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September 04, 2018

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APPLICATION NUMBER: 62/669,716
FILING DATE: *May 10, 2018*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US62/669,716



Certified by

Andres Ibarra

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

Remove

Given Name

Middle Name

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City

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Country ;

Mario

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Mannheim Astete

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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 Acoustics

Attorney Docket Number (if applicable)

1511.26600

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

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Signature

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

Signature	Joseph L. Morales/			Date (YYYY-MM-DD)	2018-05-10
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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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.
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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.
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.26600
		Application Number	
Title of Invention	Automotive Laminate with Improved Acoustics		
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.)
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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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City	Lima	State/Province	PE		
Postal Code		Country ⁱ			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

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 Acoustics		
Attorney Docket Number	1511.26600	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.26600
		Application Number	
Title of Invention	Automotive Laminate with Improved Acoustics		

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.

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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	Filing Date (YYYY-MM-DD)
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Foreign Priority Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.26600
		Application Number	
Title of Invention	Automotive Laminate with Improved Acoustics		

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)	Access Code ⁱ (if applicable)

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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
--

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.26600
		Application Number	
Title of Invention	Automotive Laminate with Improved Acoustics		

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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.

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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	MMG Towe, Piso 23		
Address 2	Avenida paseo del Mar		
City	Panamá	State/Province	
Country	PA	Postal Code	
Phone Number		Fax Number	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.26600
		Application Number	
Title of Invention	Automotive Laminate with Improved Acoustics		
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			Add

Assignee Information including Non-Applicant Assignee Information:

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Assignee	1			
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.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
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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.				
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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)	2018-05-10
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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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1511.26600
		Application Number	
Title of Invention	Automotive Laminate with Improved Acoustics		

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.**

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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)).
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Title of the Invention

Automotive laminate with improved acoustics.

Abstract of The Disclosure

5 The thickness of automotive glazing has been steadily decreasing as the industry works to improve efficiency. One undesirable side-effect has been an increase in the noise level inside of the cabin. Thinner and lighter glazing attenuates less sound than the thicker heavier glazing replaced. A partial solution has been to replace thin monolithic tempered glazing with laminated glazing of a similar thickness. This is an effective
10 solution, especially when combined with a sound attenuating interlayer. However, the cost to produce lighter annealed laminates, which also require the addition of mounting brackets due to the lack of strength of annealed glass, is much higher than that of tempered parts. A lower cost laminate, with improved acoustics, is provided comprising a thin tempered outer glass layer laminated to an ultra-thin glass layer which extends to
15 below the belt line but not fully to the lower edge of the outer glass layer, allowing the use of conventional through hole fasteners normally used to mount tempered parts.

Inventors

Name	Nationality	Address
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Field of the Invention

The invention pertains to laminated automotive glazing.

Background of the Invention

In response to the regulatory requirements for increased automotive fuel efficiency as well as the growing public awareness and demand for environmentally friendly products, automotive original equipment manufacturers around the world have been working to improve the efficiency of their vehicles.

One of the key elements of this strategy to improve efficiency has been light weighting. Often, more traditional, less expensive, conventional materials and processes are being replaced by innovative new materials and processes which while sometime being more expensive, still have higher utility than the materials and processes being replaced due to their lower weight and the corresponding increase in fuel efficiency. Sometimes, the new materials and processes bring with them added functionality as well in addition to their lighter weight. Vehicle glazing has been no exception.

By reducing the weight of the vehicle substantial improvements can be made in energy consumption. This is especially important for electric vehicles where the improvement directly translates into an increase in the range of the vehicle which is a key consumer concern.

For many years, tempered glass has been used to all positions other than the windshield, where annealed laminated glass is required. Automotive tempered windows have typically had a thickness of 5 mm. In more recent years, we have seen the thickness decrease to as thin as 3.2 mm. While a reduction of 1.8 mm may not seem significant, at a density of 2500 kg per cubic meter for the typical standard soda-lime float glass, each millimeter that the thickness is reduced, decreases the weight by 2.5 kg per square meter. The weight of a vehicle requiring 3 square meters of glazing for the front and

rear doors, quarter windows and backlite going from 5 mm to 3.2 mm is reduced by 13.5 Kg.

In addition, the glazed area of vehicles has been steadily increasing. The popular large glass panoramic roofs and windshield are just one example of this trend. A panoramic
5 windshield is a windshield on which the top edge has been substantially extended such that it comprises a portion of the vehicle roof. Today, we have SUVs and other vehicles having a glazed area in excess of six square meters.

With the reduction in weight, there are some drawbacks. While many factors influence the transmission of sound, among the most important are density and mass. As density
10 and mass are reduced, the level of sound transmitted increases. As an automotive glazing is made thinner and lighter, sound attenuation is degraded with the reduction in mass. Density also comes into play with some glass compositions commonly used for chemical tempering that have a lower density than soda-lime glass.

The lower mass of the thinner lighter glass allows more sound to enter the passenger
15 compartment. Going from a 5 mm to a 3.2 mm in the front and rear doors has a noticeable and undesirable impact of the noise level inside of the vehicle.

One solution that has been found to be effective in reducing sound transmission is the use of laminated glazing. Sound attenuation increases when the energy encounters a change in the density of the material that it is passing through. The change in density,
20 going from glass to plastic to glass in a standard laminate, results in much better attenuation than in monolithic tempered glazing of the same thickness.

Laminates, in general, are articles comprised of multiple sheets of thin, relative to their length and width, material, with each thin sheet having two oppositely disposed major faces and typically of relatively uniform thickness, which are permanently bonded to one
25 and other across at least one major face of each sheet.

Laminated safety glass is made by bonding two sheets (201 & 202) of annealed glass 2 together using a plastic bonding layer comprised of a thin sheet of transparent thermos plastic 4 (interlayer) as shown in Figure 1.

Another solution used to offset the degradation in attenuation resulting from the use of
5 thinner and lighter glass, as well as to improve the attenuation of ordinary laminates, has been the use of acoustic interlayers in laminated glazing. Interlayers that can dampen sound, above and beyond the level of attenuation of a normal laminate, are comprised in whole or in part of a layer of plastic that is softer and more flexible than that normally used. A reduction of as much as 6 dB at certain frequencies is typical.

10 On a movable door glazing, it is typical to have multiple holes drilled through the glass near the bottom edge of glass (Figures 5A, 5B and 2C). These holes are used to mount the glazing to the window lifting mechanism. The through holes allow for simple and fast attachment during assembly. These through hole attachments are also very reliable.

15 When a tempered glazing is replaced with a laminated glazing, changes must be made to the design of the glazing due to the limitations of annealed glass.

