is typically a clear plastic when bonding one glass layer **2** to another glass layer **2**. For automotive use, the most commonly used bonding layer **4** (interlayer) is polyvinyl butyl (PVB). In addition to polyvinyl butyl, ionoplast polymers, ethylene vinyl acetate (EVA), cast in place (CIP) liquid resin and thermoplastic polyurethane (TPU) can also be used. Interlayers are available with enhanced
10 capabilities beyond bonding the glass layers together. The invention may include interlayers designed to dampen sound. Such interlayers are comprised whole or in part of a layer of plastic that is softer and more flexible than that normally used. The interlayer may also be of a type which has solar attenuating properties.

15 The types of glass **2** that may be used include but are not limited to: the common soda-lime variety typical of automotive glazing as well as aluminosilicate, lithium aluminosilicate, borosilicate, glass ceramics, and the various other inorganic solid amorphous compositions which undergo a glass transition and are classified as glass included those that are not transparent. The glass layers may be comprised of heat absorbing glass compositions as well
20 as infrared reflecting and other types of coatings.

Infrared reflecting coatings include but are not limited to the various metal/dielectric layered coatings applied through magnetron sputtered vacuum deposition (MSVD) as well as others known in the art that are applied via pyrolytic, spray, CVD, dip and other methods.

25

Infrared reflecting films include both metallic coated substrates as well as organic based optical films which reflect in the infrared.

The glass layers may be annealed or strengthened. There are two processes that can be used
30 to increase the strength of glass. They are thermal strengthening, in which the hot glass is

rapidly cooled (quenched) and chemical tempering which achieves the same effect through an ion exchange chemical treatment. In the chemical tempering process, ions in and near the outside surface of the glass are exchanged with ions that are larger.

- 5 This places the outer layer of glass in compression. Compressive strengths of up to 1,000 Mpa are possible.

The glass layers are formed using gravity bending, press bending, cold bending or any other conventional means known in the art. Gravity and press bending methods for forming glass
10 are well known in the art and will not be discussed in the present disclosure.

Tempered monolithic windows can only make use of heat absorbing compositions to control solar load. One of the big advantages of a laminated window over a tempered is that a laminate can make use of infrared reflecting coatings and infrared reflecting films in addition
15 to heat absorbing compositions.

A heat absorbing window can be very effective but the glass gets hot and transfers energy to the passenger compartment through convective transfer and radiation whereas the infrared reflecting coatings and films reflect the heat back to the atmosphere allowing the glass so
20 stay cooler.

Infrared reflecting coatings 20 include but are not limited to the various metal/dielectric layered coatings applied through Magnetron Sputtered Vacuum Deposition (MSVD) as well as others known in the art that are applied via pyrolytic, spray, controlled vapor deposition
25 (CVD), dip and other methods.

In addition to the metallic and non-metallic films that reflect in the infra-red, a wide variety of other films are available for use in laminates to add capability and enhance other properties. To control light transmission there are available: electro chromic, photochromic,
30 thermochromic and field effect films which are designed to be incorporated into laminates. Of

particular interest are suspended particle devices (SPD) and polymer dispensed liquid crystal (PDLC) films which can quickly change state under the control of an electrical field. These films will be collectively referred to as performance films.

5 Film, as used in this document shall refer to single ply/layer compositions as well as films comprised of multiple layers. A common plastic used in such films is PET (polyethylene terephthalate) but as can be appreciated can be of any other composition found to be suitable can be used. Some examples include but are not limited to: metal based heat reflecting films, non-metal based heat reflecting films, tint films, and heat absorbing films, Suspended Particle
10 Device (SPD) films, Polymer Dispersed Liquid Chrystal (PDLC) films, conductive coated films, and ordinary PET.

If a combination of frit and the method of the invention are used for the black band **32** and the Camera obscuration **34**, any difference in the appearance between the two may be
15 noticeable. In that case, separating the Camera obscuration **34** from the black band, as shown in Figure 2, will improve the aesthetic.

In the obscuration areas where the invention is applied, all of the detrimental effects of the black enamel frit on the glass are eliminated resulting in superior optical quality, lower stress,
20 and a lower probability of breakage.

In addition to the benefits to the finished laminate, the elimination of the non-uniform heating and high thermal gradient present in the black frit areas increases yields through the bending process and also, due to the higher strength and lower surface mismatch, increases yields
25 through the lamination process.

