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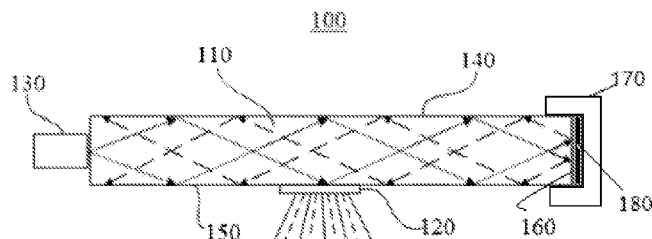


FIG.2

(57) Abstract: The present disclosure provides a glass assembly and a window assembly. The glass assembly comprises a light guiding component comprising a glass body and having a first surface and a second surface arranged oppositely, wherein incident light entering the light guiding component is capable of being totally reflected and transmitted between the first surface and the second surface; a light-emitting structure located in the light guiding component or arranged on the first surface or the second surface, and leading the incident light out from the second surface; a sealing component surrounding circumferential edge of the light guiding component, wherein one side of the sealing component facing the circumferential edge of the light guiding component is at least partially provided with a reflective layer or the sealing component comprises reflective material to increase the reflection of the incident light inside the light guiding component. The glass assembly of the present disclosure can especially reduce the loss of light brightness at the circumferential edge of the glass assembly on the premise of basically not affecting the performance and aesthetics of the glass itself, so that the luminous effect is effectively enhanced and the user experience is improved.

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GLASS ASSEMBLY AND WINDOW ASSEMBLY

FIELD

The present disclosure relates to the technical field of glass, in particular to a glass assembly integrated with luminous function and enhanced luminous effect, and a window assembly using the glass assembly.

BACKGROUND

With the rapid development of automobile industry and the increasing demand of consumers for vehicle functions, a glass with luminous function has been widely valued by vehicle manufacturers and favored by the consumers. Generally, the glass with luminous function forms a pattern area by laminating a microstructure film layer into the glass, or micro-carving or applying luminous enamel or ink on the surface of the glass based on pattern design. After incident light emitted by a light source arranged on the surface or side of the glass or integrated in the glass is totally reflected in the glass and projected to the pattern area, the light is scattered or diffused and passes through the pattern area due to the change of the surface structure, thus achieving different luminous effects.

Although the light can be totally reflected and transmitted in the glass, it is easy to transmit from the edge of the glass when being transmitted to the edge of the glass, which will not only produce unexpected peripheral bright stripes on the edge of the glass to affect the visual comfort, but also cause the loss of light brightness due to the failure to make full use of the light emitted by the light source, and cannot achieve satisfactory luminous effect. Therefore, how to improve the utilization rate of the light source has become one of the keys to improve the luminous effect of luminous glass.

SUMMARY

The purpose of the present disclosure is to provide a glass assembly with enhanced luminous function, which can reduce or completely eliminate the scattering or diffusion of the incident light at the edge of the glass by combining a reflective layer arranged on a sealing component or combining a sealing component with reflectivity, thereby improving the

utilization rate of the light source of the luminous glass, improving the product performance and enhancing the user experience.

To this end, according to one aspect of the present disclosure, a glass assembly is provided. The glass assembly comprises a light guiding component comprising a glass body and having a first surface and a second surface arranged oppositely, wherein incident light entering the light guiding component is capable of being totally reflected and transmitted between the first surface and the second surface; a light-emitting structure located in the light guiding component or arranged on the first surface or the second surface, and leading the incident light out from the second surface; a sealing component surrounding circumferential edge of the light guiding component, and one side of the sealing component facing the circumferential edge of the light guiding component being at least partially provided with a reflective layer to increase the reflection of the incident light inside the light guiding component.

By providing the reflective layer arranged on the sealing component or providing the sealing component with reflectivity, the glass assembly of the present disclosure prevents the loss of light at the edge of the glass, thereby effectively utilizing the incident light emitted by the light source, improving the luminous brightness and enhancing the comfort of the user. The reflective layer arranged on the sealing component or the sealing component with reflectivity is easy to implement, so that the glass assembly of the present disclosure has the beneficial effects of simple process, obvious performance improvement and the like.

According to another aspect of the present disclosure, a sealing component suitable for sealing circumferential edge of a light guiding component is provided. The sealing component comprises a receiving portion suitable for receiving the circumferential edge of the light guiding component, and one side of the receiving portion facing the circumferential edge of the light guiding component is at least partially provided with a reflective layer, or the sealing component comprises reflective material.

According to the above technical concept, the embodiment of the present disclosure may further include any one or more of the following alternative forms.

In some alternative forms, the reflective layer is bonded to the sealing component.

In some alternative forms, the reflective layer is a strip or a film layer bonded to the

sealing component by an adhesive or an adhesive tape with an adhesive layer to be bonded to the sealing component by the adhesive layer.

In some alternative forms, the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T1, and T1 is less than or equal to 1 N/mm, less than or equal to 0.5 N/mm, less than or equal to 0.1 N/mm, or equal to 0 N/mm.

In some alternative forms, the peeling strength of the reflective layer corresponding to the circumferential edge and the sealing component is T2, and T2 is greater than or equal to 10 N/mm, greater than or equal to 15 N/mm, greater than or equal to 20 N/mm, greater than or equal to 30 N/mm, greater than or equal to 40 N/mm, or greater than or equal to 50 N/mm.

In some alternative forms, the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T1, and the peeling strength between the reflective layer corresponding to the circumferential edge and the sealing component is T2, and T2-T1 is greater than or equal to 9 N/mm, greater than or equal to 15 N/mm, greater than or equal to 20 N/mm, greater than or equal to 30 N/mm, greater than or equal to 40 N/mm, greater than or equal to 50 N/mm.

In some alternative forms, the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T1, and the peeling strength between the reflective layer corresponding to the circumferential edge and the sealing component is T2, and the difference between T1 and T2 is less than or equal to 5 N/mm, or less than or equal to 1 N/mm.

In some alternative forms, the ratio of the area of the adhesive or the adhesive layer between the reflective layer and the circumferential edge of the light guiding component to the area of the reflective layer corresponding to the circumferential edge is less than 20%, less than 10%, less than 5%, less than 1%, or equal to 0%.

In some alternative forms, the reflective layer is a coating layer applied to the sealing component.

In some alternative forms, an adhesive or an adhesive layer is provided between the reflective layer and the circumferential edge of the light guiding component.

In some alternative forms, the reflective layer is continuously or dispersedly arranged on one side of the sealing component facing the circumferential edge of the light guiding

component, and the reflective layer is at least approximately flush with the first surface and/or the second surface.

In some alternative forms, the reflective layer is continuously or dispersedly arranged on one side of the sealing component facing the circumferential edge of the light guiding component, and the reflective layer extends to cover the first surface and/or the second surface.