One of the main problems that we have making annealed glass with holes 24 through the glass is that the holes 24 create weak spots which lead to breakage. Holes in glass are not made using the traditional material removal methods that are used with metals
20 and plastics. Glass is a brittle material. While it exhibits almost perfect elastic behavior it does not undergo plastic deformation under stress. Under stress, glass will bend but not deform unless it is pushed to the point of failure. Prior to that point, the glass will flex back to its original shape when the force is removed. As a result, it cannot be cut, drilled or otherwise worked by the same methods that are used for plastics, wood and
25 metals. The glass will shatter. Holes 24 need to be made by grinding away the glass. In addition, it is desirable to use two drill/grinding bits that meet in the middle of the glass thickness to avoid chipping that occurs when a single drill/grinding bit emerges through

the opposite side. This creates defects in the glass surface and in the walls of the hole which can lead also to breakage. The compressive state of the surface of a tempered glass part requires much higher level of stress to open up the surface defects and break and so is not subject to a high level of breakage. Therefore, holes are not practical on
5 laminated glass parts.

To mount door laminated glass, the glazing size must be decreased along the bottom edge to allow for mounting brackets **20** which bonded to the glass with an adhesive 8 (Figure 4A). The holes in the **brackets 20** take the place of the holes which would otherwise be drilled in the glass. Bonded on **brackets 20** have a tendency to fail at a
10 much higher rate than through bolt mounting systems due to degradation of the adhesive over time with exposure to heat, moisture, chemicals and UV which is transmitted through the thickness of the glass. The brackets 20 and the labor required to bond them to the glass add to the already higher cost of the laminate. Weight of a pair of brackets needed on a movable door glazing is around 0.8Kgs and 20% additional
15 to the glass weight. Pack density is also reduced increasing shipping and handling cost.

Some tempered sidelites are produced that do not have mounting holes drilled through them. On these a simpler lighter type of bracket than used on laminated parts is bonded to the edge of glass. On these types of parts, the brackets must often be reinforced to compensate for the lower glass strength when the tempered part is replaced with a
20 laminate.

To replace a 4 mm thick tempered part, a laminate comprising two 1.6 mm thick glass layers and an 0.76 mm thick layer of plastic interlayer is a common cross section. If a chemically tempered inner layer is used, a possible cross section would be a 2.1 mm outer glass layer, an 0.7 mm inner glass layer and an 0.76 mm plastic interlayer.

25 In either example, while the outer glass layer may be thermally strengthened, the outer glass layer is too thin to achieve a full temper and so is not suitable for mounting holes to be used. As a result, the bottom portion of the glazing must be made smaller to allow

for mounting brackets **20** to be bonded to the glazing in place of the holes that would otherwise have been drilled in a tempered part.

Another drawback of thinner laminated glazing is Stiffness. This problem is even greater on frame-less doors and when the user operates the window at high speed. 20-30mm
5 deflection has been seen above 200Kms/hr. To reduce this effect on thin laminates, heavier brackets and expensive adhesives are used on movable door glazing.

Although inner- and outer glass would run directly after each other during the bending process, both glass layers are not perfectly parallel, thus there are bending tolerances.

With press bending an average of +/- 0.75mm is currently standard and the best in its
10 class throughout the whole surface. This is the main reason why a 0.76mm PVB interlayer is used assuring a good long lasting bonding between the glass layers.

It would be desirable to provide a lower cost solution that had the acoustic attenuation of a laminate.

Brief Summary of the Invention

15 Rather than laminating two thin glass layers together or producing a monolithic full tempered glazing a hybrid cross section is utilized. The hybrid has two glass layers. The outer glass layer is comprised of a fully tempered glass layer. The inner glass layer is comprised of a thin glass layer which has a lower edge **22** that extends to below the belt line but does not extend fully to the edge of the outer glass layer.

20 The beltline **28** is the line formed by the lower visible edge of the vehicle glazing. The beltline of the vehicle front and rear doors is the portion where the door window seals come into contact with the glass. The portion of the door glazing that is below the beltline is not visible.

As the glazing is essentially a standard tempered part below the beltline **28** conventional through holes may be drilled and standard mounting hardware can be used. No brackets **20** are required. The section above the belt line provides all of the same acoustic benefits of a laminate. An acoustic interlayer **4** may be used to further improve the sound attenuation. In addition, all of the coatings, films, interlayers and glass compositions available in the art may also be used to provide for various other functionality.

Due to the use of a tempered outer layer of glass, in combination with a laminated inner glass layer, a higher level of durability and safety is also provided by the invention.

- 10 The inner glass layer may be chemically strengthened. The inner glass layer may also be thermally bent or cold bent to its final shape. A cold bent inner glass layer doubles the bent glass capacity of the line.

Benefits:

Cold bent inner layer doubles bending capacity.

- 15 Can be produced using standard automotive glass equipment and processes.

Better acoustic attenuation than a tempered glass part.

As compared to a standard laminated glazing:

- Lower cost
- 20 • Lower weight
- Mounting brackets not required
- Lower assembly cost
- Greater stiffness
- Less subject to damage

- Less subject to breakage
 - Higher pack density
 - Lower shipping and handling cost
 - Higher impact resistance
- 5 • Better acoustic attenuation

10 **Brief Description of the Several Views of the Drawings**

1A	Cross section: typical automotive laminate
1B	Cross section: typical automotive laminate with film and coating
1C	Cross section: typical automotive tempered glazing
2A	Cross section A: sidelite with improved acoustics
2B	Cross section B: laminated sidelite of the prior art.
2C	Cross section C: tempered sidelite of the prior art.
3A	Sidelite with improved acoustics: right view
3B	Sidelite with improved acoustics: exploded view
4A	Laminated sidelite of the prior art: right view
4B	Laminated sidelite of the prior art: exploded view
5A	Tempered sidelite of the prior art: right view
5B	Tempered sidelite of the prior art: iso view

Reference Numerals of Drawings

2	Glass
4	Plastic Interlayer

6	Obscuration
8	Adhesive
12	Film
18	Coating
20	Bracket
22	Edge of glass
24	Hole
28	Beltline
101	Surface one
102	Surface two
103	Surface three
104	Surface four
201	Outer glass layer
202	Inner glass layer

Detailed Description of the Invention

The following terminology is used to describe the laminated glazing of the invention.

Typical automotive laminated glazing cross sections are illustrated in Figures 1A and 1B.

- 5 A 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). In a laminate, 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
- 10 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. An obscuration 6 may be also applied to the glass. Obscurations are commonly comprised of black enamel frit printed on either the number two 102 or number four surface 104

or on both. The laminate may have a coating 18 on one or more of the surfaces. The laminate may also comprise a film 12 laminated between at least two plastic layers 4.

Figure 1C shows a typical tempered automotive glazing cross section. Tempered glazing is typically comprised of a single layer of glass 201 which has been heat strengthened.

5 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 glass layer 201, the interior surface of the glass, is surface two 102 or the number two surface. The number two surface 102 of a tempered glazing is on the interior of the vehicle. An obscuration 6 may be also applied to the glass. Obscurations are commonly comprised of black enamel frit printed
10 on the number two 102 surface. The glazing may have a coating 18 on the number one 101 and /or number two 102 surface.