Distortion in windshields is measured in terms of refractive power. Refractive power is the change in the angular deviation along over distance. At a high enough level, it can result in noticeable optical distortion. The refractive power is expressed in diopters.

30

$$D_{\varepsilon} = \frac{d\alpha_{\varepsilon}}{dx} \frac{1}{\cos \varepsilon} \quad (1)$$

Where:

ε : angle formed between the ray of light **42** and a line perpendicular to the surface of the glazing **50**

5 α_{ε} : angular deviation

D_{ε} : refractive power

Most large windshield production lines utilize online automated inspection system which scan the glass and produce a contour map showing the optical distortion in diopters.

10

Laminates produced by this invention have significantly lower distortion in the areas near the obscurations as compared to the same and similar laminates produced with screen print black frit.

15 Double image, another problem of the prior art, is illustrated in Figures 5a and 5b.

A ray of light **42** enters the surface of the glass at an incident angle **46** and passes through the glazing to the observer **41**. The light bends (refracts) as it passes through the glazing. The angle by which the light bends is known as the angular deviation **52**. This refraction of the
20 light causes a shifting of the apparent position **43** of the object observed

Some of the light from the ray **42** entering the glass is reflected back from the inside surface **104** and exits the glazing. A portion of the reflected light is again reflected back from outside surface **101** resulting in a double image. The separation angle **40** is the angle between the
25 primary **43** and secondary image **44** and the observer **41**. If the primary and secondary images are coincident, then the separation angle is zero. Regulatory requirements limit the separation angle to 15 minutes of arc for vision zone A (as defined by United Nations Regulation 42, revision 3) and 25 minutes of arc for vision zone B. However, it is well known

that the maximum amount of double imaging imperceptible for the human eye is 7 minutes of arc.

The double image angle, η 40, is calculated as shown in equation 2. It increases with decreasing angle of inclination 56, increasing curvature of the glass surface 104 and with increasing size of the glazing. The double image angle, η 40, can be reduced by altering the angle between the plies of glass as shown in Figure 8b. Normally, the glass surfaces are substantially parallel to each other. By creating an angle 45 between the surfaces, the primary and secondary images can be shifted towards convergence.

$$\eta = \frac{2t \sin(\epsilon)}{R\sqrt{n^2 - \sin(\epsilon)^2}} \quad (2)$$

where:

η : double image angle

t: thickness of the glazing

n: refractive index

R: radius of curvature

The angle between the plies of glass is adjusted through the use of an interlayer that has a non-uniform thickness, typically tapering from a thickness greater than the standard 0.76 mm at or near the top of the glazing a lesser thickness at the bottom. Such interlayers are produced through extrusion of the plastic. Such interlayers are known as “wedge” interlayers. They can also be formed, to a lesser extent by shaping (stretching) of the interlayer. Shaping is typically done to create a curved sunshade 6. Table 1 shows the wedge angle and reduction in thickness for a standard 0.76 mm thick interlayer over 1 meter as a function of sunshade radius.

Note that wedge interlayer can be shaped to increase the wedge angle. Any combination of wedge and shaped interlayer can be used to obtain the desired results.

Figures 7a, 7b and 7c show: a laminate with two standard interlayers, a laminate with one wedge interlayer and a laminate with two wedge interlayers. Wedge interlayer can be used to further reduce double vision.

Sunshade Radius	Interlayer Thickness	Wedge Angle
m	mm	mrاد
2.0000	0.5067	0.253
2.5000	0.5429	0.1017
3.0000	0.5700	0.190
3.5000	0.5911	0.169
4.0000	0.6080	0.152
4.5000	0.61018	0.138
5.0000	0.6333	0.127
5.5000	0.6431	0.117
6.0000	0.6514	0.109
6.5000	0.6587	0.101
7.0000	0.6650	0.095
7.5000	0.6706	0.089
8.0000	0.6756	0.084
8.5000	0.6800	0.080
9.0000	0.6840	0.076
9.5000	0.6876	0.072
10.0000	0.6909	0.069

5

Table 1: Sunshade Radius vs. Wedge Angle

Experimental results have demonstrated the remarkable and unexpected magnitude of improvement of the invention. Fracture strength is more than doubled, MTF is drastically improved (see Graph 1), distortion is reduced by a factor of six and double image if reduced from 15” to 3”. One should also note that all four of these parameters are critical to the operation of a safety camera.

