

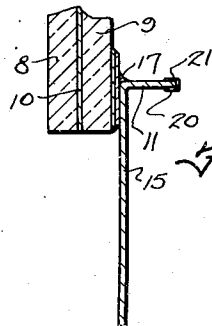
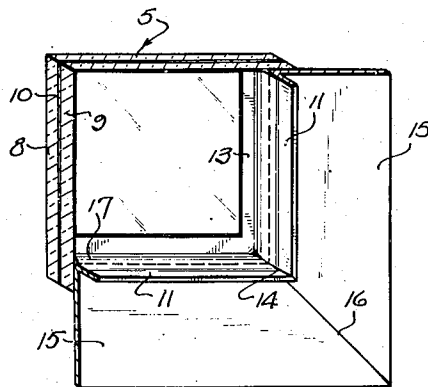
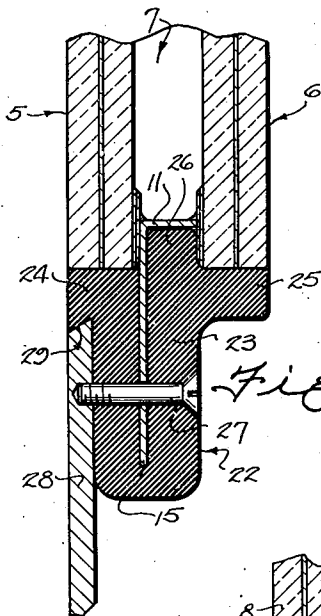
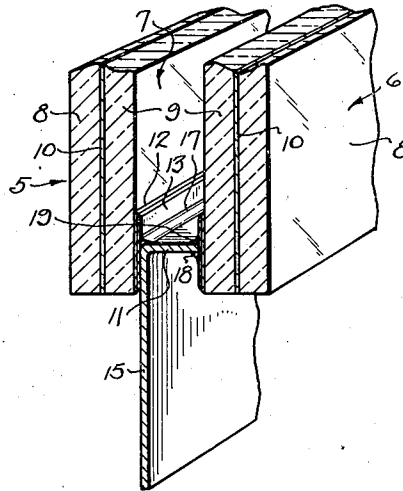
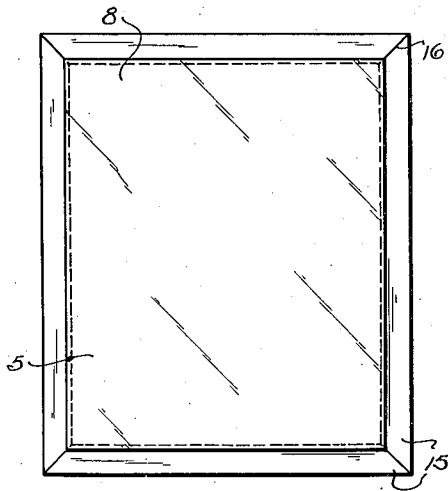
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MULTIPLE GLAZING UNIT AND MOUNTING THEREFOR

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MULTIPLE GLAZING UNIT AND MOUNTING THEREFOR

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The present invention relates to a multiple glazing unit and to the mounting thereof.

Although the glazing unit of this invention is not restricted to any particular use, it has been primarily designed for and is of utility in glazing openings in airplanes and other aircraft where the requirements are unusually stringent.

Generally stated, the type of glazing construction comprehended by the invention comprises two transparent panels arranged in face to face relation and spaced from one another by separator means secured to the panels entirely around the marginal portions thereof to provide an insulating space therebetween. Each transparent panel may consist of a single sheet of plate or window glass or other relatively hard material such as resin. As disclosed herein by way of example, each transparent panel consists of a sheet of laminated safety glass comprising two sheets of glass and an interposed layer of thermoplastic adherent thereto.

An object of the invention is to provide an improved multiple glazing unit of the above type having means for mounting the same of such character as to afford a certain resiliency or freedom of movement of the unit relative to the supporting frame in or upon which it is mounted, whereby torsion and shock that the airplane may be subjected to will be "cushioned" and for all practical purposes will not be transmitted directly to the glass or other transparent panels, thus reducing or eliminating the tendency of cracking or shattering thereof from such cause.