In some alternative forms, the reflective layer is a single layer film or is formed by laminating multiple layers of films, wherein the materials or thicknesses of the multiple layers of films are the same or different from each other.

In some alternative forms, the material of the reflective layer comprises one or a combination of more of metal, metal oxide, nonmetallic oxide and organic polymer.

In some alternative forms, the metal comprises one or a combination of more of silver, aluminum, copper and gold; the metal oxide comprises titanium dioxide; the nonmetallic oxide comprises silicon dioxide; the organic polymer comprises one or a combination of more of polyester, polyvinyl chloride, polyurethane, thermoplastic elastomer, polypropylene, acrylonitrile butadiene styrene copolymer and polycarbonate.

In some alternative forms, the reflectivity of the reflective layer or the reflectivity of the reflective material is greater than or equal to 60%, greater than or equal to 70%, greater than or equal to 80%, greater than or equal to 85%, greater than or equal to 90%, greater than or equal to 95%, greater than or equal to 97%, or greater than or equal to 99%.

According to yet another aspect of the present disclosure, a glass assembly is provided. The glass assembly comprises a light guiding component comprising a glass body and having a first surface and a second surface arranged oppositely, wherein incident light entering the light guiding component is capable of being totally reflected and transmitted between the first surface and the second surface; a light-emitting structure located in the light guiding component or arranged on the first surface or the second surface, and leading the incident light out from the second surface; a sealing component surrounding circumferential edge of the light guiding component, and the sealing component comprising reflective material to increase the reflection of the incident light inside the light guiding component.

In some alternative forms, the reflective material comprises one or a combination of more of polyvinyl chloride (PVC), thermoplastic elastomer (TPE), polyurethane (PU), silicone,

ethylene propylene rubber (EPDM) and synthetic rubber modified polypropylene (PP-EPDM).

In some alternative forms, the reflectivity of the reflective material is greater than or equal to 60%, greater than or equal to 70%, greater than or equal to 80%, greater than or equal to 85%, greater than or equal to 90%, greater than or equal to 95%, greater than or equal to 97%, or greater than or equal to 99%.

In some alternative forms, the glass body is monolithic glass or laminated glass.

According to another aspect of the present disclosure, a window assembly is provided. The window assembly comprises the above glass assembly, wherein the window assembly comprises door, window, curtain wall, vehicle window glass, airplane glass or ship glass.

In some alternative forms, the window assembly is a vehicle window glass comprising front windshield, rear windshield, skylight glass, vehicle door glass or corner window glass, wherein the first surface of the light guiding component faces the outside of the vehicle and the second surface faces the inside of the vehicle.

According to the glass assembly of the present invention integrated with the reflective layer arranged on the sealing component or the sealing component with reflectivity, the loss of the light brightness at the circumferential edge of the glass assembly can be particularly reduced on the premise of basically not affecting the performance and aesthetics of the glass itself, so that the luminous effect is effectively enhanced and the user experience is improved. Through various combinations of different configurations of the edge of the glass body and different reflective layers or sealing components with reflectivity, the glass assembly of the present disclosure can be applied to various occasions to meet the diversified requirements of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the present disclosure will be better understood by the following alternative embodiments described in detail in conjunction with the accompanying drawings, in the drawings:

Fig. 1 is a schematic view of a light emitting mode of a glass assembly, in which incident light totally reflected in a light guiding component is led out through a light emitting structure;

Fig. 2 is a schematic view of a glass assembly according to an embodiment of the present

disclosure, in which the incident light totally reflected in a light guiding component is led out through a light-emitting structure after being reflected on the edge of the light guiding component and into the light guiding component again;

Fig. 3 is a schematic view of a glass assembly according to another embodiment of the present disclosure, in which the incident light totally reflected in a light guiding component is led out through a light-emitting structure after being reflected on the edge of the light guiding component and into the light guiding component again;

Fig. 4 is a schematic view of a glass assembly according to yet another embodiment of the present disclosure, in which the incident light totally reflected in a light guiding component is led out through a light-emitting structure after being reflected on the edge of the light guiding component and into the light guiding component again;

Figs. 5A to 5C are schematic views respectively showing different circumferential edge structures of the light guiding component.

DETAILED DESCRIPTION OF EMBODIMENTS

The implementation and use of the embodiments are discussed in detail below. However, it should be understood that the specific embodiments discussed merely exemplify the specific ways of implementing and using the present disclosure, and do not limit the scope of the present disclosure. When describing the structural positions of various components, such as the directions of upper, lower, top, bottom, etc., the description is not absolute, but relative. When the various components are arranged as shown in the figures, these directional expressions are appropriate, but when the positions of the various components in the figures would be changed, these directional expressions would also be changed accordingly.

In this context, the terms "first", "second" and so on are not used to limit the sequence and the number of components unless otherwise stated.

In this context, the meanings of "a plurality of" and "multiple layers" refer to two or more than two, unless otherwise specified.

In this context, "glass" is an amorphous inorganic nonmetallic material, which is generally made of a variety of inorganic minerals (such as quartz sand, borax, boric acid, barite, barium carbonate, limestone, feldspar, soda ash, etc.) as main raw materials, and a

small amount of auxiliary raw materials. Its main components are silica and other oxides. In the described embodiments, although it is shown as plane glass in the figures, the glass of the present disclosure may also be curved glass. In addition, in various embodiments, the light guiding component in the glass assembly is described as an independent glass body or glass plate. However, in some cases, the surface of the glass body can also use special coating layer or colloid to improve thermal insulation and/or comfort and/or provide other functional functions. Such coating layer or colloid can have refractive index similar to that of the glass body so as to constitute the light guiding component as a whole, and the glass body can also be a laminated glass to obtain diversified functions or effects.

Hereinafter, the glass assembly applied to a vehicle window glass will be described, but it does not exclude that the glass assembly can be applied to other environments such as door, window, curtain wall, airplane glass or ship glass. When the glass assembly is described as the vehicle window glass of a vehicle, "outside" and "inside" refer to the directions relative to vehicle body, "outside" refers to the direction away from the vehicle body and "inside" refers to the direction facing the vehicle body. It should be understood that the vehicle window glass according to the embodiment of the present disclosure includes, but is not limited to, front windshield, rear windshield, skylight glass, vehicle door glass or corner window glass, which can provide different luminous effects based on different requirements.

In the ever-changing automobile industry, a glass assembly with luminous effect (e.g., lighting effect, decorative effect, etc.) has been widely used in medium-to high-grade vehicles, such as vehicle skylights, which can not only achieve the effects of light intensity and/or color change, but also combine with coating layers and/or sandwiched structures to form illumination effects with different patterns.