10

Table 2

	Laminate with Black Frit	Laminate with Obscuration Printed on Film
--	--------------------------	--

Fracture Strength (ring-on-ring)	60 Mpa	115 Mpa
Distortion (Camera window - 5mm from the black edge)	150 milli diopters	25 milli diopters
Double image (Camera window - 5mm from the black edge)	15" (arc minute)	3" (arc minute)

As camera system for cars improve and cars now have advanced driving assisted systems the vehicles windshield becomes an important component of the complex lens system that makes up the vehicle vision system. For our interest here our windshield serves as a lens in front of the camera, comprising one component of a complex lens system. The best way to evaluate this system is by measuring the MTF.

Modulation Transfer Function or "MTF" is the most widely used scientific method of describing lens performance. The modulation transfer function is, a measure of the transfer of modulation (or contrast) from the subject to the image. In other words, it measures how faithfully a lens reproduces (or transfers) detail from the object to the image produced by a lens. When we graph MTF we chart against contrast dropping from 100 to 0 and Spatial frequency (Nyquist frequency). Spatial frequency is the ability to resolve over distance and as contrast drops this ability gets weaker. Plotting this in X&Y gives us the total systems contrast and its ability to faithfully reproduce into the distance. This is especially important in semi-autonomous or autonomous driving vehicles as the focus will be the horizon and all images in the focal plane will need to be detectable both in shape and in size.

Obscurements produced by the method of the invention have resulted in a remarkable improvement in system MTF as compared to the same production model with a normal frit obscuration.

Embodiment 1

The windshield of Figure 1 comprising a ceramic frit black band **32** and a thin plastic adhesive backed die cut insert camera obscuration **8** applied to the number 2 surface.

Embodiment 2

5 The windshield of Figure 1 comprising a ceramic frit black band **32** and a thin plastic adhesive backed die cut insert camera obscuration **8** applied to the number 2 surface and number 4 surface.

Embodiment 3

10 The windshield of Figure 1 comprising a ceramic frit black band **32** and a thin plastic adhesive backed die cut insert camera obscuration **8** applied to the number 2 surface 2 and number 4 surface and further comprising a wedge/shaped plastic interlayer.

Embodiment 4

15 The windshield of Figure 1 comprising a ceramic frit black band **32** and a thin plastic adhesive backed die cut insert camera obscuration **8** applied to the number 2 surface and number 4 surface and further comprising two wedge/shaped plastic interlayers sandwiching between them a infra-red heat reflecting PET film.

20 It must be understood that this invention is not limited to the embodiments described and illustrated above. A person skilled in the art will understand that numerous variations and/or modifications can be carried out that do not depart from the spirit of the invention, which is only defined by the following claims.

CLAIMS

1. A laminate comprising:
 - a. at least two glass layers each having two oppositely disposed major faces,
 - b. at least one plastic interlayer having two oppositely disposed major faces,
 - c. at least one obscuration produced by applying a thin insert to at least one of the glass layer major faces,
 - d. said obscuration comprising a substantially opaque material cut to the required size,
 - e. and said obscuration is applied after heating and bending of the glass layers.
2. The obscuration of claim 1 further comprising an insert that is less than about 1/3 of the total plastic interlayer thickness.
3. The obscuration of claim 1 further comprising an insert that is less than about 1/4 of the total plastic interlayer thickness.
4. The laminate of claim 1 further comprising at least one wedge interlayer.
5. The laminate of claim 1 further comprising a camera obscuration separate from and spaced from the black band obscuration.
6. The laminate of claim 1 further comprising an IR reflecting layer.
7. The laminate of claim 1 further comprising a PET film layer.
8. A vehicle utilizing the laminate of claim 1.