The term “glass” can be applied to many organic and inorganic materials, include many that are not transparent. For this document we will only be referring to nonorganic transparent glass. From a scientific standpoint, glass is defined as a state of matter
15 comprising a non-crystalline amorphous solid that lacks the ordered molecular structure of true solids. Glasses have the mechanical rigidity of crystals with the random structure of liquids.

Glass is formed by mixing various substances together and then heating to a temperature where they melt and fully dissolve in each other, forming a forming a
20 miscible homogeneous fluid.

Most of the worlds’ flat glass is produced by the float glass process, first commercialized in the 1950s. In 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
25 at which the molten glass is drawn from the vessel. As the glass cools and hardens, the glass ribbon transfers to rollers. Float glass thickness can typically vary by +/-50 um over a short distance due to what is known as draw line distortion. This is caused by the

mechanical means used to draw the molten glass extruded from the vessel into a thin ribbon on the flat glass float line.

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
5 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 as infrared reflecting and other types of coatings.

Most of the glass used for containers and windows is soda-lime glass. Soda-lime glass is
10 made from sodium carbonate (soda), lime (calcium carbonate), dolomite, silicon dioxide (silica), aluminum oxide (alumina), and small quantities of substances added to alter the color and other properties.

Borosilicate glass is a type of glass that contains boric oxide. It has a low coefficient of thermal expansion and a high resistance to corrosive chemical. It is commonly used to
15 make light bulbs, laboratory glassware, and cooking utensils.

Aluminosilicate glass is made with aluminum oxide. It is even more resistant to chemicals than borosilicate glass and it can withstand higher temperatures. Chemically tempered Aluminosilicate glass is widely used for displays on smart phones and other electronic devices.

20 A wide range of coatings, used to enhance the performance and properties of glass, are available and in common use. These include but are not limited to anti-reflective, hydrophobic, hydrophilic, self-healing, self-cleaning, anti-bacterial, anti-scratch, anti-graffiti, anti-fingerprint and anti-glare.

Methods of application include Magnetron Sputtered Vacuum Deposition (MSVD) as well as others known in the art that are applied via pyrolytic, spray, controlled vapor deposition (CVD), dip, sol-gel and other methods.

5 Most coatings fall into one of two groups: hard coats and soft coats. Hard coats are durable and can be exposed to weather and touch. Soft coats are easily damaged by touch and exposure. Soft coats are generally protected by applying to one of the enclosed surfaces of an insulated glass unit or, in a laminate, to one of the major faces adjacent to the plastic bonding layer.

10 The glass layers are formed using gravity bending, press bending, cold bending or any other conventional means known in the art. In the gravity bending process, the flat glass is supported near the edge of glass and then heated. The hot glass sags to the desired shape under the force of gravity. With press bending, the flat glass is heated and then bent on a full or partial surface mold. Air pressure and vacuum are often used to assist the bending process. Gravity and press bending methods for forming glass are well known in the art and will not be discussed in detail in the present disclosure.

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 thermoset plastic.

20 For automotive use, the most commonly used bonding layer 4 (interlayer) is polyvinyl butyral (PVB). PVB has excellent adhesion to glass and is optically clear once laminated. It is produced by the reaction between polyvinyl alcohol and n-butyraldehyde. PVB is clear and has high adhesion to glass. However, PVB by itself, it is too brittle. Plasticizers must be added to make the material flexible and to give it the ability to dissipate energy over the temperature range required for an automobile. Only a small number of plasticizers are used. They are typically linear dicarboxylic esters. Two in common use are di-n-hexyl adipate and tetra-ethylene glycol di-n-heptanoate. A typical automotive PVB interlayer is comprised of 30-40% plasticizer by weight.

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. Automotive interlayers are made by an extrusion process which has a thickness tolerance and process variation. As a smooth surface tends to stick to the glass, making it difficult to position on the glass and to trap air, to facilitate the handling of the plastic sheet and the removal of air (deairing) from the laminate, the surface of the plastic is normally embossed contributing additional variation to the sheet. Standard thickness for automotive PVB interlayer is 0.76 mm (30 mil) due to the curvature tolerances between the two glass layers. For special triple interlayer stacks usually with PET in between, two PVB interlayers of 0.38mm (15 mil) can be used.

Interlayers are available with enhanced 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. A standard automotive PVB interlayer will have a typical glass transition temperature of ~20 C whereas an acoustic PVB may have one as low as 0 C. At normal laminate assembly room temperatures (< 20 C), an acoustic PVB interlayer can be difficult to work with. They tend to be very soft, limp and sticky making them difficult to handle and to position on the glass as the laminate is assembled. Lower than normal assembly room ambient temperatures are needed to assemble laminates that comprise these types of monolithic acoustic PVBs. To address this disadvantage, many triple layer interlayer products have been introduced. In the triple layer product, the softer material is sandwiched between two thin layers of the normal PVB material. The overall thickness remains like that of an ordinary PVB interlayer. Handling is like ordinary PVB interlayer.

The interlayer may also be of a type which has solar attenuating properties.

A wide variety of films are available that can be incorporated into a laminate. The uses for these films include but are not limited to: solar control, variable light transmission,

increased stiffness, increased structural integrity, improved penetration resistance, improved occupant retention, providing a barrier, tint, providing a sunshade, color correction, and as a substrate for functional and aesthetic graphics. The term “film” shall include these as well as other products that may be developed or which are
5 currently available which enhance the performance, function, aesthetics or cost of a laminated glazing. Most films do not have adhesive properties. To incorporate into a laminate, sheets of plastic interlayer are needed on each side of the film to bond the film to the other layers of the laminate.

Automotive glazing often makes use of heat absorbing glass compositions to reduce the
10 solar load on the vehicle. While a heat absorbing window can be very effective the glass will heat up and transfer energy to the passenger compartment through convective transfer and radiation. A more efficient method is to reflect the heat back to the atmosphere allowing the glass to stay cooler. This is done using various infrared reflecting films and coatings. Infrared coatings and films are generally too soft to be
15 mounted or applied to a glass surface exposed to the elements. Instead, they must be fabricated as one of the internal layers of a laminated product to prevent damage and degradation of the film or coating.

One of the big advantages of a laminated window over a tempered monolithic glazing is that a laminate can make use of infrared reflecting coatings and films in addition to
20 heat absorbing compositions and interlayers.

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 (CVD), dip and other methods.

25 Infrared reflecting films include both metallic coated plastic substrates as well as organic based non-metallic optical films which reflect in the infrared. Most of the infrared

reflecting films are comprised of a plastic film substrate having an infrared reflecting layered metallic coating applied.

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 also helps to prevent penetration by objects striking the laminate from the exterior and in the event of a crash occupant retention is improved.

The glass layers of a laminate may be annealed or strengthened. There are two processes that can be used 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.