Fig. 1 illustrates a glass assembly in a light emitting mode. A glass assembly 10 includes a glass body 11 having a first surface 14 and a second surface 15, a light-emitting structure 12 arranged on the second surface 15 of the glass body 11, and a light source 13. The light source 13 is, for example, a point or linear light source integrated inside the glass body 11, or a point or linear light source attached to the first surface or the second surface of the glass body in a manner of proximity, attachment, etc., or a light source attached to the circumferential edge of the glass body in a manner of proximity, attachment, etc., such as an LED light-emitting

strip. The light-emitting structure 12 can be any structure that changes the transmission angle of the light in the glass body 11 and leads the light out, for example, it can be a particle structure or a layer structure arranged in the glass body, or light-scattering particles arranged on the second surface 15 by mechanical structuring, laser engraving, embossing, etching or spraying, etc., so that the incident light emitted by the light source 13 into the glass body 11 emerges from the light-emitting structure 12 on the second surface 15 after being transmitted and totally reflected between the first surface 14 and the second surface 15, as shown by arrows in the figure. The light-emitting structure 12 may also be an enamel printed layer or an ink printed layer based on pattern design, and may be discontinuously arranged on the second surface 15 to generate different display patterns or display effects. When applied to the window glass of a vehicle, the first surface 14 faces the outside of the vehicle and the second surface 15 faces the inside of the vehicle, so that passengers in the vehicle can experience various luminous effects from the window glass. As the light is totally reflected in the glass body 11, as shown in Fig. 1, the light will scatter out of the glass body after being reflected to the edge of the glass body 11, which will not only lead to the loss of the brightness of the light required for the luminous effect, but also cause unexpected bright stripes at the edge of the glass body, which affects the visual comfort.

According to the concept of the present disclosure, the sealing component surrounding the circumferential edge of the light guiding component is at least partially provided with a reflective layer on one side facing the circumferential edge of the light guiding component or the sealing component surrounding the circumferential edge of the light guiding component comprises reflective material, so that the light totally reflected to the edge of the light guiding component is reflected back into the light guiding component, so as to reduce or basically completely prevent the light from diffusing or scattering from the edge of the light guiding component. The sealing component is used to surround the circumferential edge of the light guiding component, which can play the roles of sealing, shock absorption, sound insulation, waterproof or dustproof and so on. As an example, the material of the sealing component includes polyvinyl chloride (PVC), ethylene propylene diene monomer (EPDM), etc., which is made by extrusion molding or injection molding.

Specifically, as an embodiment shown in Fig. 2, a glass assembly 100 includes a glass

body 110 having a first surface 140 and a second surface 150, a light-emitting structure 120 arranged on the second surface 150 of the glass body 110, and a light source 130. It should be understood that any commercially available coating layers or films with equivalent functions or effects can be used as the above light-emitting structure. In addition, the number of layers, size and distribution of the light-emitting structure can be determined as required, and are not limited to those shown in the figure.

According to the present disclosure, a sealing component 170 surrounds circumferential edge 160 of the glass body 110, and one side of the sealing component 170 facing the circumferential edge 160 of the glass body 110 is provided with a reflective layer 180. As an example, in Fig. 2, the sealing component 170 surrounds the circumferential edge 160 of the glass body 110 and extends to cover the first surface 140 and the second surface 150, and the side of the sealing component 170 facing the circumferential edge 160 of the glass body 110 is provided with the reflective layer 180. As an example, the thickness of the sealing component 170 in Fig. 2 may be not more than 15mm or not less than 2mm, and the thickness of the reflective layer 180 may be 20-100 microns. The reflective layer 180 faces and attaches to the circumferential edge 160 of the glass body 110 to increase the reflection of the incident light emitted by the light source 130 inside the glass body 110. Ideally, after the light is reflected by the reflective layer at the circumferential edge of the glass body, the incident angle of the light relative to the first surface and/or the second surface will not change obviously, that is, the angle of total reflection and transmission in the glass body can still be maintained. Therefore, the circumferential edge of the glass body and the reflective layer need to be well matched to minimize the diffusion of the light at the circumferential edge. In addition, the reflective layer is at least approximately flush with the surface of the glass body to substantially completely block the light from transmitting out from the glass body. For example, in some embodiments, the reflective layer 180 is continuously or dispersedly arranged on the side of the sealing component 170 facing the circumferential edge 160 of the glass body 110 and at least approximately flush with the first surface 140 and/or the second surface 150. In some embodiments, the reflective layer 180 is continuously or dispersedly arranged on the side of the sealing component 170 facing the circumferential edge 160 of the glass body 110 and extends to cover the first surface 140 and/or the second surface 150,

thereby effectively and completely reflecting the light incident on the circumferential edge 160 back to the glass body 110.

The light source 130 may be arranged as a light source attached to the circumferential edge of the glass body 110 in a manner of proximity, attachment, etc., including but not limited to that shown in Fig. 2. At this time, the sealing component 170 may surround the entire circumferential edge of the glass body 110, and the light source 130 attached to the circumferential edge of the glass body 110 may also be surrounded in the sealing component, and the reflective layer 180 may be dispersedly arranged on the side of the sealing component 170 facing the circumferential edge of the glass body 110 where no light source is provided.

In some embodiments, the light source can be a point or linear light source integrated inside the glass body (for example, when the glass body is a laminated glass), or it can be a point or linear light source attached to the first surface or the second surface of the glass body in a manner of proximity, attachment, etc. At this time, the reflective layer 180 can surround the entire circumferential edge of the glass body, thereby improving the reflectivity and in turn improving the luminous effect. In some embodiments, the light source is preferably embedded in one or more openings in the glass body 110 arranged adjacent to the circumferential edge 160. Alternatively, the opening may be formed by, for example, drilling. In this way, the reflective layer can not only surround the entire circumferential edge of the glass body, but also make both monolithic glass and laminated glass obtain improved luminous effect with low cost and simplified structure. When the glass body has a polygonal structure, such as a quadrangle, the openings are advantageously arranged at corner positions.

As can be seen from Fig. 2, by arranging the reflective layer 180 on the side of the sealing component facing the circumferential edge of the glass body, the incident light emitted from the light source 130 transmits in the glass body 110 to the circumferential edge 160 through total reflection (for example, in the direction of the solid arrows), and then is reflected back to the glass body 110 through the reflective layer 180 for one or more reflections (as indicated by the dashed arrows), and is led out from the glass body 110 through the light-emitting structure 120. Because the light is reflected back to the glass body, it can repeatedly pass through the light-emitting structure, thus improving the utilization rate of the light source and increasing the brightness of the luminous glass.

As mentioned above, in Fig. 2, the sealing component 170 surrounds the circumferential edge 160 of the glass body 110 and extends to cover the first surface 140 and the second surface 150. The present disclosure is not limited to this arrangement. The sealing component 170 can also only extend to cover the second surface 150 and present an inverted L-shape. Specifically, Fig. 3 shows this embodiment.