Another object of the invention is the provision of a multiple glazing unit of the above character provided with flexible yet substantial means for mounting the same and characterized by the provision of a flexible or yielding metal member permanently carried by the unit and extending beyond the edges of the glass or other transparent panels to provide an attaching flange by which the unit may be initially mounted with relative ease in the supporting frame or other support in such a way that when the plane is in flight and twists, weaves, or is subjected to varying pressure differentials, the glass or other transparent panels will not tend to break because of their ability to "float" without introduction of localized strains.

A further object of the invention is the provision of a multiple glazing unit of the above character having associated therewith a mounting strip of resilient, compressible material adapted to be secured in or upon the supporting frame and receiving the flexible metal attaching mem-

ber therein; said mounting strip and metal attaching member being associated with one another and with the glass or other transparent panels in such a manner that when the glazing unit is mounted in or upon the supporting frame the outer face of the unit can be made flush with the outer surface of said frame and thus not interfere with streamlined surfaces or tend to increase wind resistance.

A still further object of the invention is the provision of a multiple glazing unit of the above character suitable for use in glazing stratosphere planes in which pressurized cabins or other compartments are provided and being so constructed that it will effectually withstand a differential in pressure on the inside of the plane as compared to the outside thereof as well as providing a pressure-tight flexible mounting which will serve to maintain the pressure differential between the inside of the plane and the exterior thereof.

Other objects and advantages of the invention will become more apparent during the course of the following description, when taken in connection with the accompanying drawing.

In the drawing, wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a face view of a multiple glazing unit made in accordance with this invention;

Fig. 2 is a perspective section through one edge portion of the unit;

Fig. 3 is a perspective section of one of the transparent panels;

Fig. 4 is a transverse section through the unit and mounting therefor; and

Fig. 5 is a transverse section of the panel shown in Fig. 3.

With reference now to the drawing, the multiple glazing unit consists generally of the two transparent panels 5 and 6 arranged in face to face relation and equidistantly spaced from one another throughout substantially their entire areas to provide an insulating space 7 therebetween. Although the transparent panels 5 and 6 may consist of single sheets or plates of glass, they preferably comprise sheets of laminated safety glass, each including two sheets or plates of glass 8 and 9 bonded to one another by an interposed adherent layer of thermoplastic 10.

The glass sheets 8 and 9 may consist of ordinary plate or window glass and may be either fully tempered or semi-tempered, or any desired combination of glass sheets may be used. The plastic interlayer 10 may be formed from a polyvinyl acetal resin, and one such resin which has

been used is polyvinyl butyr acetal resin plasticized with 37½ parts dibutyl sebacate per 100 parts of resin by weight. However, different plastics varying in physical characteristics may be employed as the invention is not limited to the use of any particular resin, class of resins, cellulosic derivatives or the like.

Broadly speaking, the insulating space 7 between the transparent panels 5 and 6 is formed by the use of metal separator means 11 arranged between said panels inwardly of the peripheral edges thereof and joined to the inner glass sheets 9 through the intermediary of the metallic coatings 12 and 13. The separator means 11 preferably comprises metal strips arranged at the four edges of the panels and cooperating with one another to form a closed frame; the meeting ends of the strips being secured together as indicated at 14 (Fig. 3). Of course, a single continuous metal separator strip can be employed if desired. The separator strips 11 may be of any suitable metal such as lead, tin, aluminum, galvanized metal, and the like.

Carried by the metal separator strip 11 at each edge of the glazing unit and preferably, although not necessarily, formed integral therewith is a flexible metal attaching member 15 extending outwardly at substantially right angles to said separator strip and projecting beyond the peripheral edges of the transparent panels 5 and 6. While flexible metal attaching members 15 may be provided at two opposite edges only of the unit, it is preferred that they be arranged at all four edges thereof; in which case, the meeting ends of the said members are preferably mitered as at 16. The meeting ends of the metal attaching members 15 may be left disconnected or they may be welded, soldered or otherwise suitably secured together. Although the metal attaching members have been shown as integral with the metal separator strips 11, it will be apparent that they may be independent thereof and secured directly to the transparent panel 5 through the metallic coatings 12 and 13. The flexible metal attaching members 15 may be of the same material as the separator strips 11 or of a different metal as preferred.

