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AUTOMOTIVE LAMINATE WITH IMPROVED OPTICS MADE WITH RESIN AND DEFORMABLE INSERT

Cross-references to related applications

None

5 Abstract of the disclosure

The use of camera based safety systems is growing at a rapid rate in modern automobiles. As the industry moves towards vehicles with full autonomous capability, the number of cameras required and the resolution of the cameras are both increasing. At the same time, windshields, where many of the cameras are mounted, are becoming larger and more complex in shape. This presents problems in the area of camera optics. Variations in the thickness of the glass and the plastic layer, surface mismatch, surface texture and the design curvature of the glass in conjunction with the often low installation angle, can reduce the optical clarity. These optical aberrations are further exacerbated during the lamination process when the three layers are bonded together under pressure. The laminate of the invention utilizes a cutout in the plastic bonding layer in the camera field of view into which a removable insert is placed prior to lamination. The insert serves to prevent breakage during the lamination process. After lamination, the insert is removed, the void is filled with laminating resin and the resin is cured. The result is a laminated glazing with superior optical quality. The insert is designed and fabricated such that it can be deformed during removal from the laminate. This allows for the insert to be removed through an opening that is substantially narrower than the cutout.

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Field of the invention

This invention relates to the field of laminated automotive glazing.

5 Background of the invention

The use of camera based safety systems, requiring a wide field of view and a high level of optical clarity, is growing at a rapid rate. As the industry moves towards full autonomous capability, the number of cameras and the resolution of the cameras are both increasing. At the same time, windshields, where many of the cameras are mounted, are becoming larger and more complex in shape.

The main cameras require a high, forward looking field of view and so must typically be mounted on the windshield and 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 of multiple cameras. A clear undistorted field of view, with minimal double imaging and excellent Modulation Transfer Function (MTF, 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 increases, the need for a clear distortion free field of view increases.

Laminated windshields are made by bonding two sheets (**201 & 202**) of annealed glass together using an interlayer **4** which is a thin thermoplastic sheet to bond the glass layers together as shown in Figure 1. Annealed glass is glass that has been slowly cooled from the bending temperature down through the glass transition range during the bending process. 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 interlayer **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.

This laminated construction presents problems in the area of optics. For one, the camera is looking out through at least two layers of bent glass bonded together by a third layer of plastic. Secondary reflections from the multiple surfaces can result in double image. The curvature of the glass, in conjunction with the often-low installation angle, can also contribute to double image as well as further reducing the optical clarity of the field of view.

Further problems arise from variations in the thickness of the glass and the plastic layer used to bond the two glass layers to each other.

Most of the worlds' flat glass is produced by the float glass process, first commercialized in the 1950s. With the float glass process, the raw ingredients are melted in a large refractory vessel and then the molten glass is extruded from the vessel onto a bath of molten tin where the glass floats. The thickness of the glass is controlled by the speed at which the molten glass is drawn from the vessel. Float glass thickness can typically vary by +/- 50 μm over a short distance due to what is known as draw line distortion. This is the result of the mechanical means used to transform the molten glass into a thin ribbon on the flat glass float line. As the glass cools and hardens, the glass ribbon transfers to rollers.

There is also variation in the thickness of the plastic bonding interlayer 4. Automotive interlayers are made by an extrusion process with a thickness tolerance to accommodate process variation. In addition, to facilitate the handling of the plastic sheet and the removal of air (de-airing) from the laminate, the surface of the plastic is normally embossed contributing additional variation to the sheet. A smooth surface tends to stick to the glass making it difficult to position the sheet relative to the glass and also tends to trap air.

While these variations of themselves can cause distortion, the optical aberrations are further exacerbated by the lamination process. During lamination, the two layers of glass are forced together under pressure and permanently held there by the plastic bonding layer. Any surface irregularities or thickness variation will result in residual stress which is locked into the glass. This is especially a problem due to the material properties of glass.

Glass is a transparent isotropic substance. Physical properties, such as the index of refraction, do not depend on its orientation. However, when a mechanical stress is applied to glass, it becomes anisotropic, in the case of glass, the index of refraction will vary with stress. This phenomenon is known as mechanical birefringence, photo elasticity, or stress birefringence. The induced birefringence in glass is proportional to the stress applied.

When glass becomes birefringent, it will display two different indices of refraction that depend on polarization; one refraction index for a particular axis of polarization and another one for its perpendicular axis. For an incident non-polarized light in a birefringence material, half of the light will be affected by one refraction index and the other half by a different refraction index, producing an effect commonly known as “double image”. This property is well known in the industry and taken advantage of measuring the residual stress in glass through the use of a polarized light source and a polarizing filter.

It would be desirable to overcome these limitations by providing a laminated glazing with superior optical quality and performance.

Brief summary of the invention

The present invention provides for a laminated glazing with superior optical quality. The glazing is made by first making a cutout **8** area in the plastic bonding interlayer **4** in the area used by the cameras. An insert **14**, made from a material that the plastic will not adhere to, is used to fill the gap left by the cutout **8** between the two glass layers to prevent breakage during the lamination process. The insert **14** is designed and fabricated such that it can be pulled apart during removal from the laminate. This allows for the insert to be removed through an opening that is substantially narrower than the cutout. After lamination, the insert **14** is removed. The cutout **8** is designed to facilitate removal of the insert. The void is then filled with a transparent laminating resin **16** and the resin **16** is cured.

Advantages:

- Insert can be removed through a narrow opening;
- Superior optical quality:
 - Reduces distortion due deviation in curvature of glass;
 - Reduces distortion due to surface mismatch;
 - Reduces distortion due to birefringence;
 - Reduces distortion due variation in thickness of glass and interlayer;
 - Reduces double image;
- Reduces residual stress;
- Reduces probability of breakage;
- Supports cameras with higher resolution;
- Fabricated using standard automotive glass processes and equipment.

Brief description of drawings

Figure 1	Cross section of a laminate construction
Figure 2	Exploded view of a laminate
Figure 3A	Isometric view of an embodiment of a windshield
Figure 3B	Front view of an embodiment of a windshield
Figure 4A	View of camera optics with insert
Figure 4B	View of camera optics with insert removed
Figure 5A	View of camera optics with filling tubes inserted
Figure 5B	View of camera optics with laminating resin in place.
Figure 6A	Cross section of camera optics with insert
Figure 6B	Cross section of camera optics with insert removed
Figure 7A	Cross section of camera optics with filling tubes inserted
Figure 7B	Cross section of camera optics with laminating resin in place.
Figure 8	Insert with perforations.
Figure 9	Insert with perforations and notches.
Figure 10	Insert with perforations, notches and wire reinforcement
Figure 11	Formed insert.

Reference numerals

2	Glass
4	Bonding/Adhesive Layer
6	Obscuration
8	Cutout
12	Fill Tube
14	Insert
16	Laminating resin
18	Gap/void
20	Perforation
22	Reinforcement

26	Notch
28	Tab
32	Opening in obscuration for camera
101	Surface one
102	Surface two
103	Surface three
104	Surface four
201	Outer layer
202	Inner layer

Detailed description of the invention

In the drawings and discussion, the following description and terminology is used to describe the method for producing laminated glazing and the structural characteristics of the configuration of a laminated glazing as illustrated in Figure 1. A typical automotive laminate is comprised of at least two different layers of glass separated by plastic layers between the glass layers. In the embodiment shown in the figures, the exterior or outer glass layer **201** and interior or inner glass layer **202** are permanently bonded together by a plastic interlayer **4**. It should be noted that laminated glazings can be formed by multiple glass layers and plastic bonding layers.

In the embodiment shown in Figure 1, 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 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 interlayer **4**. It should be noted that different glass **2** layers can be used in automotive applications, hence plastic interlayer **4** are placed between glass layers **2**.