=====

1/9

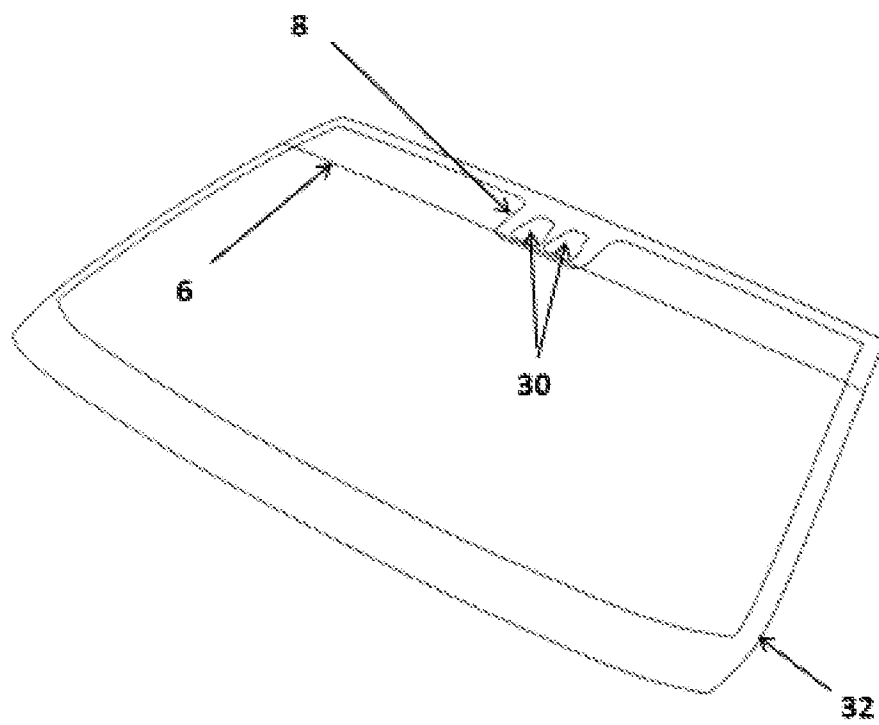


Fig. 1

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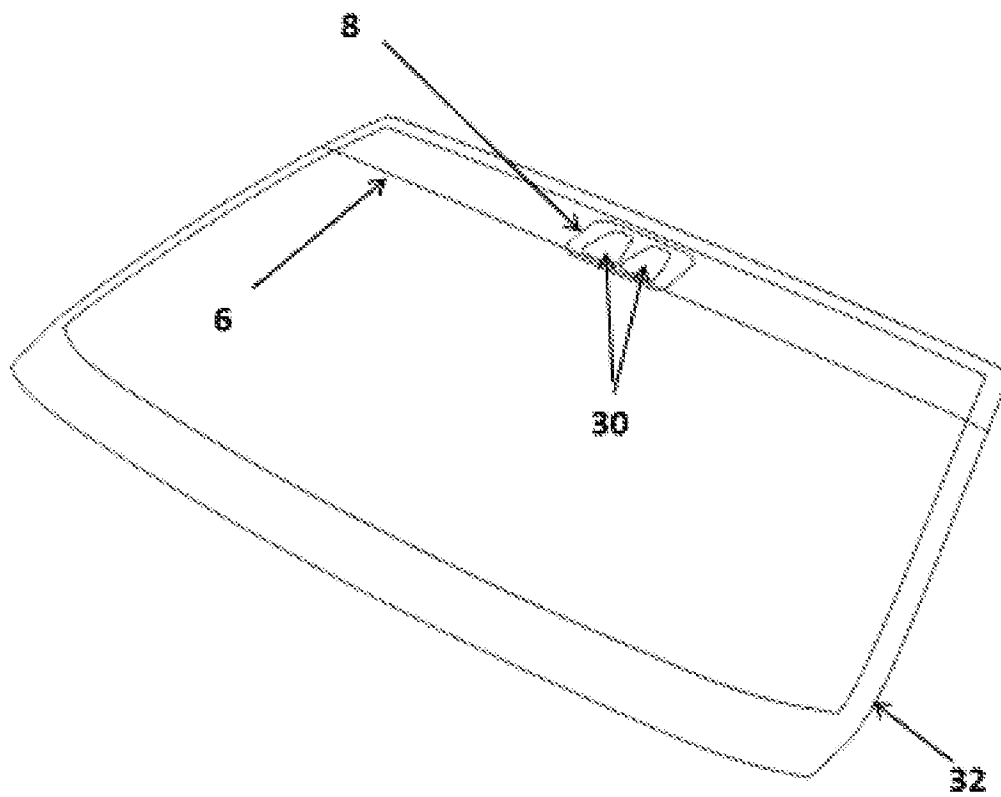