Heat strengthened, full temper soda-lime float glass can be used in all vehicle positions other than the windshield.

Heat strengthened (tempered) glass has a layer of high compression on the outside surfaces of the glass, balanced by tension on the inside of the glass which is produced by the rapid cooling of the hot softened glass. When tempered glass breaks, the tension and compression are no longer in balance and the glass breaks into small beads with dull edges. For glass to be considered heat strengthened, this compressive stress on the surface of the glass should be a minimum of 69 megapascals (10,000 psi). For it to be considered safety glass, the surface compressive stress should exceed 100 megapascals (15,000 psi).

Tempered glass is much stronger than annealed laminated glass. The thickness limits of the typical automotive heat strengthening process are in the 3.0mm to 3.6 mm range.

This is due to the rapid heat transfer that is required. It is not possible to achieve the high surface compression needed with thinner glass using the typical blower type low pressure air quenching systems.

5 In the chemical tempering process, ions in and near the outside surface of the glass are exchanged with ions that are larger. This places the outer layer of glass in compression. Compressive strengths of up to 1,000 MPa are possible. The typical methods involved submerging the glass in a tank of molten salt where the ion exchange takes place. The glass surface must not have any paint or coatings that will interfere with the ion exchange process.

10 Cold bending is a relatively new technology. As the name suggest, the glass is bent, while cold to its final shape, without the use of heat. On parts with minimal curvature a flat sheet of glass can be bent cold to the contour of the part. 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-
15 term probability of breakage. Thin sheets of annealed 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 can 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.

20 Cylindrical shapes can be formed with a radius in one direction of less than 4 meters. Shapes with compound bend, that is curvature 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 and the types and thicknesses of the substrates.

25 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 must 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.

The glass to be cold bent is placed with a bent to shape layer and with a bonding layer placed between the glass to be cold bent and the bent glass layer. 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 in 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. 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, except for having an unbent glass layer added to the stack of glass. As this ultra thin inner glass layer (0.5mm to 0.7mm) is highly flexible and accommodates well to the thicker outer glass layer, a thinner 0.38mm interlayer PVB can be used without compromising durability.

Description of Embodiments

The various embodiments of the invention are illustrated generically in Figures 2A, 3A and 3B. The actual size and shape of each configuration may be varied to fit a specific vehicle design and position without departing from the nature of the invention.

Embodiment 1: A laminated automotive glazing for the front door of a vehicle is provided. The laminate has compound curvature with a horizontal radius of 12 meters and a vertical radius of 8 meters. The outer glass layer 201 is comprised of a 3.0 mm thick solar green heat absorbing composition. The outer glass layer 201 is thermally strengthened to achieve a full temper and also has two 12 mm holes 24, located near

the bottom edge, that are used to mount the laminate in the window mechanism used to raise and lower the laminate. The inner glass layer 202 is comprised of a 0.55 mm thick aluminosilicate glass which has been bent to shape and then chemically tempered. The bottom edge of the inner glass layer 202 ends 12 mm below the beltline **28** and does not have holes. The two layers 201, 202 are laminated together by means of a sheet of 0.76 mm thick clear PVB interlayer 4 using a standard automotive lamination process.

Embodiment 2: A laminated automotive glazing for the front door of a vehicle is provided. The laminate has compound curvature with a horizontal radius of 10 meters and a vertical radius of 6 meters. The outer glass layer 201 is comprised of a 4.0 mm thick solar green heat absorbing composition. The outer glass layer 201 is thermally strengthened to achieve a full temper and also has two 12 mm holes 24, located near the bottom edge, that are used to mount the laminate in the window mechanism used to raise and lower the laminate. The inner glass layer 202 is comprised of a 0.55 mm thick aluminosilicate glass which has been bent to shape and then chemically tempered. The bottom edge of the inner glass layer 202 ends 12 mm below the beltline **28** and does not have holes. The two layers 201, 202 are laminated together by means of a sheet of 0.76 mm thick clear PVB interlayer 4 using a standard automotive lamination process.

Embodiments 3 & 4: The hybrid laminates of embodiments 1 & 2 are produced wherein the inner glass layer 202 is cold bent.

Embodiments 5, 6, 7 & 8: The hybrid laminates of embodiments 1, 2, 3 & 4 are produced wherein an acoustic interlayer 4 is used.

Embodiments 9, 10, 11 & 12: The hybrid laminates of embodiments 1, 2, 3 & 4 are produced wherein a 0.38mm thick clear interlayer 4 is used.

Embodiments 13, 14, 15 & 16: The hybrid laminates of embodiments 1, 2, 3 & 4 are produced with no holes. Brackets are bonding to the glass.

Claims

What is claimed is:

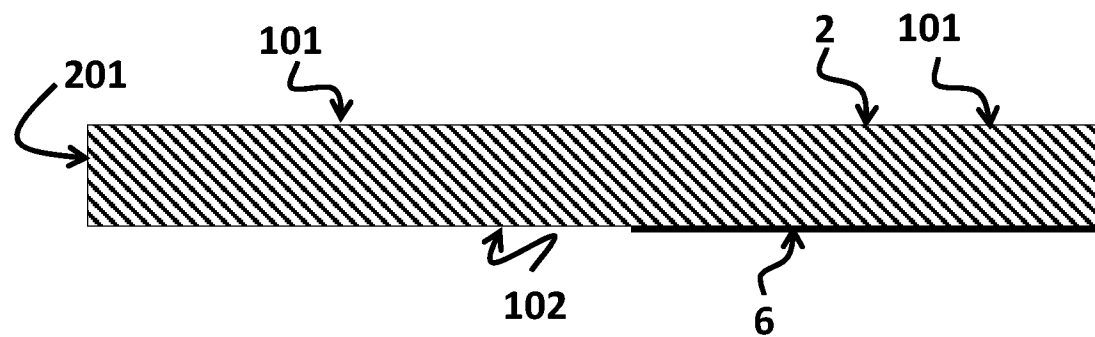
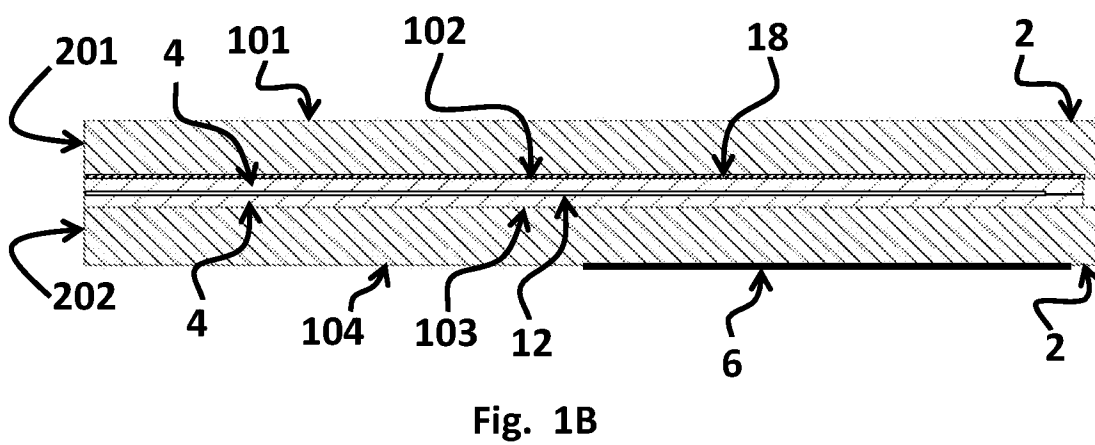
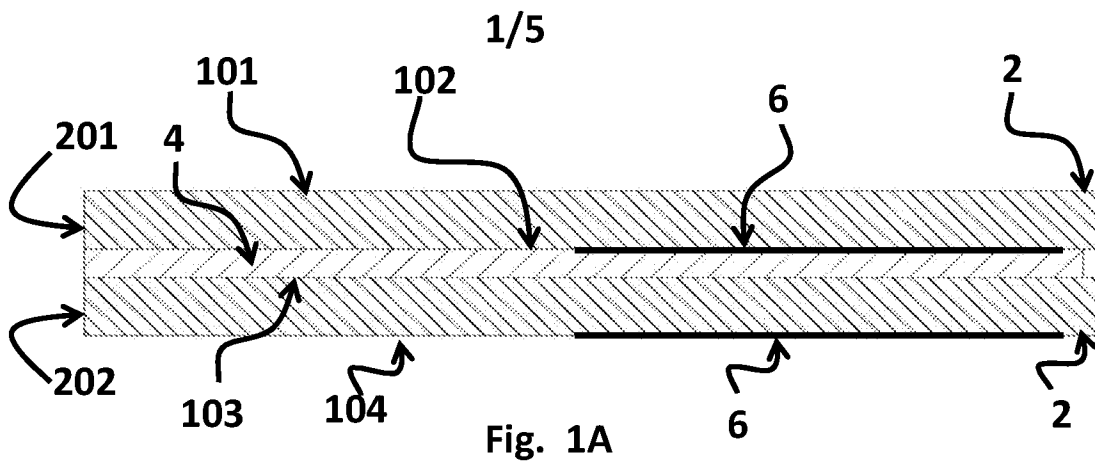
- 5 1. A hybrid automotive laminate comprising:
 - a. an inner glass layer,
 - b. an outer glass layer,
 - c. and at least one plastic interlayer,
 - d. wherein the inner glass layer
 - 10 i. is strengthened,
 - ii. is thinner than the outer glass layer,
 - iii. has a surface area less than that of the outer glass layer,
 - iv. has a lower periphery edge wherein the edge
 1. extends to at least the belt line
 - 15 e. wherein the outer glass layer
 - i. is tempered,
 - ii. has a lower periphery edge that extends beyond the lower periphery edge of the inner glass layer,
- 20 2. The hybrid automotive laminate of claim 1, wherein the surface of the outer glass layer between the beltline and its peripheral lower edge is partially covered by the inner glass layer and the surface above the beltline is completely covered.
3. The hybrid automotive laminate of claim 1 wherein the outer glass layer further comprises at least one hole.
4. The hybrid automotive laminate of claim 1 wherein the outer glass layer has a
 - 25 full temper with a compression level above 90Mpa.
5. The hybrid automotive laminate of claim 1 wherein the outer glass layer is less than 5 mm in thickness.

6. The hybrid automotive laminate of claim 1 wherein the inner glass layer is chemically tempered.
7. The hybrid automotive laminate of claim 1 wherein the inner glass layer is less than 1.2 mm in thickness.
- 5 8. The hybrid automotive laminate of claim 1 wherein the inner glass layer is cold bent.
9. The hybrid automotive laminate of claim 1 wherein the inner glass layer has a lower edge that end just below that beltline.
- 10 10. The hybrid automotive laminate of claim 3 wherein the inner glass layer does not overlap said at least one hole in the outer glass layer.
11. The hybrid automotive laminate of claim 1 wherein one of said at least one plastic interlayer is of a thickness between 0.38mm and 0.85mm.
12. The hybrid automotive laminate of claim 1 wherein one of said at least one plastic interlayer is an acoustic interlayer.
- 15 13. The hybrid automotive laminate of claim 1 further comprising at least one performance film.
14. The hybrid automotive laminate of claim 1 further comprising at least one coating.
- 20 15. The hybrid automotive laminate of claim 1 wherein the laminate does not have holes.