Hence, the first step of the method of the present invention is to provide a laminated glazing having an exterior glass layer, an interior glass layer and one or more plastic

bonding layers. The plastic bonding interlayer **4** 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 to another glass layer **2**. For automotive use, the most commonly used bonding interlayer **4** is polyvinyl butyl (PVB). However, several materials can be used such as polyvinyl butyl, ionoplast polymers, ethylene vinyl acetate (EVA), cast in place (CIP) liquid resin and thermoplastic polyurethane (TPU), among others. Interlayers are available with enhanced capabilities beyond bonding the glass layers together. For instance, the present 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 those materials normally used or the ones described above.

Different types of glasses **2** may be used in the present invention and include but are not limited to: the common soda-lime variety typical of automotive glazing, building windows and containers 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. The glass layers of the present invention may also comprise various glass compositions and/or coatings. Some of these may be heat absorbing and/or aesthetic glass compositions as well as glass with different types of coatings, such as infra-red reflecting, anti-glare and anti-reflective coatings among others. Coatings may be applied to any of the glass surfaces.

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

Infrared reflecting films include both metallic coated substrates as well as organic based optical films which reflect in the infrared. Lamination of films requires the addition of an additional plastic bonding layer used to bond the opposite faces of the film to the opposite faces of the glass layers.

The glass layers may be annealed or strengthened. Generally, there are two processes that can be used to strengthen glass. They are thermal strengthening, also known as

toughening or tempering, 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. This ion exchange process places the outer
5 layer of glass in compression. Compressive strengths of up to 1,000 Mpa are possible.

The use of thin glass layers has been found to improve resistance to breakage from impact such as from stone chips. The thinner glass is more flexible and absorbs the energy of the impact by deflecting and then bouncing back rather than breaking as is the case with a thicker stiffer layer of glass. Also, embodiments comprising a borosilicate exterior layer
10 are substantially more resistant to impact than soda lime glass due to the nature of the composition. Embodiments comprising a chemically tempered layer will also exhibit superior resistance to impact as compared to ordinary soda-lime glass due to the high surface compression of such glasses.

In the embodiment shown in the figures, the present invention comprises a laminate
15 having two glass layers **201** and **202** with each having opposing major faces bonded together permanently by at least one plastic bonding interlayer **4**. The plastic bonding interlayer **4** may have at least one cutout **8** in different areas around the plastic interlayer **4** where different elements can be mounted, for instance, the cutout **8** can be located at the area where least one camera can be mounted. The camera location may be in the top
20 center area of the windshield, the typical location on standard windshields. Other locations on the windshield may be used.

A subsequent step of the method, is to provide a cutout **8** in the portion of the plastic bonding layer **4** in the camera field of view area of the windshield extending to the edge of glass.

25 The next step of the method is to place an insert **14** to fit into the cutout **8** of the plastic bonding layer. Sufficient clearance must be allocated to allow for the alignment between the insert **14** and the cutout **8** taking into account the tolerance stack. In the embodiments shown, there is a 0.5 mm gap between the insert **14** and the edge of the cutout **8** in the plastic bonding layer **4**.

The insert **14** can be fabricated from any suitable material that can provide the strength and temperature resistance needed. The material used must also not mark the glass. The material selection will at least partly depend upon the shape of the glass and the processing parameters. The insert **14** must prevent compression of the glass plies during the lamination process while being sufficiently flexible to facilitate and allow for removal of the insert **14** after lamination. Some of the materials which have been found to be suitable include but are not limited to: silicone rubber, Teflon® and nylon.

If the cutout **8** is close to the edge of glass it may be convenient to have an insert **14** that is the same width or wider than the cutout **8** so as to allow for easy removal of the insert from the laminate after the lamination process has been completed. However, on some windshields, in particular panoramic windshields in which the top edge of the windshield is extended further into the roof line, a wide area insert may not be desired or possible. In addition, an irregular, rounded or trapezoid shape may be needed in which case, removal of an irregular, rounded or trapezoid shaped insert would be difficult or impossible.

The insert **14** of the invention is designed such that it can be pulled apart during removal by pulling on one or more tabs **28** extending outboard and beyond the edge of glass. The tab **28** portion of the insert **14** can be accessed from the exterior of the laminate. In the exemplary embodiments, the tab **28** of the insert **14** is designed to extend beyond the edge of glass by at least 6 mm and to have a width of less than 25 mm. The insert **14** shown in Figure 8 is fabricated from a sheet of 0.76 silicon rubber. Perforations **20** are made in the vertical direction that are just sufficient to hold the insert **14** together during handling and assembly of the laminate. The perforations **20** are spaced approximately 6 mm apart.

Upon the application of force to the insert, the material of the insert perforations **20** will break allowing further deformation of the insert **14**.

The perforations **20** themselves may be formed with a perforation width such as that they would be considered slots. The insert **14** may have gaps, voids, slots or other shapes depending upon the glass thickness, the autoclave and processing parameters, the insert material and the insert **14** design. The key is to have an area of unsupported glass of less

than that which allow for an excess degree of deformation of the glass itself to take place and the accompanying increase in the level of stress in the glass and in the probability of breakage. Such gaps, rather than just perforations of minimal width, can facilitate removal of the insert by providing for increased clearance inside of the laminate.

- 5 The material selected for the insert **14** as well as the thickness of the material will determine the length of each perforation and the spacing. The perforations **20** may take the form of a series of small circles or dots as would be the case if a LASER were to be used to create the perforations as is commonly done with paper documents which are required to have a portion that is easily separated.
- 10 The perforation can be created through a variety of methods known in the art, as appropriate for the material selected. They may be die cut, LASER cut, blade cut, molded or otherwise formed. If the material has sufficient stiffness such that it can be readily handled and worked with during assembly, the perforations may not be needed at all as illustrated in Figure 11.
- 15 A subsequent step of the method, is to laminate the glass layers and plastic layers. After lamination, the insert **14** is removed in two separate sections by pulling on each of the two tabs **28** extended from the edge of glass. As the tabs **28** are placed in tension, the rubber stretches and the perforations **20** tear allowing the segments to unfold and further separate. Each tab **28** may have different thicknesses, the embodiment illustrated has a
- 20 width of approximately 12 mm so that the segments can be easily pulled through the gap **18**.

- Figure 9 shows the insert of Figure 8 further comprising additional cuts or notches **26** made to prevent binding of the insert during removal. A wedge shape is shown but as can be appreciated, other shapes may be just as effective or even more. The wedge of the
- 25 exemplary embodiment allows the insert **14** to more easily bend.

In some instances, where the insert **14** must be removed through a very narrow opening and or over a greater distance, greater force may be required to remove the insert **14**. Figure 10 shows the insert of Figure 9 with a thin high tensile strength wire reinforcement

22 embedded in the plastic of the insert **14**. The wire is sized such as to be able to withstand the maximum force required to remove the insert **14** from the laminate. This may also be used to allow for a more rapid removal rate as well. A 100 μm or greater solid Tungsten wire has been found to work well.

5 Figure 11 shows an alternate embodiment of the insert **14**. In this example, the insert **14** is formed through injection molding, vacuum molding or any other forming method known in the art suitable for the material chosen. In the exemplary embodiment illustrated, a single center tab **28** is provided, which is first removed, facilitating the removal of the remaining two segments. The simpler and more uniform cross section
10 allows for easier deformation of the insert **14**. The gaps are limited by the thickness and the strength of the glass as well as the maximum force to be applied and the duration of the lamination process cycle.

The following step is to laminate the glazing. During the assembly of the laminate, the insert **14** is placed between the glass layers **2** and aligned with the cutout **8** in the plastic
15 bonding layer **4**. An autoclave is used to apply heat and pressure to an assembled laminate to complete the lamination process.