As a variation of Fig. 2, in Fig. 3, a glass assembly 200 includes a glass body 210 having a first surface 240 and a second surface 250, a light-emitting structure 220 arranged on the second surface 250 of the glass body 210, and a light source 230. A sealing component 270 surrounds circumferential edge 260 of the glass body 210 and extends to cover the second surface 250. One side of the sealing component 270 facing the circumferential edge 260 of the glass body 210 is provided with a reflective layer 280. As an example, the thickness of the sealing component 270 in Fig. 3 may be not more than 15mm or not less than 2mm, and the thickness of the reflective layer 280 may be 20-100 microns. In addition, in some embodiments, the reflective layer 280 is continuously or dispersedly arranged on the side of the sealing component 270 facing the circumferential edge 260 of the glass body 210 and at least approximately flush with the first surface 240 and/or the second surface 250. In some embodiments, the reflective layer 280 is continuously or dispersedly arranged on the side of the sealing component 270 facing the circumferential edge 260 of the glass body 210 and extends to cover the second surface 250 and is approximately flush with the first surface 240, thus effectively and completely reflecting the light incident on the circumferential edge 260 back to the glass body 210.

In addition, as a further variation of Figs. 2 and 3, the sealing component may be wholly or partially made of reflective material, that is, the sealing component may comprise reflective material. The reflective material includes polyvinyl chloride (PVC), thermoplastic elastomer (TPE), polyurethane (PU), silicone, ethylene propylene rubber (EPDM), synthetic rubber modified polypropylene (PP-EPDM), etc. These materials can be dyed to form, for example, white or other highly reflective colors.

Specifically, Fig. 4 shows this embodiment. In Fig. 4, a glass assembly 300 includes a glass body 310 having a first surface 340 and a second surface 350, a light-emitting structure 320 arranged on the second surface 350 of the glass body 310, and a light source 330. A

sealing component 370 surrounds circumferential edge 360 of the glass body 310 and extends to cover the second surface 350, and the sealing component 370 is wholly made of reflective material. In this way, the sealing component can be manufactured in a simple structure, simplified operation and cost-saving manner to serve as a dual function of sealing and reflection. Alternatively, the sealing component 370 may be integrally molded with the glass body 310 in a manner of integral injection molding. As an example, the thickness of the sealing component 370 in Fig. 4 may be not more than 15mm or not less than 2mm. In addition, in some embodiments, the sealing component 370 can continuously surround the circumferential edge 360 of the glass body 310 and extend to cover the second surface 350 and be substantially flush with the first surface 340, thus effectively and completely reflecting the light incident on the circumferential edge 360 back to the glass body 310. In addition, Fig. 4 shows an example in which the sealing component 370 is wholly made of reflective material. Certainly, the sealing component 370 may also be partially made of reflective material. For example, the portion of the sealing component 370 corresponding to the circumferential edge 360 is made of reflective material, while the portion of the sealing component 370 covering the second surface 350 can adopt a conventional non-reflective sealing component, and such two portions can be combined together to form the sealing component 370 by, for example, bonding, pressing and welding, etc. It can be understood that the side of the sealing component facing the circumferential edge of the light guiding component at least partially comprises reflective material.

In addition, corresponding to Figs. 2-4, the present disclosure provides a sealing component suitable for sealing circumferential edge of a light guiding component, which includes a receiving portion suitable for receiving the circumferential edge of the light guiding component, and one side of the receiving portion facing the circumferential edge of the light guiding component is at least partially provided with a reflective layer, or the sealing component comprises reflective material. Specifically, the receiving portion may be a groove as shown in Fig. 2 or an inverted L-shape as shown in Fig. 3.

Compared with the way of directly coating or bonding the reflective layer on the circumferential edge of the glass body, the solution of the present disclosure has the following advantages. Since the thickness of the circumferential edge of the glass body is relatively

small (for example, 1-3mm), and the glass body is rigid overall, large in area and has high requirements for the surface quality of the glass body, it is very time-consuming and difficult to guarantee the quality by directly coating or bonding the reflective layer on the circumferential edge of the glass body. The way of coating or bonding the reflective layer on the surface of the sealing component is simple in process, fast and excellent in quality because of the small area and overall flexibility of the sealing component. In addition, when the reflective layer is directly coated on the circumferential edge of the glass body, it is necessary to finely polishing the circumferential edge of the glass body before coating, while coating the reflective layer on the surface of the sealing component can eliminate the need for fine polishing of the circumferential edge of the glass body, thereby saving time and cost.

In addition, before the glass body is attached to the commonly used sealing component, a primer needs to be applied on the first surface and/or the second surface of the glass body at the position corresponding to the sealing component, and then the glass body is attached to the sealing component after the primer is dried (for example, naturally dried), and the undried primer may corrode and damage the reflective layer on the glass body. Setting a reflective layer on the sealing component or making the sealing component wholly or partially of reflective material can avoid this problem, since the glass body is attached to the sealing component after the primer on the first surface and/or the second surface is dried, and the primer after drying will not corrode and damage the reflective layer on the sealing component or the sealing component including reflective material.

Furthermore, due to the large area and overall rigidity of the glass body, the glass body with reflective layer on the circumferential edge is easy to damage the reflective layer on the circumferential edge during storage or transportation before the glass body is attached to the sealing component. However, the sealing component is easy to store and transport because of its small area and overall flexibility, and it is not easy to damage the reflective layer on the sealing component or the sealing component including reflective material.

In addition, for the above mentioned embodiment in which the sealing component is wholly or partially made of reflective material, it has the additional advantages of simple structure, simplified operation and cost saving.

Figs. 5A to 5C respectively illustrate the structural forms of the circumferential edge of

the glass body in the glass assembly according to different embodiments of the present disclosure. It should be understood that the different structural forms of the circumferential edge of the glass body are the key factors that the reflective layer on the sealing component or the sealing component including reflective material can increase the light reflectivity inside the glass body. Through the combination of reasonable design of the structural forms of the circumferential edge of the glass body with the material selection of the reflective layer or reflective material, the reflectivity of the reflective layer on the sealing component or the sealing component including reflective material can be increased to at least 60%, preferably 70% or more, more preferably 80% or more, more preferably 85% or more, more preferably 90% or more, more preferably 95% or more, more preferably 97% or more, and more preferably 99% or more.

Advantageously, the circumferential edge of the glass body is approximately at right angle to the first surface and/or the second surface. In an embodiment shown in Fig. 5A, the circumferential edge 160a of the glass body 110a is approximately at right angle to the first surface and the second surface, and is arranged as a plane. The reflective layer on the sealing component may be approximately flush with the first surface and the second surface. In this way, the possibility of scattering or diffusion of the light at the circumferential edge can be minimized, and the reflectivity of the reflective layer can reach 95% or more. After being reflected by the reflective layer on the sealing component, the light can still transmit in the glass body 110a through total reflection, and the light can be completely led out with almost lossless when passing through the light-emitting structure, thus obtaining the best luminous effect. It should be understood that in some embodiments, the reflective layer may also be only approximately flush with the first surface or the second surface, provided that the required reflectivity is met. In addition, correspondingly, for the sealing component including reflective material, the sealing component can surround the circumferential edge of the glass body and extend to cover one of the first surface or the second surface and be flush with the other; or extend to cover both the first surface and the second surface.