The metallic coatings 12 on the inner glass sheets 9 of panels 5 and 6 may be produced from pure copper or an alloy of copper or other solderable metal or metal alloy and may be applied to the glass in any desired manner, such as by spraying the molten metal thereon with a metallizing gun. The metallic coating 13 consists of a relatively thin layer of solder applied to the metallic coating 12 and which aids in securing the metal separator strip 11 to said metallic coating 12. Therefore, the separator strips should be of a metal which can be readily soldered to the metallic coatings.

In order to prevent discoloration of the plastic interlayer 10 of panels 5 and 6 or weakening of the bond between the plastic and glass, it is preferred that if the metallic coating 12 is formed by spraying molten metal upon the glass, it be applied to the glass sheet 9 before said sheet is laminated with the respective glass sheet 8 and plastic interlayer 10. The layer of solder 13 may be applied to the metallic coating 12 either before or after the laminating of the glass sheets with the plastic interlayer, but if applied before laminating will serve to protect the metallic coating 12.

In fabricating the glazing unit, the metal separator strips 11 are associated with one of the

transparent panels, such as panel 5 as shown in Fig. 3, and the said separator strips secured to the metallic coating 12 by running a solder joint along the edge of the separator strips to form a fillet 17. This can be accomplished by the usual method of drawing a hot iron along the edges of the separator strips and at the same time applying the desired amount of solder thereto. The solder will not only adhere to the separator strips but will likewise fuse or amalgamate with the layer of solder 13 on metallic coating 12 to form a strong, tight connection between the separator strips and glass sheet.

The transparent panel 6 is then secured to the opposite edge of the metal separator strips 11 by means of the solder fillets 18 and 19 (Fig. 2) arranged at opposite sides of the separator strips and bonding the same to the metallic coating 12. To effect the formation of the fillets 18 and 19, the separator strips may be precoated with deposits of solder 20 and 21 (Fig. 5). As the soldering iron or other heating means is used to elevate the temperature of the solder deposit 20 and the solder coating 12 to induce flowing of the solder and formation of the fillet 18 on the outside of the separator strips, the heat will also be sufficient to cause a flowing of the solder deposit 21 on the inside of the separator strips to form the inside fillet 19.

When installing the glazing unit above described in an opening to be glazed, there is associated with the flexible metal attaching members 15 a mounting strip 22 of resilient, compressible material, such as rubber, rubber composition or the like; said mounting strip 22 and metal attaching members 15 cooperating to provide a metal reinforced, flexible mounting for the unit.

The mounting strip 22 comprises a body portion 23 for receiving the metal attaching members 15 therein approximately midway the inner and outer faces thereof. The body portion 23 is provided along its inner edge with oppositely directed shoulders 24 and 25 engaging the peripheral edges of the transparent panels 5 and 6 respectively, while formed intermediate said shoulders is an inwardly projecting rib 26 received between the panels outwardly of the separator strips 11.

The glazing unit may be mounted within a supporting frame or upon a support by means of screws, bolts, or other suitable fastening elements 27 which pass transversely through the body portion 23 of mounting strip 22 and also through openings in the metal attaching members 15. By way of example, the numeral 28 (Fig. 4) designates the skin of an airplane having an opening in which the glazing unit is mounted and, in this case, it will be seen that the body portion 23 of mounting strip 22 is secured to the inner side of the skin of the plane. The inner edges of the skin of the plane surrounding the opening to be glazed may be beveled as at 29 and the shoulder 24 of mounting strip 22 correspondingly beveled to snugly fit the same.

When mounting the glazing unit by securing the flexible metal attaching members 15 only in a frame or to a support as distinguished from clamping the marginal edge portions of the glass sheets, there is given to the mounting a certain flexibility or resiliency so that any twisting or weaving of the plane will be taken up by the mounting instead of being transmitted directly to the glass.

Since the metal attaching members 15 only are secured to the skin 28 of the plane, it will be apparent that the glazing unit will be permitted

a certain amount of floating movement to and fro in the opening due to the resiliency or yieldability of the metal attaching members 15 and mounting strip 22. Because of this, the liability of breaking or shattering of the glass resulting from a weaving and twisting of the ship proper will be minimized. Also, because of the flexibility or yieldability of the mounting strip 22 and metal attaching members 15, the glazing unit can be readily accommodated to certain irregularities in the supporting frame as well as to irregularities in the glazing unit itself at time of installation without placing any undue strain upon the glass. The glazing unit herein provided can be readily and quickly mounted within the frame or removed therefrom for replacement and, in addition, the use of heavy or bulky fasteners or holders for mounting the unit is avoided.