After lamination, the following step is to removing the insert **14** from the laminate, leaving a void **18** in its place, as shown in Figure 4B. The following step is to filling the void **18** with a transparent laminating resin. Methods used to produce injection molded
20 plastic parts are well known in the art and any suitable method can be used to fill the void **18** with a transparent laminating resin **16** as shown in Figure 7. Many such resins are known and commercially available. One with an index of refraction matched to glass that can be UV cured is preferred. The manner in which the resin **16** can be introduced is exemplified. Here, the filling is performed using a fill tube needle **12** of 0.5 mm diameter,
25 which is less than the distance between the surfaces involved. As discussed, any number of methods may be used to fill the void **18** without departing from the intent of the invention.

It should be noted that the forming process of the laminated glazing can be carried out by the standard manufacturing process available in the art. The typical process includes, but it is not limited to, the following steps:

- a) cutting glass to shape,
- 5 b) treating the edge of glass;
- c) bending by means of gravity or press bending and temperature the glass layers;
- d) optionally strengthening the glass;
- e) assembling the internal glass layer, external glass layer and adhesive layer;
- 10 and
- f) laminating the glass layers and plastic layer.

An optional step is to print the black obscuration **6** on surface two **102** and/or on surface four **104** of the glass to hide any parting line delineating the boundary between the injected resin **16** and the bonding layer **4**. Screen printed black frit obscurations are
15 applied to the flat glass prior to bending.

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 are well known in the art and will not be discussed in the present disclosure.

On parts with minimal curvature at least one glass layer can be formed by cold bending a
20 flat sheet of glass to the contour of the part. Cold bending is a relatively new technology. As the name suggests, the glass is bent, while cold, to its final shape, without the use of heat. This is possible because as the thickness of glass decreases, the sheets become increasingly more flexible and can be bent without inducing stress levels high enough to significantly increase the long term probability of breakage. Thin sheets of annealed
25 soda-lime glass, in thicknesses of about 1 mm, can be bent to large radii cylindrical shapes (greater than 6 m). When the glass is chemically or heat strengthened the glass is able to endure much higher levels of stress and can be bent along both major axis. The process is primarily used to bend chemically tempered thin glass sheets (≤ 1 mm) to shape.

Cylindrical shapes can be formed with a radius in one direction of greater than 4 meters. Shapes with compound bend, that is that are curved in the direction of both principle axis, can be formed with a radius of curvature in each direction of as small as approximately 8 meters. Of course, much depends upon the surface area of the parts, types of glass and thicknesses of the substrates.

The cold bent glass will remain in tension and tend to distort the shape of the bent layer that it is bonded to. Therefore, the bent layer shape may need to be compensated to offset the tension. For more complex shapes with a high level of curvature, the flat glass may need to be partially thermally bent prior to cold bending.

In the embodiments shown, the assembly may be formed by bending one of the layers by gravity bending and then placing the other unbent glass layer thereon to be cold bent. Along with the bonding interlayer 4 placed between them, the assembly is placed in what is known as a vacuum bag. The vacuum bag is an airtight set of plastic sheets, enclosing the assembly and bonded together at the edges, which allows for the air to be evacuated from the assembly and which also applies pressure on the assembly forcing the layers into contact. The assembly, in the evacuated vacuum bag, is then heated to seal the assembly. Other methods of removing air, such as the vacuum channel method, are known in the art and may also be employed to the same effect. The assembly is next placed into an autoclave which heats the assembly and applies high pressure. This completes the cold bending process as the flat glass at this point has conformed to the shape of the bent layer and is permanently affixed. The cold bending process is very similar to a standard vacuum bag/autoclave process, well known in the art, with the exception of having an unbent glass layer added to the stack of glass.

It should also be noted, as one of ordinary skill in the art can appreciate that the invention can be applied to other laminates and positions in addition to the windshield. The windshield is just the most common location to date and the only position which is required by law to be comprised of laminated safety glass.

Windshield distortion is measured by automated scanning devices and quantified in millidiopters usually as a contour plot of the windshield. Diopters are used to measure

the power of a lens. Millidiopters is the reciprocal of its focal length in kilometers. Limits are typically in the range of 100-500 millidiopters depending upon the area of the windshield where the distortion occurs. Using the methods described surprising and unexpected results have been obtained. In one experiment, working with a random sample
5 of bent glass from normal serial production, the maximum distortion in the camera area portion of a standard production windshield was reduced from ~200 millidiopters to under 100 millidiopters. In some of the experiments, the distortion has been reduced to under 50 millidiopters.

DETAILED DESCRIPTION OF THE EMBODIMENTS

10 1. The windshield of Figures 2, 3A and 3B, has a standard 2.1 mm thick exterior glass layer **201** and 2.1 mm interior glass layer **202**. Black frit is applied to the surface two **102** and the surface four **104**. The black frit frames the camera viewing area and also served to obscure the boundary between the PVB and the resin **16**. In the camera field of view area, a cutout **8** made in the 0.76 mm thick
15 PVB plastic bonding layer **4**. The cutout **8** has a depth of about 170 mm and a width of about 175 mm and a rectangular tab **28** section having a width of 24 mm connecting the edge of glass to the main cutout area. An insert **14**, with perforations **20**, that is 0.5 mm smaller than the cutout **8** and with tabs **28** that extend 6 mm beyond the edge of glass, is made from 0.76 mm silicon rubber as
20 illustrated in Figure 8. The tabs **28** should extend outboard of the edge of glass to facilitate removal after lamination. At the same time, the extended portion must not interfere with lamination. An extension of 6 mm allows for the use of vacuum channels to de-air the assembly without modification. After bending, the glass layers **201** and **202** are assembled and the insert **14** is placed between the glass
25 layers in the cutout **8**. The assembly is then laminated. After lamination, the insert **14** is removed from the laminate, by pulling on the tabs, one at a time, causing the perforations **26** to tear and the insert to separate and unfold, leaving behind a void **18**. The laminate is placed in the vertical position and the fill tube **12** needles are inserted into the void. A transparent optical laminating resin **16** is
30 then injected using a precision metering pump, into the void **18**. The fill tube needles **12** are withdrawn as the level of the resin **16** rises. Agitation and vacuum

may be used, if needed, to remove air. The resin may be cured by means of ultra-violet light.

2. A second embodiment comprises the windshield of embodiment 1 further enhanced by the application of an infra-red reflecting coating to the surface two
5 **102.**
3. An additional embodiment comprises the windshield of embodiment 1 further enhanced by the addition of an infra-red reflecting film and a second plastic bonding interlayer **4** having a thickness of about 0.38 mm. The film is placed between the two bonding layers. The thickness of the insert **14** is correspondingly
10 increased to a 1.15 mm.
4. An additional embodiment comprises the windshield of embodiment 1 further enhanced by the use of a sound dampening plastic bonding layer.
5. An additional embodiment comprises the windshield of embodiment 1 further enhanced by the use of a heat absorbing plastic bonding layer.
- 15 6. An additional embodiment comprises the windshield of embodiment 1 further enhanced by an obscuration printed on the plastic bonding layer.
7. An additional embodiment comprises the windshield of embodiment 3 further enhanced by an obscuration printed on the plastic film.
8. An additional embodiment comprises the windshields of embodiments 1-7
20 comprising an insert of the type illustrated in Figure 9.
9. An additional embodiment comprises the windshields of embodiments 1-7 comprising an insert of the type illustrated in Figure 10.
10. An additional embodiment comprises the windshields of embodiments 1-7 comprising an insert of the type illustrated in Figure 11 or an insert of a serpentine
25 shape.

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 modifications can be carried out that do not depart from the spirit of the invention, which is only defined by the following claims.