Alternatively, the circumferential edge of the glass body can also be configured as a curved surface or a plane with chamfer. In an embodiment shown in Fig. 5B, the circumferential edge 160b of the glass body 110b is configured as a curved surface, and

correspondingly, the reflective layer on the sealing component can be configured as a curved surface matching with the circumferential edge 160b. In an embodiment shown in Fig. 5C, the circumferential edge 160c of the glass body 110c is configured as a plane with chamfers (e.g., circular arc chamfers), and accordingly, the reflective layer on the sealing component can be configured as a plane with chamfers matching with the circumferential edge 160c. Comparatively speaking, the reflectivity of the reflective layer described for Fig. 5C is lower than the reflectivity of the reflective layer described for Fig. 5A, but higher than the reflectivity of the reflective layer described for Fig. 5B. In addition, correspondingly, for the sealing component including reflective material, the sealing component can surround the circumferential edge of the glass body and extend to cover one of the first surface or the second surface and be flush with the other; or extend to cover both the first surface and the second surface.

In some embodiments, the reflective layer on the sealing component can be continuously or dispersedly arranged on the side of the sealing component facing the circumferential edge of the glass body and extend to cover the first surface and/or the second surface. As a variation of the embodiment shown in Fig. 5A, the reflective layer on the sealing component can cover the circumferential edge 160a of the glass body 110a and extend to cover the first surface and the second surface of the glass body 110a. Similarly, as a variation of the embodiment shown in Fig. 5B, the reflective layer on the sealing component can cover the circumferential edge 160b of the glass body 110b and extend to cover the first surface and the second surface of the glass body 110b. Similarly, as a variation of the embodiment shown in Fig. 5C, the reflective layer on the sealing component can cover the circumferential edge 160c of the glass body 110c and extend to cover the first surface and the second surface of the glass body 110c. In the above variations, the area range of the reflective layer on the sealing component covering the first surface and the second surface of the glass body can be determined according to actual requirements and process selection, as long as the reflectivity of the reflective layer on the sealing component is controlled within a preferred range, and the reflective layer on the sealing component can also cover only one surface and be approximately flush with the other surface. It can be understood that, for the sealing component including reflective material, the area range of the portion of the sealing component including reflective material

covering the first surface and/or the second surface of the glass body does not exceed the extension range of the sealing component itself.

In the various embodiments described above in connection with the attached drawings, the glass assembly of the present disclosure is provided with a reflective layer at least partially on one side of the sealing component facing the circumferential edge of the light guiding component, or the sealing component comprises reflective material, so that the utilization rate of the light source is effectively improved, the luminous brightness is increased, and the glass assembly has the beneficial effects of simple process, obvious performance improvement and the like, wherein the reflective layer can be obtained from commercially available products, and its thickness and other dimensions are not limited. Advantageously, the reflective layer may be a coating layer, or the reflective layer may be bonded to the sealing component, for example, the reflective layer may be a strip or a film layer attached by an adhesive, or an adhesive tape with an adhesive layer. In some embodiments, the reflective layer may be a single layer film or is formed by laminating multiple layers of films, wherein the materials or thicknesses of the multiple layers of films may be the same or different from each other. In this context, the coating layer can be applied to the sealing component by coating, sputtering, plating and other methods known in the art.

Further, when the reflective layer is a strip or a film layer bonded to the sealing component by an adhesive or an adhesive tape with an adhesive layer to be bonded to the sealing component by the adhesive layer, when the sealing component provided with the reflective layer is pressed against the circumferential edge of the light guiding component, the peeling strength of the reflective layer and the circumferential edge of the light guiding component is T_1 , and T_1 can be less than or equal to 1 N/mm, less than or equal to 0.5 N/mm, less than or equal to 0.1 N/mm, or equal to 0 N/mm. In addition, the ratio of the area of the adhesive or the adhesive layer between the reflective layer and the circumferential edge of the light guiding component to the area of the reflective layer corresponding to the circumferential edge may be less than 20%, less than 10%, less than 5%, less than 1%, or equal to 0%. In addition, since the bonding between the reflective layer corresponding to the circumferential edge and the sealing component involves the adhesive or the adhesive layer, the peeling strength of the reflective layer corresponding to the circumferential edge and the sealing

component is T_2 , and T_2 can be greater than or equal to 10 N/mm, greater than or equal to 15 N/mm, greater than or equal to 20 N/mm, greater than or equal to 30 N/mm, greater than or equal to 40 N/mm, or greater than or equal to 50 N/mm. Here, the reflective layer corresponding to the circumferential edge means the reflective layer corresponding to the circumferential edge, excluding the reflective layer corresponding to the first surface or the second surface. Further, T_2 minus $T_1(T_2 - T_1)$ can be greater than or equal to 9 N/mm, greater than or equal to 15 N/mm, greater than or equal to 20 N/mm, greater than or equal to 30 N/mm, greater than or equal to 40 N/mm, or greater than or equal to 50 N/mm. It should be noted that the parameters T_1 and T_2 and the numerical examples of T_1 and T_2 are introduced in this paragraph to illustrate that the reflective layer is bonded to the sealing component instead of the circumferential edge of the light guiding component, thus bringing the advantages of the solution of bonding the reflective layer to the sealing component mentioned above relative to the way of bonding the reflective layer to the circumferential edge of the light guiding component.

It is worth noting that in the way of bonding the reflective layer to the circumferential edge of the light guiding component, the reflective layer is bonded to the circumferential edge of the light guiding component, and the portion of the sealing component corresponding to the circumferential edge is pressed against the circumferential edge of the light guiding component, so that the peeling strength T_1 between the reflective layer bonded to the circumferential edge and the circumferential edge of the light guiding component is relatively large, while the peeling strength T_2 between the reflective layer and the sealing component is relatively small, which is significantly different from the values T_1 and T_2 in the solution of the present disclosure mentioned above, thus showing the difference between the present disclosure and the background technology.

In addition, when the sealing component provided with the reflective layer is bonded to the circumferential edge of the light guiding component, the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T_1 , and the peeling strength between the reflective layer corresponding to the circumferential edge and the sealing component is T_2 , and the difference between T_1 and T_2 can be less than or equal to 5 N/mm, or less than or equal to 1 N/mm. Here, the difference between T_1 and T_2 represents

the absolute value of the difference between T1 and T2.