Fig. 2

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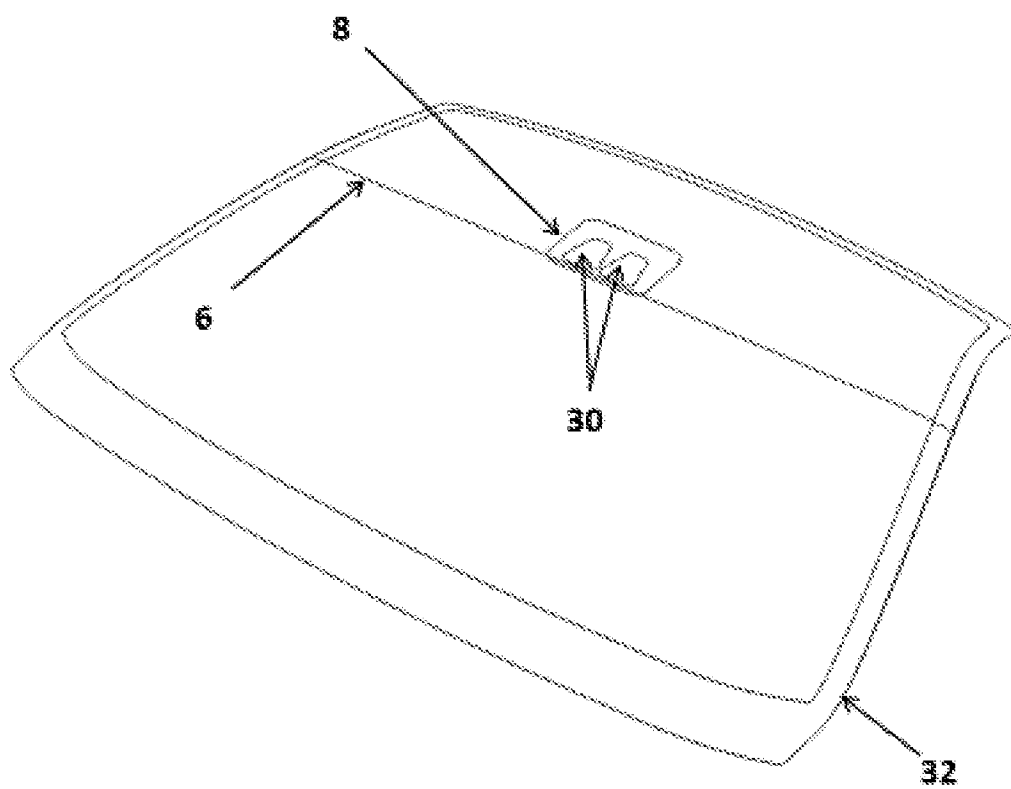