30

CLAIMS

What is claimed is:

1. A method for producing a laminated glazing comprising:
 - a. providing a laminate glazing having:
 - 5 i. an exterior glass layer;
 - ii. an interior glass layer;
 - iii. one or more plastic bonding layers between the exterior and interior glass layers, the plastic bonding layer having at least one cutout in the camera field of view and extending to the edge of glass;
 - 10 iv. an insert size to fit within the cutout area or the plastic bonding layer with
 1. said insert having at least one tab portion
 - a. wherein the tab portion extends to the edge of glass,
 2. wherein the insert elongates upon the application of force to said tab;
 - 15 b. placing the insert within the cutout of the plastic bonding layer;
 - c. laminating the glazing;
 - d. removing the insert from laminate after lamination process;
 - e. filling the void left by the insert with a laminating resin; and
 - f. curing the resin.
- 20 2. The method of claim 1 wherein the insert is of a thickness that is about the same as the plastic bonding layer.
3. The method of claim 1 wherein the insert is of a serpentine shape.
4. The method of claim 1 wherein the insert is perforated.
5. The method of claim 1 wherein at least one of the glass layers is cold bent.
- 25 6. The method of claim 1 wherein at least one of the glass layers is chemically strengthened.
7. The method of claim 1 wherein the insert elongates when the tab is placed in tension.
8. A glazing produced by the method of claim 1.
- 30 9. The glazing of claim 8 wherein the laminate incorporates an infra-red reflecting coating.

10. The glazing of claim 8 wherein the laminate incorporates an infra-red reflecting film.
11. The glazing of claim 8 wherein at least one of the glass layers is cold bent.
12. The glazing of claim 8 wherein at least one of the glass layers is chemically
5 tempered.
13. The glazing of claim 8 wherein at least one of the glass layers is of a thickness
 that is less than about 1.6 mm.
14. The glazing of claim 8 wherein at least one of the glass layers is of a thickness
 that is between about 0.4 mm and about 1.2 mm.

10

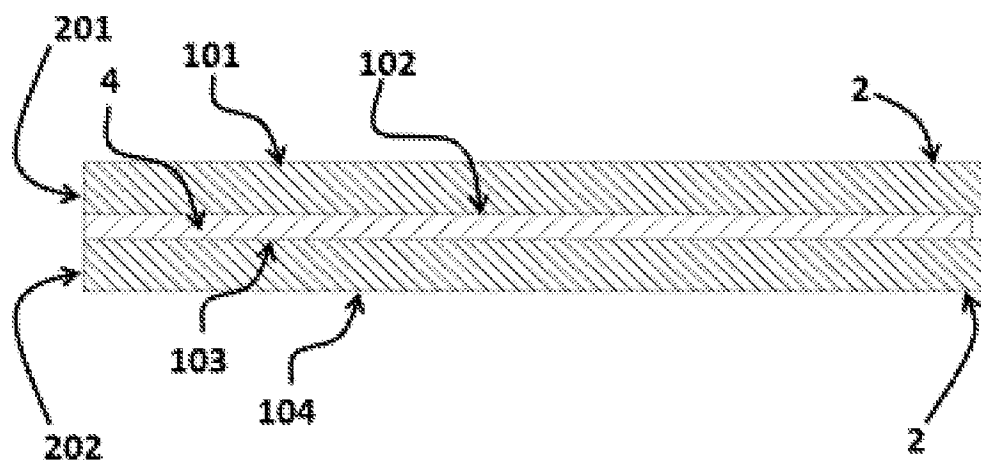


Fig. 1

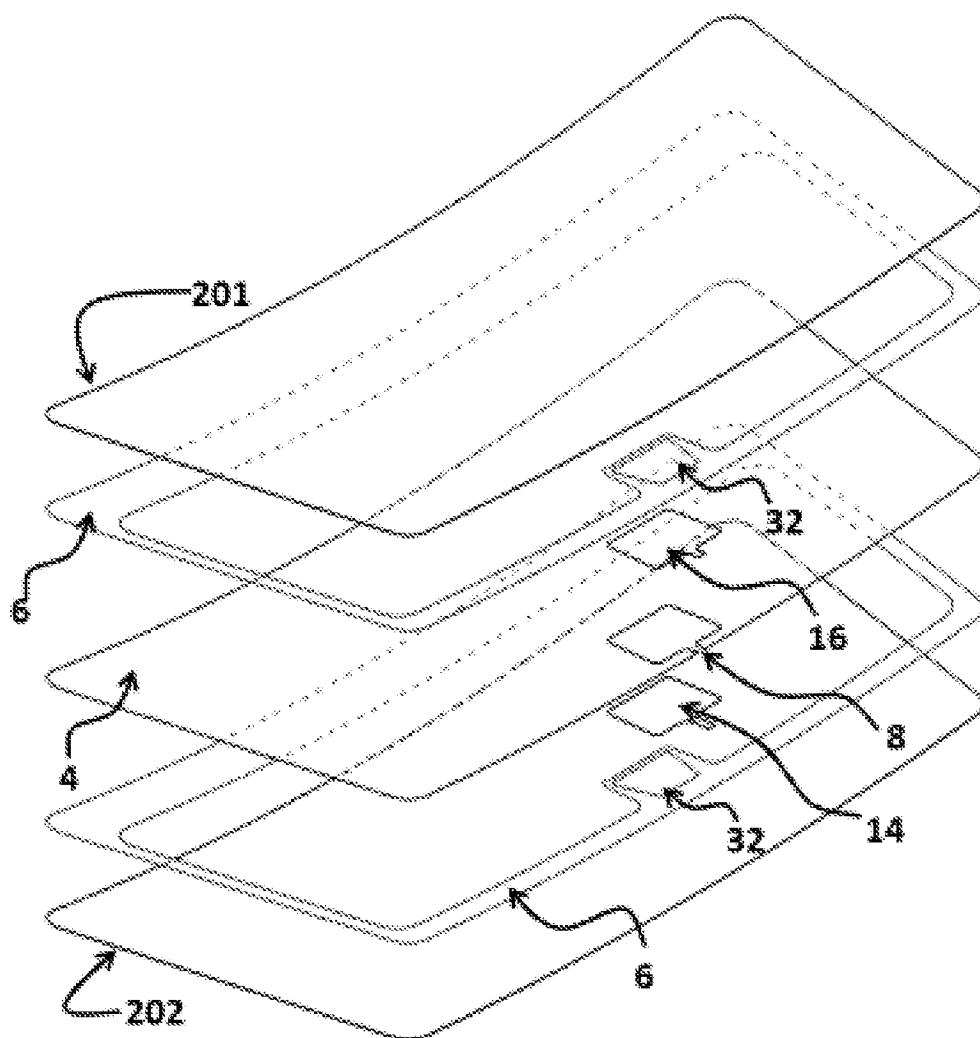


Fig. 2

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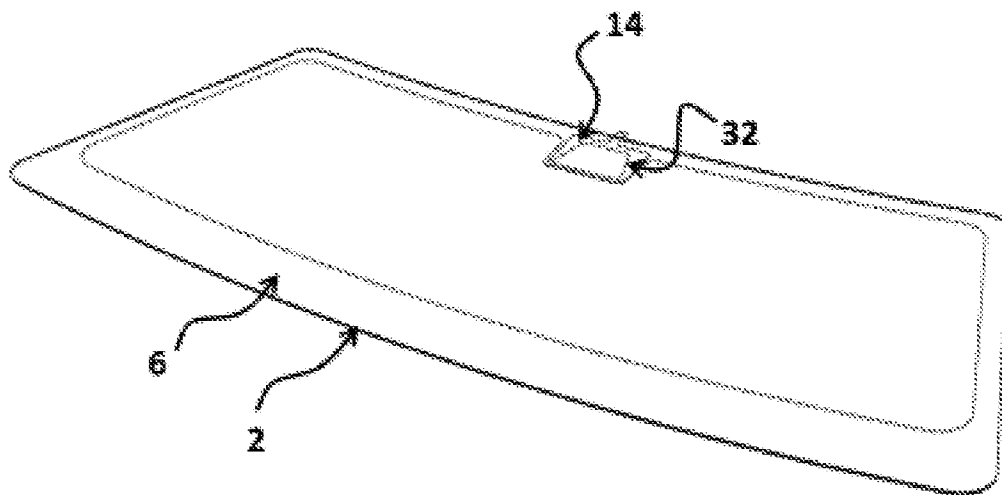