For the test of the above-mentioned peeling strength, the sample to be tested is placed in an environment of 25 degrees Celsius and humidity of 60% - 75% for 48 hours, and then the sample is laid flat on a horizontal table and peeled by a tensile tester at a speed of 50 mm/min (millimeter/minute) at 90 degrees from the horizontal table. After the reflective layer (e.g., a strip or a film layer or an adhesive tape) is peeled off from the sample, the peeling strength is measured by taking the maximum value among the values recorded in the peeling process by the tensile tester.

In addition, the sealing component applied with the reflective layer can be pressed against the circumferential edge of the light guiding component, or can be bonded to the circumferential edge of the light guiding component by an adhesive or an adhesive layer, and for the latter, the adhesive or the adhesive layer is arranged between the reflective layer and the circumferential edge of the light guiding component.

In the described or non-described possible embodiments, the glass body can be selected as monolithic glass or laminated glass. For example, when it is applied to the front windshield glass or skylight glass in the vehicle window glass, the laminated glass can be selected, which includes at least two layers of glass bodies and an intermediate layer (such as polyvinyl butyral (PVB) or ethylene-vinyl acetate copolymer (EVA)) for bonding them together. It should be understood that the laminated glass has been widely used in the field of vehicle, and various functional layers are usually arranged in the laminated glass to obtain different functions, such as dimming layers (such as PDLC, polymer dispersed liquid crystal; or EC, Electrochromism), luminous layer, imaging layer, touch layer, etc. In the present disclosure, the side of the sealing component facing the circumferential edge of the light guiding component is at least partially provided with the reflective layer or the sealing component comprises reflective material, which does not affect the functions of these functional layers. For the front and rear door glasses or rear windshield glass in the vehicle window glass, a single piece of toughened glass can be used. Alternatively, the reflective layer on the sealing component may be provided on the side of the sealing component facing the circumferential edge of the light guiding component by, for example, coating or bonding, or the sealing component may comprise reflective material. The material of the reflective layer includes one or a combination of more

of metal, metal oxide, nonmetallic oxide, organic polymer, etc.

Depending on different requirements, optionally, the metal includes one or a combination of more of silver (Ag), aluminum (Al), copper (Cu), gold (Au) and the like; the metal oxide includes titanium dioxide (TiO₂), etc.; the nonmetallic oxide includes silicon dioxide (SiO₂), etc.; the organic polymer includes one or a combination of more of polyester (PET), polyvinyl chloride (PVC), polyurethane (PU), thermoplastic elastomer (TPE), polypropylene (PP), acrylonitrile butadiene styrene (ABS) copolymer, polycarbonate (PC), etc.

As an example, the reflective layer on the sealing component is configured to include, but not limited to, a metal coating layer or a metal tape with an adhesive layer; an organic polymer coating layer or film layer with white or other high reflection color; a composite structure at least comprising a first layer (such as an oxidation-resistant layer/protective layer), a second layer (such as a base layer) and a third layer sandwiched therebetween, wherein the first layer and/or the second layer is selected from organic polymer and the third layer is selected from metal; a coating layer including metal and metal oxide; a mixture including metal or metal oxide and organic polymer, such as titanium dioxide/aluminum/silver+polyester/polycarbonate, or a mixture of metal oxide and nonmetallic oxide and organic polymer, such as titanium dioxide+silicon dioxide+polyester/polycarbonate.

It is verified by experiments that the luminous glass with no reflective layer on the sealing component or the sealing component without reflective material has a brightness of 6.211 Candeira/square meter (cd/m²) measured after the light source is turned on, and the brightness was measured again by bonding an aluminum foil tape on the sealing component and surrounding the circumferential edge of the luminous glass with the sealing component having the aluminum foil tape, and the brightness was 8.136 Candeira/square meter (cd/m²), which is increased by about 31%. White polyvinyl chloride (PVC) is used to make the sealing component, and the sealing component surrounds the circumferential edge of the luminous glass. The brightness is measured again to be 7.983 Candeira/square meter (cd/m²), and the luminous brightness increases by nearly 29%. It can be learnt that, the glass assembly of the present disclosure can increase the luminous brightness of the luminous glass and improve the light utilization rate of the light source module without changing the existing light source

module, so as to meet the requirements of the manufacturers and the users. When a design is adopted in which the light source is integrated in the opening of the glass body near the circumferential edge, the present disclosure can particularly obtain satisfactory luminous brightness.

5 It should be understood here that the embodiments shown in the drawings only illustrate the optional architecture, shapes, sizes and arrangements of various optional components of the glass assembly according to the present disclosure; however, it is only illustrative rather than restrictive, and other shapes, sizes and arrangements can be adopted without departing from the spirit and scope of the present disclosure.

10 The technical content and technical features of the present disclosure have been disclosed above. However, it can be understood that those skilled in the art can make various changes and improvements to the above disclosed concept under the creative idea of the present disclosure, all of which fall within the protection scope of the present disclosure. The description of the above embodiments is illustrative rather than restrictive, and the protection
15 scope of the present disclosure is determined by the claims.

CLAIMS

1. A glass assembly comprising:

a light guiding component comprising a glass body and having a first surface and a second surface arranged oppositely, wherein incident light entering the light guiding component is capable of being totally reflected and transmitted between the first surface and the second surface;

a light-emitting structure located in the light guiding component or arranged on the first surface or the second surface, and leading the incident light out from the second surface;

a sealing component surrounding circumferential edge of the light guiding component, and one side of the sealing component facing the circumferential edge of the light guiding component being at least partially provided with a reflective layer to increase the reflection of the incident light inside the light guiding component.

2. A sealing component suitable for sealing circumferential edge of a light guiding component, wherein the sealing component comprises a receiving portion suitable for receiving the circumferential edge of the light guiding component, and one side of the receiving portion facing the circumferential edge of the light guiding component is at least partially provided with a reflective layer, or the sealing component comprises reflective material.

3. The glass assembly according to claim 1 or the sealing component according to claim 2, wherein the reflective layer is bonded to the sealing component.

4. The glass assembly or the sealing component according to claim 3, wherein the reflective layer is a strip or a film layer bonded to the sealing component by an adhesive or an adhesive tape with an adhesive layer to be bonded to the sealing component by the adhesive layer.

5. The glass assembly according to claim 3 or 4, wherein the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T1, and T1

is less than or equal to 1 N/mm, less than or equal to 0.5 N/mm, less than or equal to 0.1 N/mm, or equal to 0 N/mm.

6. The glass assembly or the sealing component according to claim 3 or 4, wherein the peeling strength between the reflective layer corresponding to the circumferential edge and the sealing component is T2, and T2 is greater than or equal to 10 N/mm, greater than or equal to 15 N/mm, greater than or equal to 20 N/mm, greater than or equal to 30 N/mm, greater than or equal to 40 N/mm, or greater than or equal to 50 N/mm.