Fig. 3

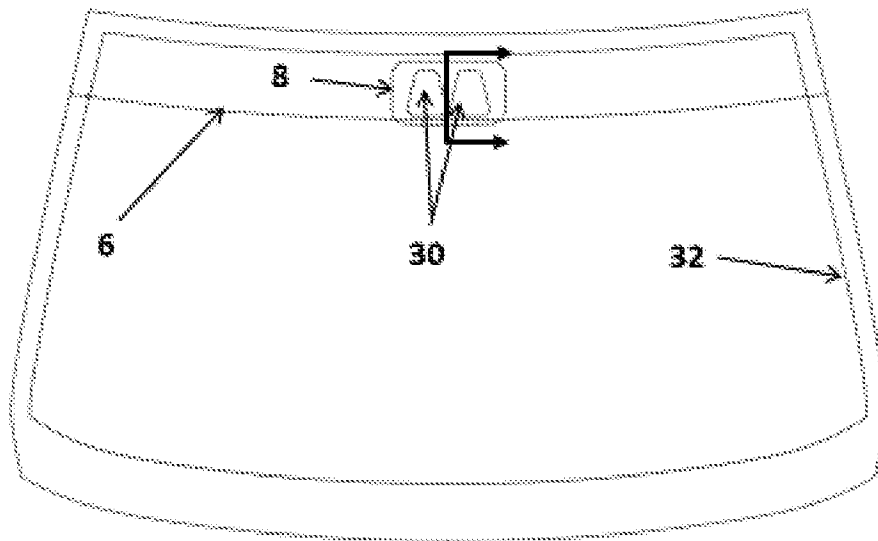


Fig. 4A



Fig. 4B

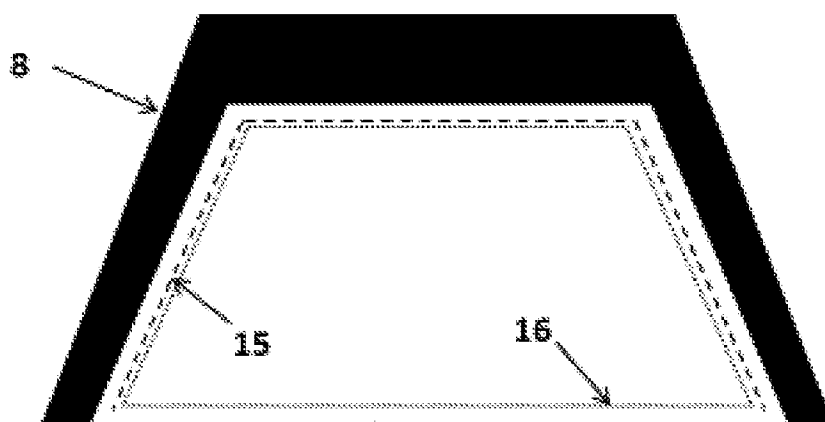


Fig. 6A

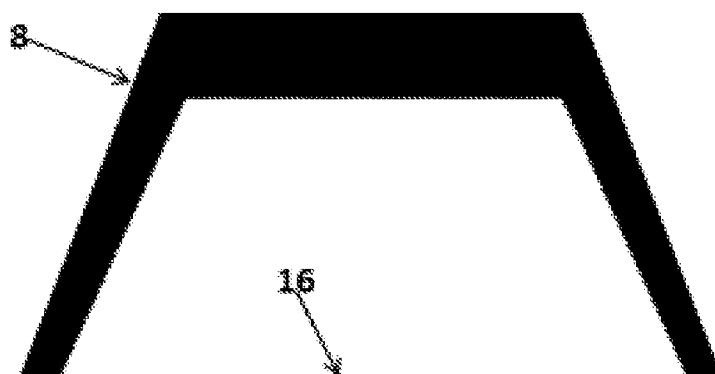


Fig. 6B

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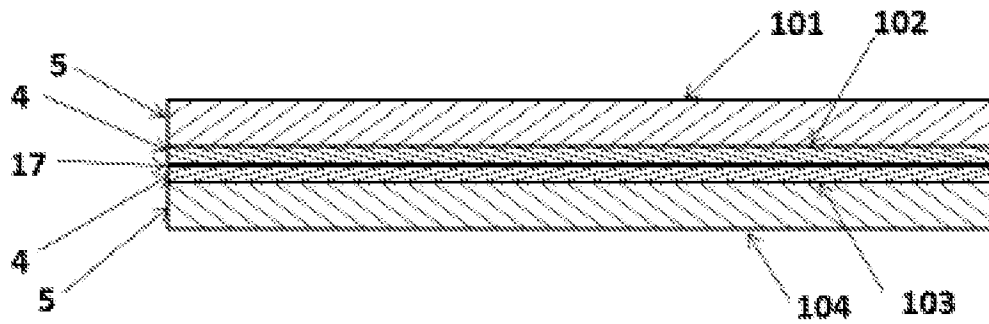