Fig. 3A

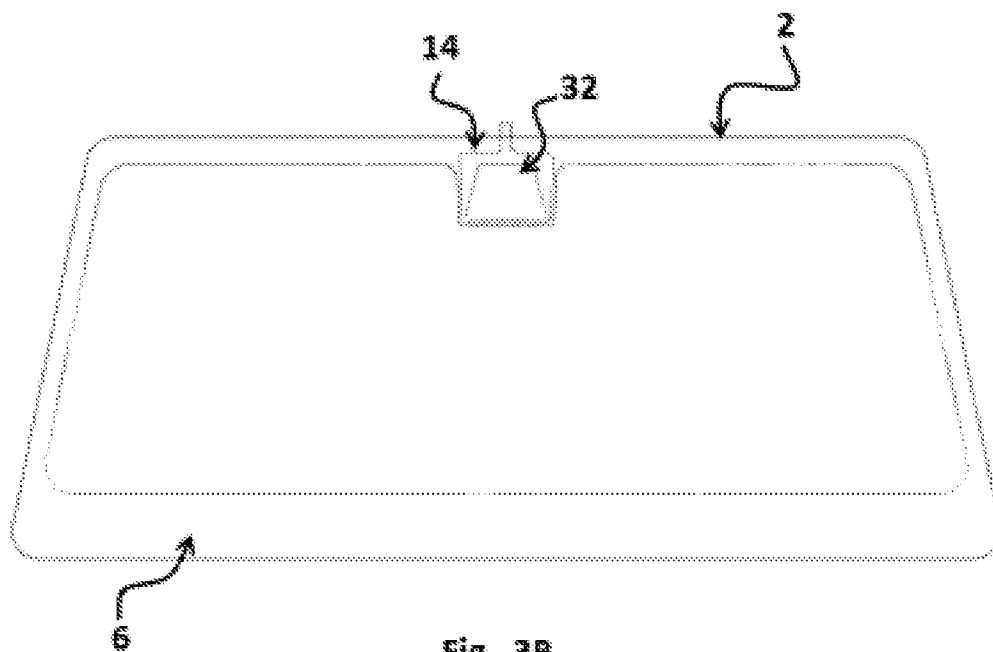


Fig. 3B

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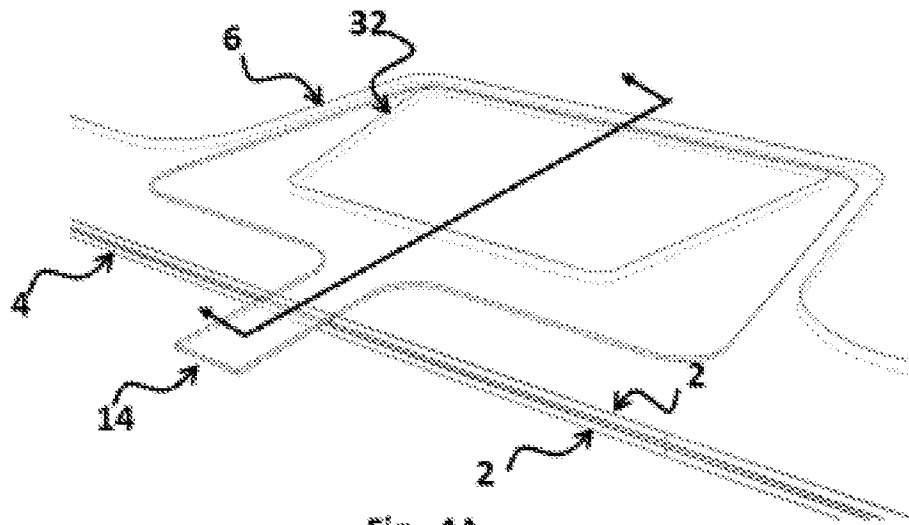


Fig. 4A

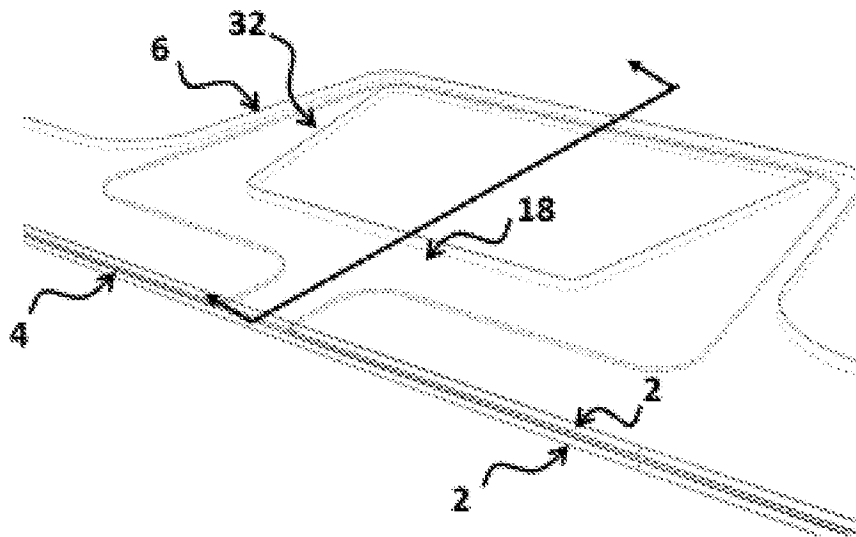


Fig. 4B

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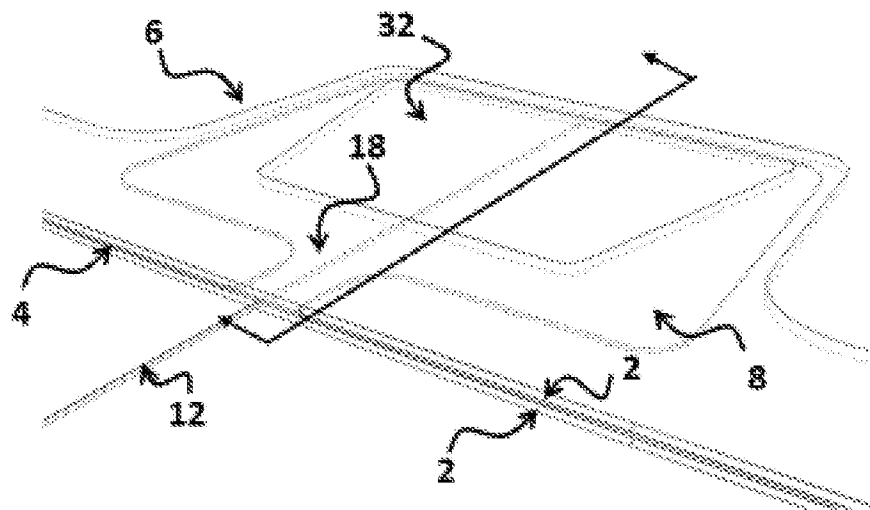