25 **Keywords**

Laminate, tempered, cold bent, chemically tempered, sidelite, annealed

References



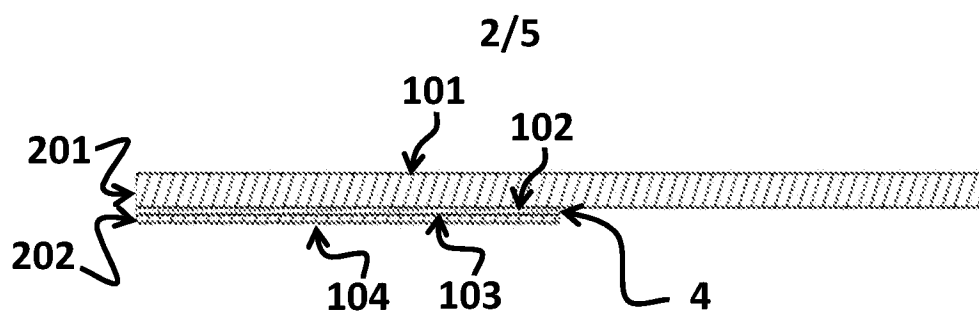


Fig. 2A

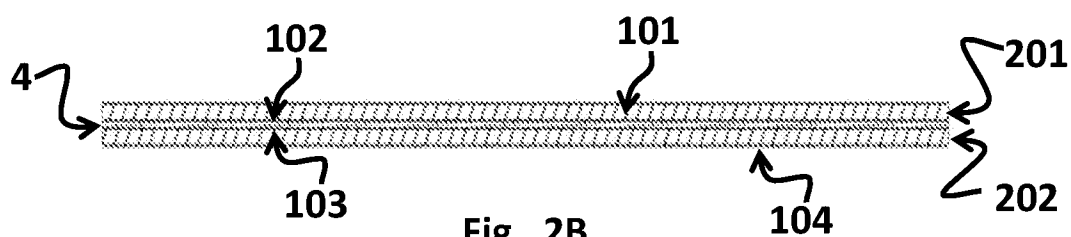


Fig. 2B

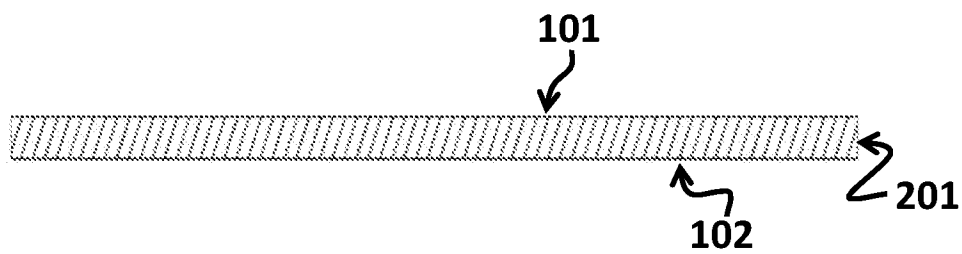


Fig. 2C

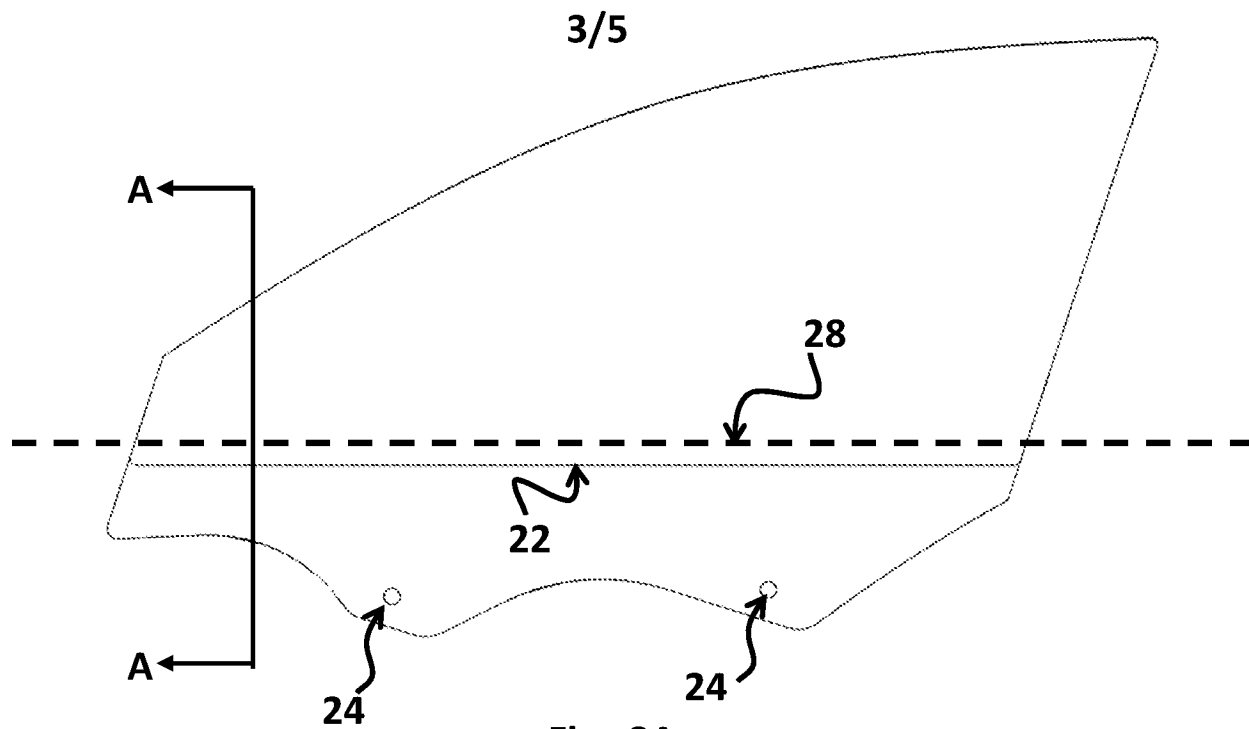


Fig. 3A

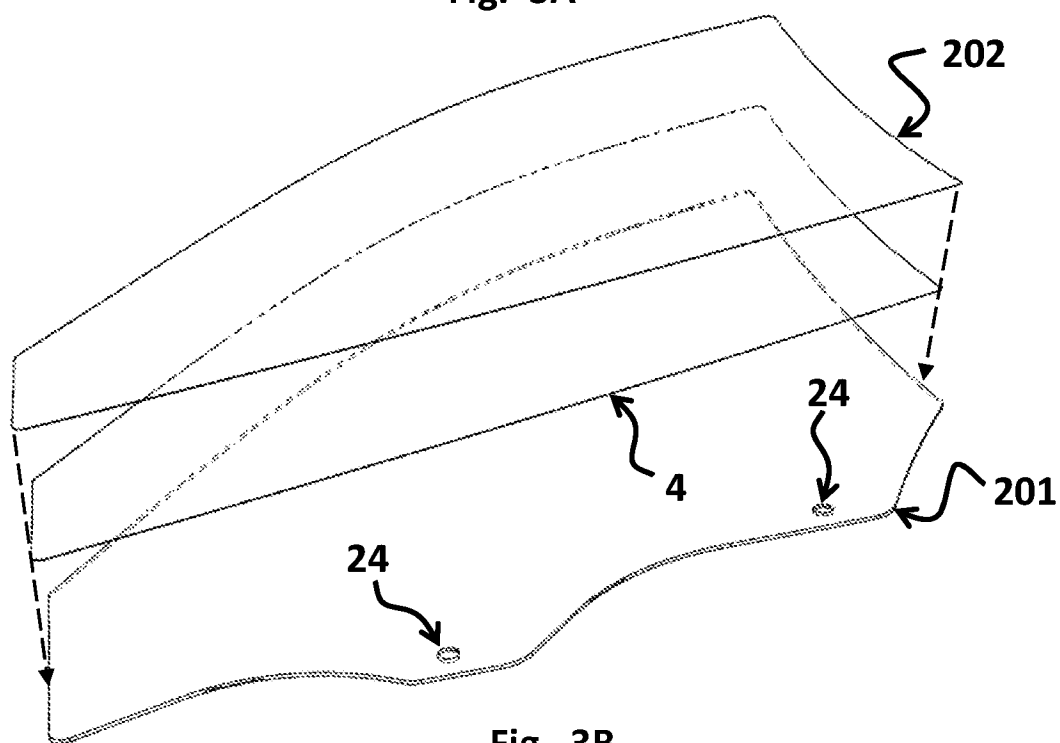


Fig. 3B

4/5

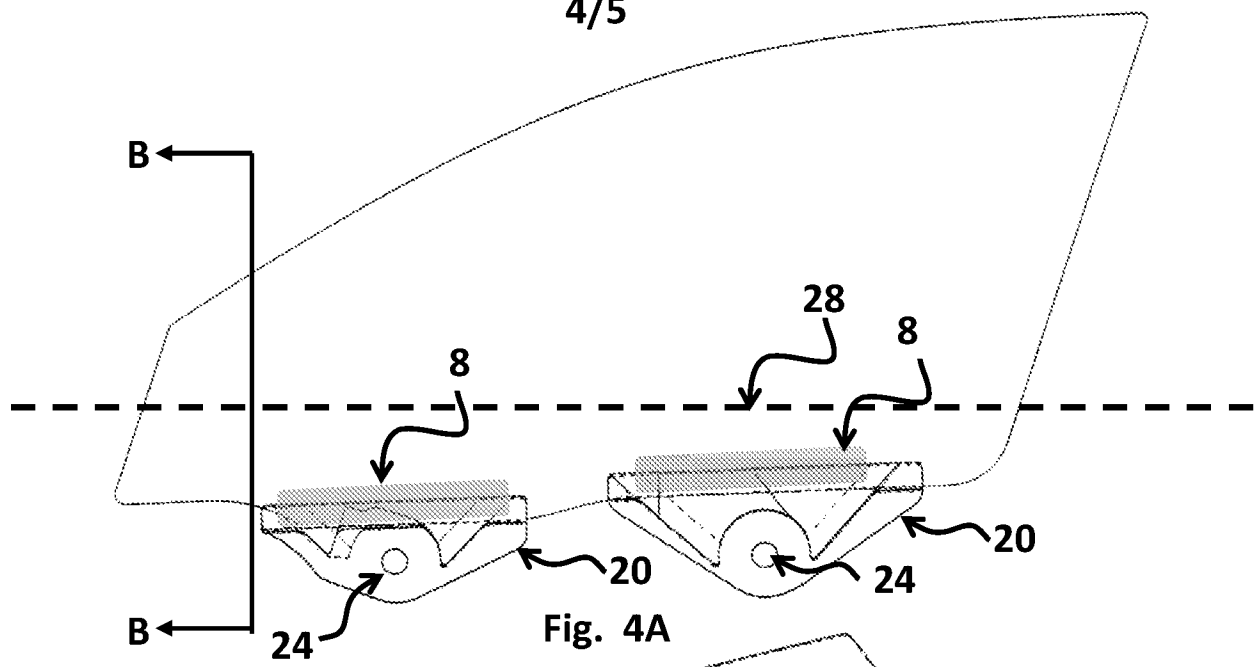


Fig. 4A

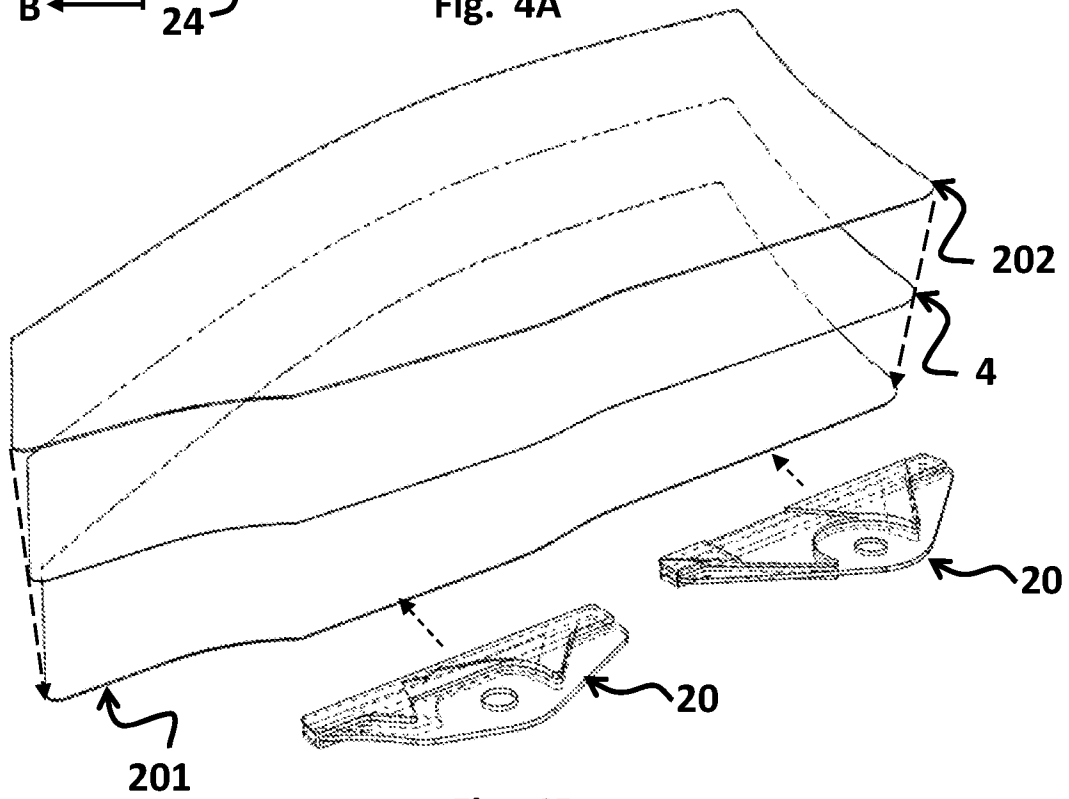


Fig. 4B

5/5

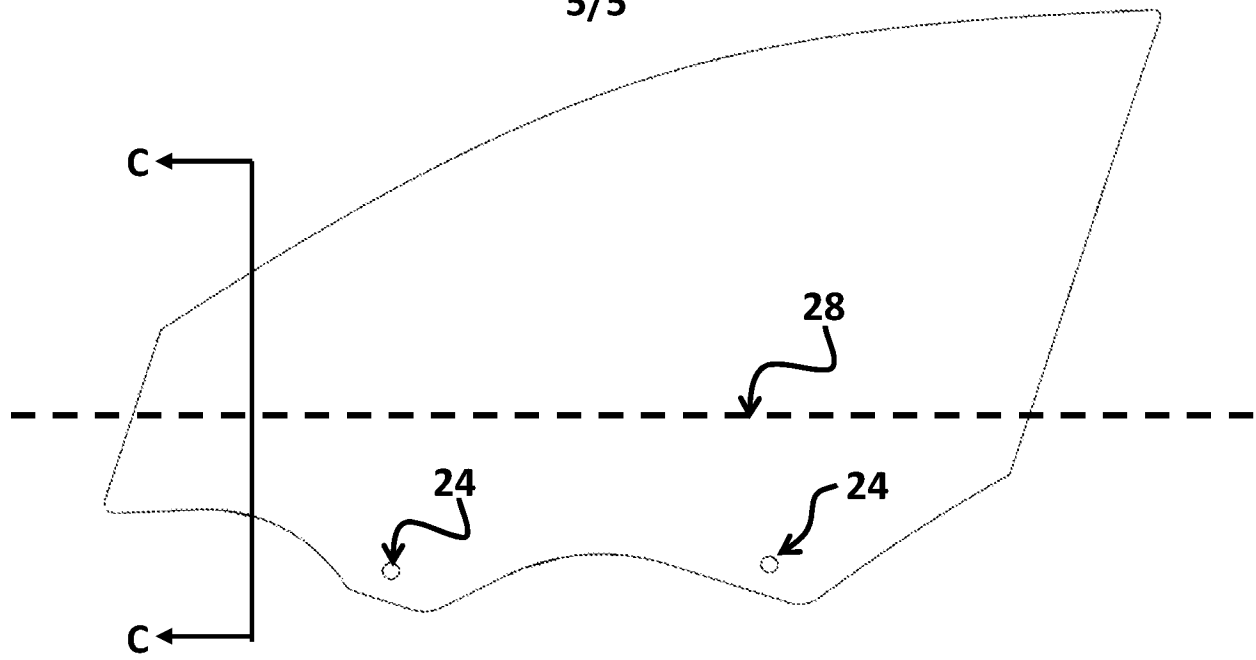


Fig. 5A

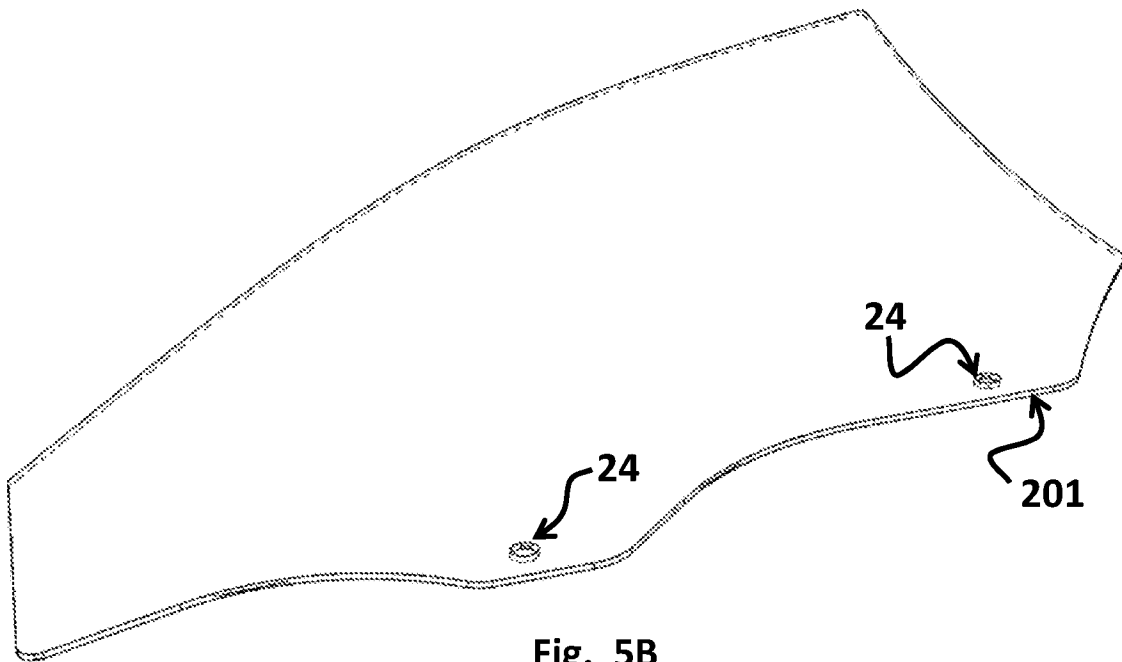


Fig. 5B

Electronic Acknowledgement Receipt

EFS ID:	32592534
Application Number:	62669716
International Application Number:	
Confirmation Number:	4868
Title of Invention:	Automotive Laminate with Improved Acoustics
First Named Inventor/Applicant Name:	Mario Arturo Mannheim Astete
Customer Number:	130961
Filer:	Joseph L. Morales
Filer Authorized By:	
Attorney Docket Number:	1511.26600
Receipt Date:	10-MAY-2018
Filing Date:	
Time Stamp:	16:30:29
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$280
RAM confirmation Number	051118INTEFSW16312500
Deposit Account	
Authorized User	

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File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	15528.PDF	1477163	no	3
			0025fc9fea8ec300df52ccaa5f78622351e504c		
Warnings:					