7. The glass assembly or the sealing component according to claim 3 or 4, wherein the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T1, and the peeling strength between the reflective layer corresponding to the circumferential edge and the sealing component is T2, and T2-T1 is greater than or equal to 9 N/mm, greater than or equal to 15 N/mm, greater than or equal to 20 N/mm, greater than or equal to 30 N/mm, greater than or equal to 40 N/mm, greater than or equal to 50 N/mm.

8. The glass assembly according to claim 3 or 4, wherein the peeling strength between the reflective layer and the circumferential edge of the light guiding component is T1, and the peeling strength between the reflective layer corresponding to the circumferential edge and the sealing component is T2, and the difference between T1 and T2 is less than or equal to 5 N/mm, or less than or equal to 1 N/mm.

9. The glass assembly according to claim 3 or 4, wherein the ratio of the area of the adhesive or the adhesive layer between the reflective layer and the circumferential edge of the light guiding component to the area of the reflective layer corresponding to the circumferential edge is less than 20%, less than 10%, less than 5%, less than 1% or equal to 0%.

10. The glass assembly according to claim 1 or the sealing component according to claim 2, wherein the reflective layer is a coating layer applied on the sealing component.

11. The glass assembly according to claim 10, wherein an adhesive or an adhesive layer is provided between the reflective layer and the circumferential edge of the light guiding component.

5 12. The glass assembly according to claim 1, wherein the reflective layer is continuously or dispersedly arranged on one side of the sealing component facing the circumferential edge of the light guiding component, and the reflective layer is at least approximately flush with the first surface and/or the second surface.

10 13. The glass assembly according to claim 1, wherein the reflective layer is continuously or dispersedly arranged on one side of the sealing component facing the circumferential edge of the light guiding component, and the reflective layer extends to cover the first surface and/or the second surface.

15 14. The glass assembly according to claim 1 or the sealing component according to claim 2, wherein the reflective layer is a single layer film or is formed by laminating multiple layers of films, and wherein the materials or thicknesses of the multiple layers of films are the same or different from each other.

20 15. The glass assembly according to claim 1 or the sealing component according to claim 2, wherein the material of the reflective layer comprises one or a combination of more of metal, metal oxide, nonmetallic oxide and organic polymer.

25 16. The glass assembly or the sealing component according to claim 15, wherein
the metal comprises one or a combination of more of silver, aluminum, copper and gold;
the metal oxide comprises titanium dioxide;
the nonmetallic oxide comprises silicon dioxide;
the organic polymer comprises one or a combination of more of polyester, polyvinyl
chloride, polyurethane, thermoplastic elastomer, polypropylene, acrylonitrile butadiene
30 styrene copolymer and polycarbonate.

17. The glass assembly according to claim 1 or the sealing component according to claim 2, wherein the reflectivity of the reflective layer or the reflectivity of the reflective material is greater than or equal to 60%, greater than or equal to 70%, greater than or equal to 80%, greater than or equal to 85%, greater than or equal to 90%, greater than or equal to 95%, greater than or equal to 97%, or greater than or equal to 99%.

18. A glass assembly comprising:

a light guiding component comprising a glass body and having a first surface and a second surface arranged oppositely, wherein incident light entering the light guiding component is capable of being totally reflected and transmitted between the first surface and the second surface;

a light-emitting structure located in the light guiding component, or arranged on the first surface or the second surface, and leading the incident light out from the second surface;

a sealing component surrounding circumferential edge of the light guiding component, and the sealing component comprising reflective material to increase the reflection of the incident light inside the light guiding component.

19. The glass assembly according to claim 18, wherein the reflective material comprises one or a combination of more of polyvinyl chloride (PVC), thermoplastic elastomer (TPE), polyurethane (PU), silicone, ethylene propylene rubber (EPDM) and synthetic rubber modified polypropylene (PP-EPDM).

20. The glass assembly according to claim 18, wherein the reflectivity of the reflective material is greater than or equal to 60%, greater than or equal to 70%, greater than or equal to 80%, greater than or equal to 85%, greater than or equal to 90%, greater than or equal to 95%, greater than or equal to 97%, or greater than or equal to 99%.

21. The glass assembly according to any one of claims 1, 3 to 20, wherein the glass body is monolithic glass or laminated glass.

22. A window assembly comprising a glass assembly according to any one of claims 1, 3 to 21, wherein the window assembly comprises door, window, curtain wall, vehicle window glass, airplane glass or ship glass.

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23. The window assembly according to claim 22, wherein the window assembly is a vehicle window glass comprising front windshield, rear windshield, skylight glass, vehicle door glass or corner window glass, and wherein the first surface of the light guiding component faces the outside of the vehicle and the second surface faces the inside of the vehicle.