Fig. 5A

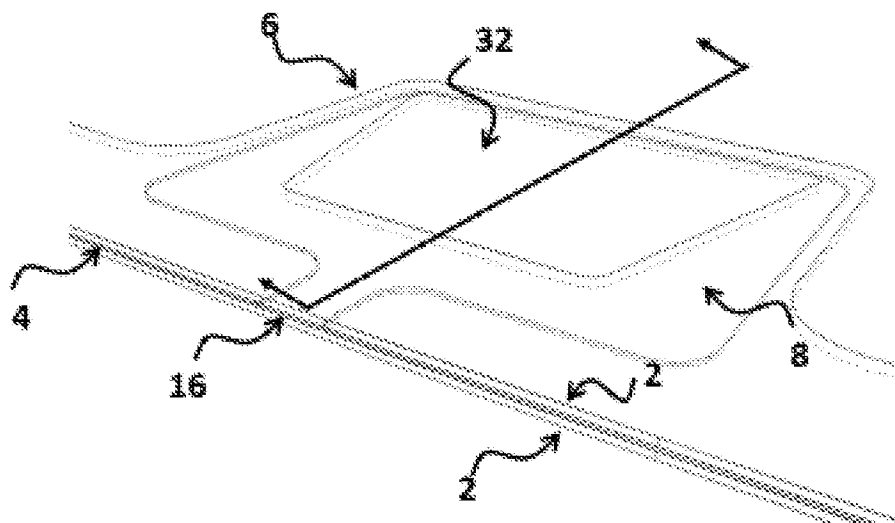


Fig. 5B

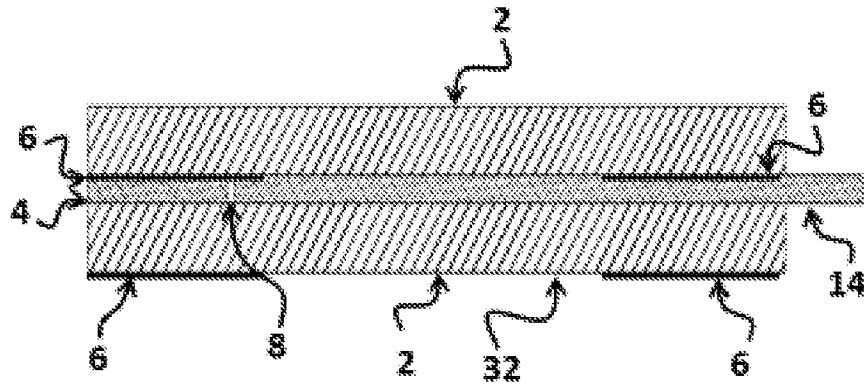


Fig. 6A

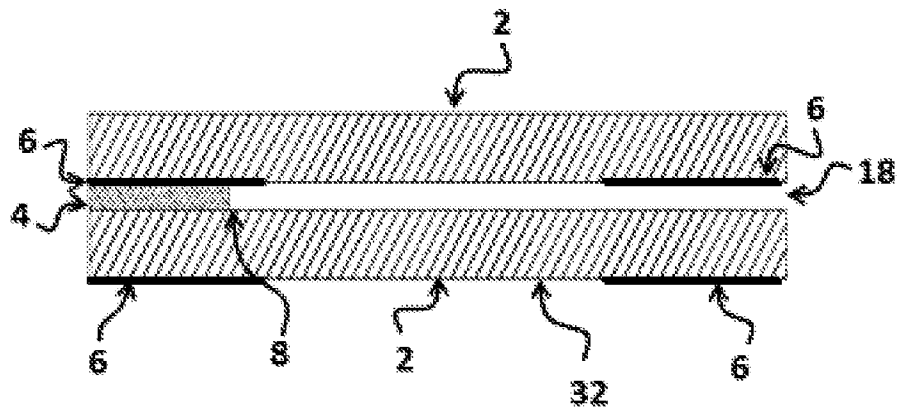


Fig. 6B

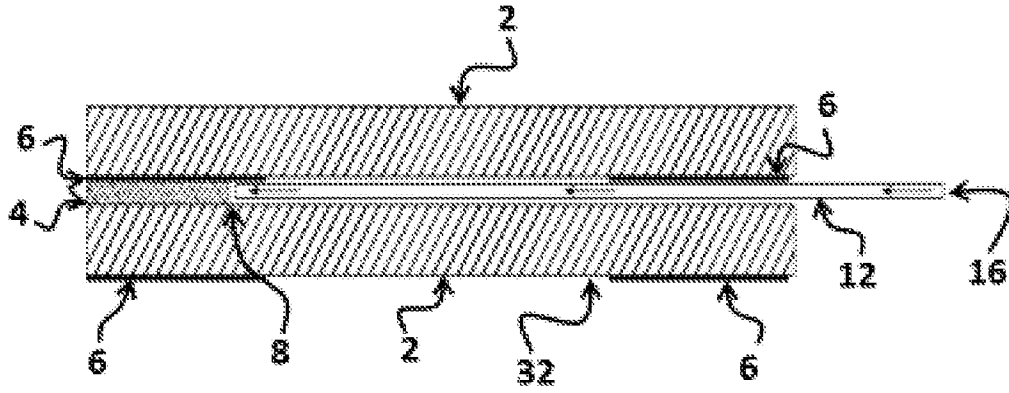


Fig. 7A

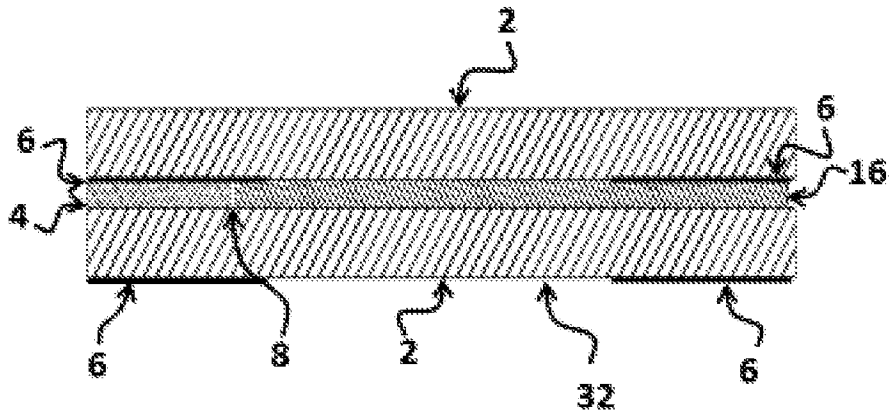


Fig. 7B