Information:					
2	Application Data Sheet	15529.PDF	1819072	no	7
			df40068b7e3f1b1db84bb1889c12c4520a607021		
Warnings:					
Information:					
3	Specification	15527.PDF	176704	no	21
			d700dd471e5b987762e292f90b55ce4e1bd3c3c30		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	15524.PDF	472465	no	5
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5	Fee Worksheet (SB06)	fee-info.pdf	29792	no	2
			56fbc52d3d7ee7622efe3ec657f75b202783659e		
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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.

ASSIGNMENT

CESION

MARIO ARTURO MANNHEIM ASTETE

by means of this document assign(s) worldwide,
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nivel mundial, a

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(nuestra) invención tal como describe en:

LAMINADO AUTOMOTRIZ CON ACÚSTICA MEJORADA

AUTOMOTIVE LAMINATE WITH IMPROVED ACOUSTICS

Place, date and signature

Mario Arturo MANNHEIM ASTETE

Lima, 17 Agosto 2018.

Lugar, fecha y firma

Señores

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIRECCIÓN DE NUEVAS CREACIONES

E. _____ S. _____ D. _____

Re: Expediente No. NC2018/0007153

**Solicitud de Patente de Invención Titulada: “LAMINADO AUTOMOTRIZ
CON ACÚSTICA MEJORADA”**

Solicitante: AGP AMERICA S.A.

Nuestra Ref.: P2018/000129