10

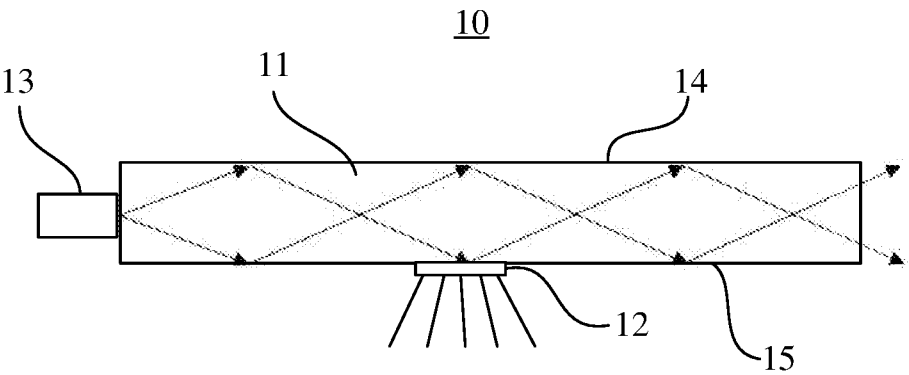


FIG.1

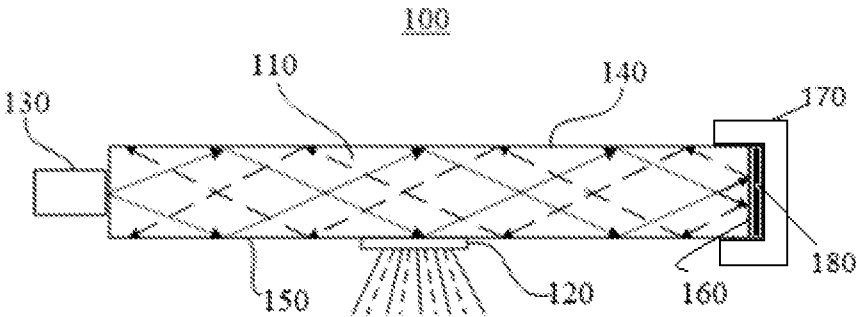


FIG.2

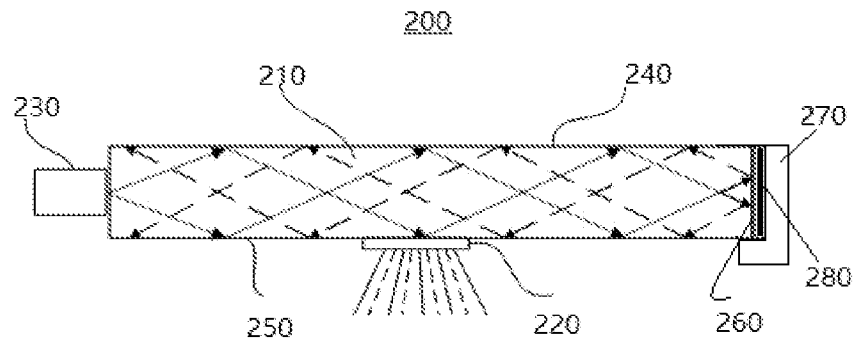


FIG.3

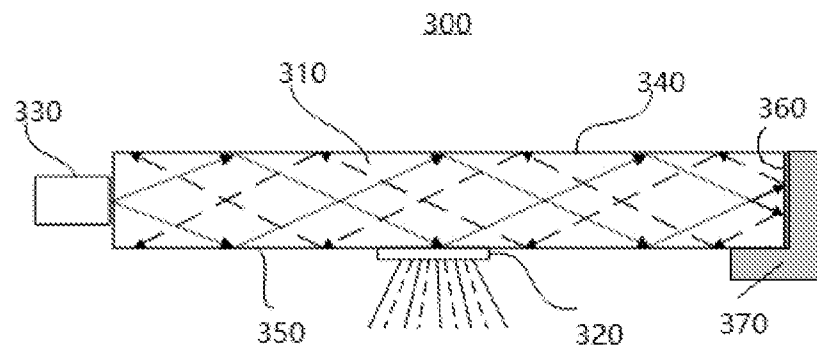


FIG.4

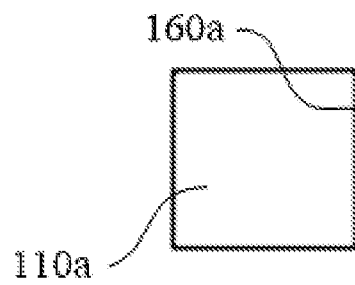


FIG. 5A

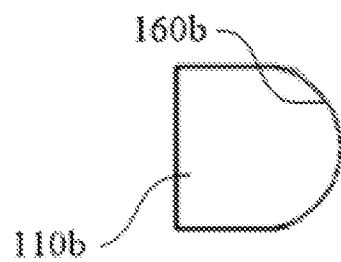


FIG. 5B

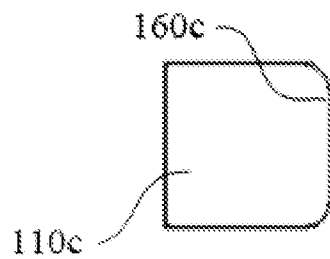


FIG. 5C

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/100527

A. CLASSIFICATION OF SUBJECT MATTER F21V7/00(2006.01)i; B60J1/00(2006.01)i; B60Q3/208(2017.01)i; B60Q3/62(2017.01)i; B64C1/14(2006.01)i; F21V31/00(2006.01)i; F21V8/00(2006.01)i; F21W107/10(2018.01)i According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC: F21V, B60J, B60Q, B64C, F21W, G02B, H01L, B60R Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT,DWPI,ENTXTC,WPABSC,CNKI:envelope, covering, protective strip, closure, border, glass plate, glass body, sidewall, bezel, light guide, plate, sheet, reflective, seal+, surround		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 115246303 A (SAINT-GOBAIN GLASS FRANCE) 28 October 2022 (2022-10-28) description, paragraphs [0034]-[0051] and figures 1-4c	1、3-4、10-23
Y	CN 111746234 A (JIANGSU TIEMAO GLASS CO., LTD.) 09 October 2020 (2020-10-09) description, paragraphs [0025]-[0027] and figures 1-2	1、3-4、10-23
X	CN 111746234 A (JIANGSU TIEMAO GLASS CO., LTD.) 09 October 2020 (2020-10-09) description, paragraphs [0025]-[0027] and figures 1-2	2
A	CN 207381419 U (HANWHA SOLARONE QIDONG CO., LTD.) 18 May 2018 (2018-05-18) the whole document	1-23
A	CN 107614302 A (SAINT-GOBAIN GLASS FRANCE) 19 January 2018 (2018-01-19) the whole document	1-23
A	CN 109109751 A (CHANGZHOU YAPU NEW MATERIAL CO., LTD.) 01 January 2019 (2019-01-01) the whole document	1-23
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed “T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family		
Date of the actual completion of the international search 05 September 2024		Date of mailing of the international search report 12 September 2024
Name and mailing address of the ISA/CN CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China		Authorized officer HUANG,JinLong Telephone No. (+86) 010-53962393

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/100527

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005029083 A (JIDOSHA GLASS ANZEN SHIKO JIGYO KYODO KU) 03 February 2005 (2005-02-03) the whole document	1-23
A	US 2021157160 A1 (LEIA INC.) 27 May 2021 (2021-05-27) the whole document	1-23

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2024/100527

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	115246303	A	28 October 2022	None			
CN	111746234	A	09 October 2020	CN	212353561	U	15 January 2021
CN	207381419	U	18 May 2018	None			
CN	107614302	A	19 January 2018	MX	2018011145	A	22 November 2018
				EP	3429876	A1	23 January 2019
				EP	3429876	B1	22 March 2023
				JP	2019515841	A	13 June 2019
				JP	6721721	B2	15 July 2020
				KR	20180059531	A	04 June 2018
				KR	102122311	B1	12 June 2020
				WO	2017157626	A1	21 September 2017
				RU	2704080	C1	23 October 2019
				CA	3009447	A1	21 September 2017
				BR	112018006898	A2	16 October 2018
				MA	44400	A	23 January 2019
				PL	3429876	T3	12 June 2023
				US	2018281570	A1	04 October 2018
				US	10675954	B2	09 June 2020
				IN	201817015981	A	12 October 2018
				ID	201811940	A	09 November 2018
				CN	107614302	B	04 June 2021
				IN	470505	B	24 November 2023
CN	109109751	A	01 January 2019	None			
JP	2005029083	A	03 February 2005	None			
US	2021157160	A1	27 May 2021	CA	3108060	A1	20 February 2020
				CA	3108060	C	23 January 2024
				KR	20210032546	A	24 March 2021
				KR	102617358	B1	21 December 2023
				JP	2021535544	A	16 December 2021
				JP	7235850	B2	08 March 2023
				TW	202014762	A	16 April 2020
				TWI	830762	B	01 February 2024
				WO	2020036587	A1	20 February 2020
				EP	3837579	A1	23 June 2021
				EP	3837579	B1	22 May 2024