Fig. 7A

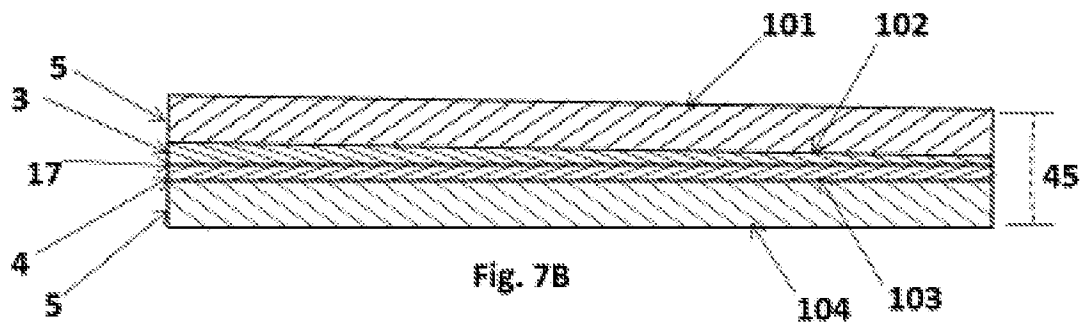


Fig. 7B

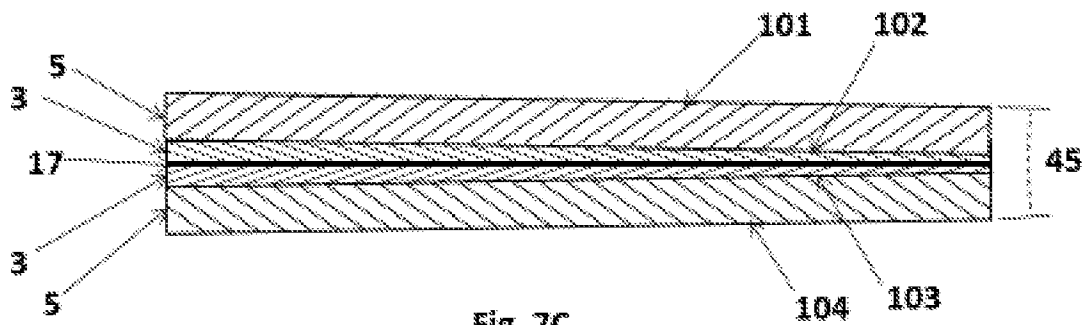


Fig. 7C

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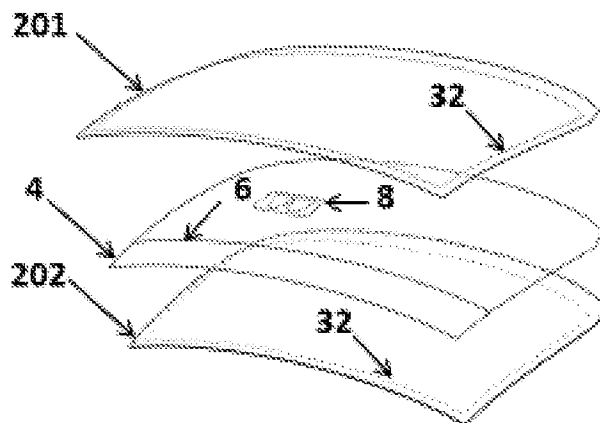


Fig. 8A

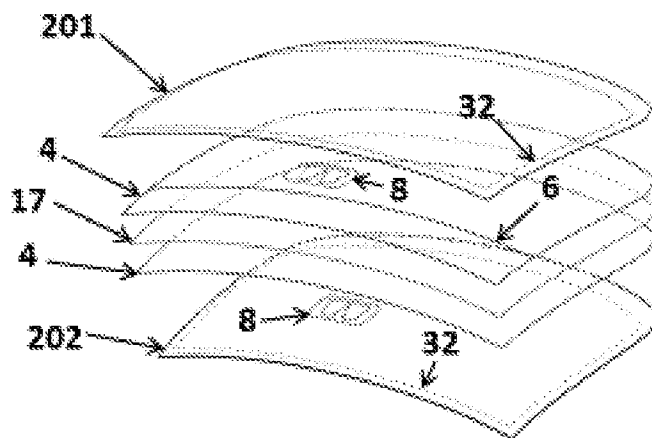


Fig. 8B

Electronic Acknowledgement Receipt

EFS ID:	30529715
Application Number:	62566254
International Application Number:	
Confirmation Number:	1081
Title of Invention:	Laminate with Thin Insert Obscuration Having Superior Strength and Optical Quality
First Named Inventor/Applicant Name:	Mario Arturo Mannheim Astete
Customer Number:	130961
Filer:	Joseph L. Morales
Filer Authorized By:	
Attorney Docket Number:	1511.23200
Receipt Date:	29-SEP-2017
Filing Date:	
Time Stamp:	22:12:53
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 260
RAM confirmation Number	100217INTEFSW22140000
Deposit Account	
Authorized User	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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Warnings:					
Information:					
2	Application Data Sheet	13496.PDF	1819460	no	8
			5642cb0ad1b101e1e0bbe7a53e4a930be2b4f6e		
Warnings:					
Information:					
3	Specification	13497.PDF	293723	no	28
			6ec2e5d718b9425b6d881e6e93efbfe28434eae		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30008	no	2
			147925daf681fbba9cef1ab47a93520e2072c2fd		
Warnings:					
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.