RESPUESTA AL OFICIO No. 8689, NOTIFICADO EL DÍA 18 DE JULIO DE 2018
(EXAMEN DE FORMA)

CARLOS R. OLARTE, mayor de edad y vecino de Bogotá, identificado tal como aparece al pie de mi firma, en mi carácter de apoderado de la sociedad solicitante, me permito manifestar lo siguiente ante el auto emanado por ese Despacho, dentro del plazo legal previsto en el artículo 39 de la Decisión 486 en los siguientes términos:

1. a- El Examinador solicita allegar el documento de cesión de derechos de los inventores al solicitante.
- b- Me permito adjuntar al presente memorial la respectiva copia del documento de cesión.

2. a- El Examinador señala que se debe presentar dentro de los nueve meses siguientes contados a partir de la fecha de presentación de la solicitud, la copia certificada de la prioridad.

b- Considero superada la anterior objeción en tanto que se adjunta al presente escrito la copia de prioridad.

3. Por lo anterior, considero que la objeción presentada por la Examinadora en su examen de forma ha sido resuelta y por consiguiente solicito respetuosamente que el Despacho tenga por cumplidos los requisitos de forma y proceda con la publicación de la solicitud de acuerdo con el artículo 40 de la Decisión 486.

Atentamente,



CARLOS R. OLARTE

C.C. No. 79.782.747 de Bogotá

T.P. 74.295

Anexos:

- Copia documento de cesión;
- Copia del documento de prioridad.