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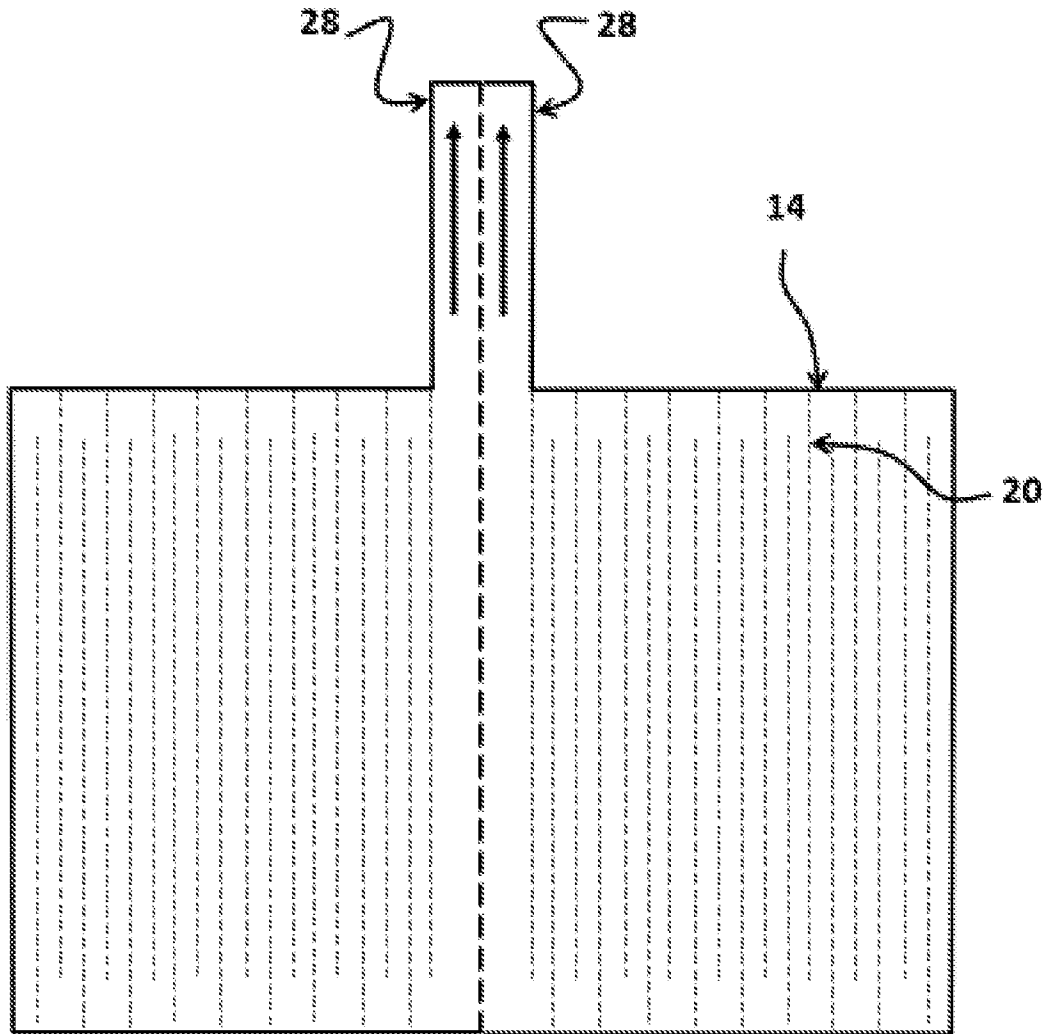


Fig. 8

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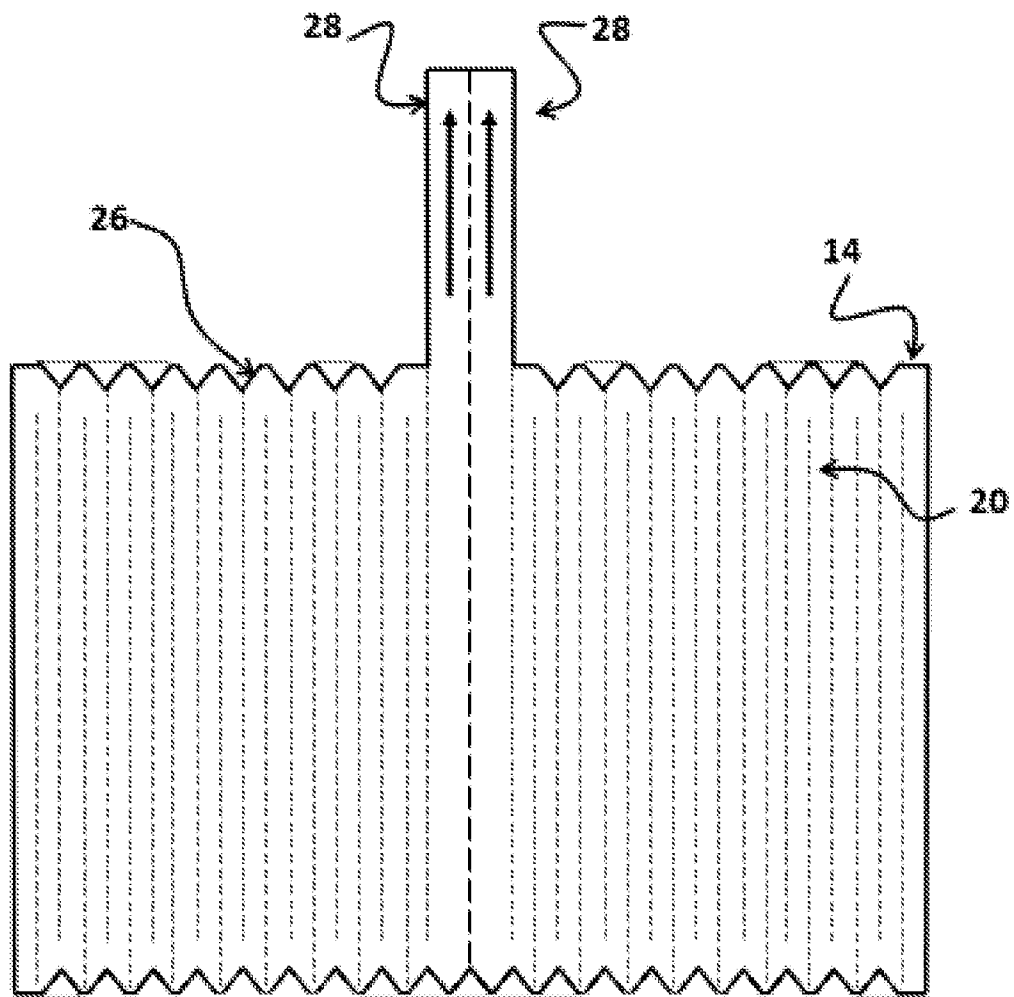


Fig. 9

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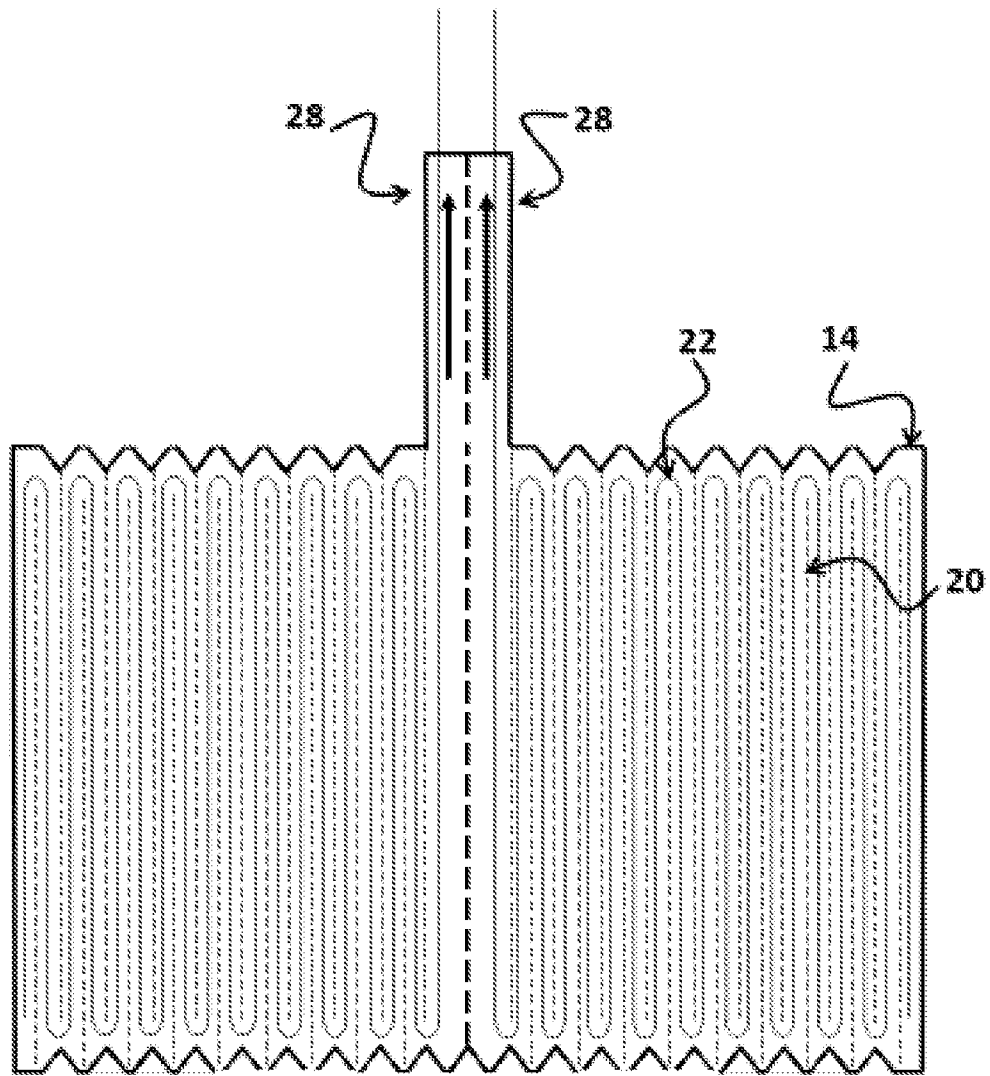


Fig. 10

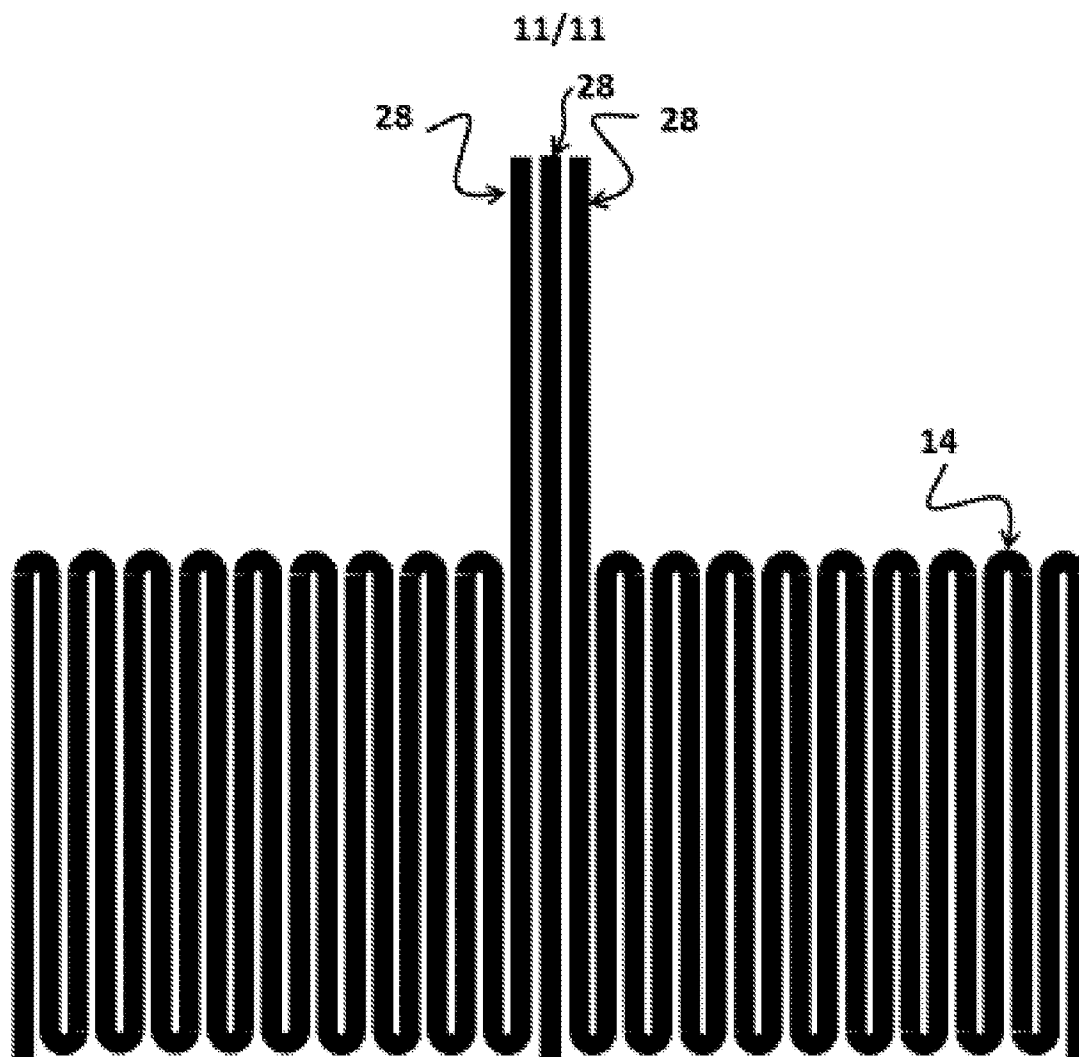


Fig. 11

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

Remove

Given Name

Middle Name

Family Name

City

State

Country j

Mario

Arturo

Mannheim Astete

Lima

PE

Inventor 2

Remove

Given Name

Middle Name

Family Name

City

State

Country j

Charles

S.

Voeltzel

Lima

PE

Inventor 3

Remove

Given Name

Middle Name

Family Name

City

State

Country j

Andres

Fernando

Sarmiento Santos

Lima

PE

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

Add

Title of Invention

Automotive Laminate With Improved Optics Made With Resin and Deformable Insert

Attorney Docket Number (if applicable)

1511.22500

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)	2017-09-14
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.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that : (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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.
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.

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	1511.22500
		Application Number	
Title of Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		
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	
	Mario	Arturo	Mannheim Astete		
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 1996				
Address 2	Cercado de Lima				
City	Lima	State/Province	PE		
Postal Code		Country ⁱ			

Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Charles	S.	Voeltzel		
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		

Inventor	3				Remove
Legal Name					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.22500
		Application Number	
Title of Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Andres	Fernando	Sarmiento Santos	
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	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add				

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	morales@moralesq.com	Add Email	Remove Email

Application Information:

Title of the Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		
Attorney Docket Number	1511.22500	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 ⁱ

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.22500
		Application Number	
Title of Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		

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.			
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)

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.22500
		Application Number	
Title of Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Add

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	1511.22500
		Application Number	
Title of Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		

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	1511.22500
		Application Number	
Title of Invention	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert		

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)	2017-09-14
First Name	Joseph	Last Name	Morales	Registration Number
			58835	

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

This collection of information is required by 37 CFR 1.76. 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 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
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).
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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.

Electronic Acknowledgement Receipt

EFS ID:	30361383
Application Number:	62558429
International Application Number:	
Confirmation Number:	6738
Title of Invention:	Automotive Laminate With Improved Optics Made With Resin and Deformable Insert
First Named Inventor/Applicant Name:	Mario Arturo Mannheim Astete
Customer Number:	130961
Filer:	Joseph L. Morales
Filer Authorized By:	
Attorney Docket Number:	1511.22500
Receipt Date:	14-SEP-2017
Filing Date:	
Time Stamp:	11:35:31
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$260
RAM confirmation Number	091417INTEFSW11430600
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Specification	13384.PDF	395130	no	29
			9ee9cd17b7d66661703b0ba8b8d3ada0d58e5a2d		
Warnings:					
Information:					
2	Provisional Cover Sheet (SB16)	13385.PDF	1477211	no	3
			cf44b9dd48da8ccab2dcf5fc30fa4574424cc307		
Warnings:					
Information:					
3	Application Data Sheet	13386.PDF	1819243	no	7
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Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29926	no	2
			5f66a3c01d643404635a052c5fb8ce60d20bb01ae		
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.