In some cases, it may be found desirable to use sheets of relatively hard plastic in place of the sheets of laminated safety glass 5 and 6 and the present invention comprehends the use of a transparent plastic sheet for either or both the laminated sheets 5 and 6. If sheets of relatively hard plastic are used, suitable means may be provided for securing the metal separator strips thereto.

Another important feature of this type of glazing unit and mounting therefor is that there is provided a so-called "flush" type of installation which is of particular advantage when used in airplanes. Thus, as shown in Fig. 4, the outer surface of the outer transparent panel 5 is flush with the outer surface of the skin 28 of the plane and also with the outer surface of shoulder 24 of mounting strip 22 so as not to break the streamlined surfaces of the plane whereby wind resistance is materially reduced.

This type of glazing structure is also suitable for use in glazing stratosphere planes in which pressurized cabins or other compartments are provided to obviate the necessity for each occupant of the plane having an individual oxygen supply. When the structure is glazed in a stratosphere plane where a difference in pressure exists between one side and the other of the glazing unit, the unit structure will effectively withstand this difference in pressure between the inside and outside of the plane as well as maintaining this pressure differential. In other words, there is provided a flexible mounting for the glazing unit which will withstand a differential in pressure on the inside as compared to the outside without leaking.

It is to be understood that the form of the invention herewith shown and described is to be taken as the preferred embodiment of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A multiple glazing unit, comprising two sheets of relatively hard transparent material arranged in face to face relation and spaced from one another, a metallic coating applied to the inner face of one of the glass sheets around the marginal portion thereof separator means securing said sheets together adjacent the edges thereof to provide an insulating space therebetween, and a flexible metal attaching member secured to said metallic coating and projecting outwardly beyond the edges of the glass sheets.

2. A multiple glazing unit, comprising two sheets of relatively hard transparent material ar-

ranged in face to face relation and spaced from one another, a metallic coating applied to the inner face of one of the glass sheets around the marginal portion thereof separator means securing said sheets together adjacent the edges thereof to provide an insulating space therebetween, a flexible metal attaching member secured to said metallic coating and projecting outwardly beyond the edges of the glass sheets, and a mounting strip of resilient, compressible material carried by said flexible metal attaching member.

3. A multiple glazing unit, comprising two sheets of relatively hard transparent material arranged in face to face relation and spaced from one another, separator means securing said sheets together adjacent the edges thereof to provide an insulating space therebetween, a flexible metal attaching member carried by the said sheets and projecting outwardly beyond the edges thereof to lie within a single plane, and a mounting strip of resilient, compressible material engaging the peripheral edges of said sheets and having said flexible metal attaching member embedded therein.

4. A multiple glazing unit, comprising two sheets of relatively hard transparent material arranged in face to face relation and spaced from one another, separator means securing said sheets together adjacent the edges thereof to provide an insulating space therebetween, a flexible metal attaching member forming a permanent part of said separator means and projecting outwardly beyond the edges of said sheets, and a mounting strip of resilient, compressible material engaging the peripheral edges of said sheets and having said flexible metal attaching member embedded therein.

5. A multiple glazing unit, comprising two sheets of relatively hard transparent material arranged in face to face relation and spaced from one another, metal separator means securing said sheets together adjacent the edges thereof to provide an insulating space therebetween, a flexible metal attaching member formed integral with said metal separator means and projecting outwardly beyond the edges of said sheets, and a mounting strip of resilient, compressible material engaging the peripheral edges of said sheets and having said flexible metal attaching member embedded therein.

6. A multiple glazing unit, comprising two sheets of glass arranged in face to face relation and spaced from one another, metallic coatings applied to the inner faces of the glass sheets around the marginal portions thereof, metal separator means arranged between the glass sheets and secured to the metallic coatings thereon, and a flexible metal attaching member carried by said separator means and projecting outwardly beyond the edges of the glass sheets inwardly of the outer faces of said sheets.

7. A multiple glazing unit, comprising two sheets of glass arranged in face to face relation and spaced from one another, metallic coatings applied to the inner faces of the glass sheets around the marginal portions thereof, metal separator means arranged between the glass sheets and secured to the metallic coatings thereon, a flexible metal attaching member carried by said separator means and projecting outwardly beyond the edges of the glass sheets inwardly of the outer faces of said sheets, and a mounting strip of resilient, compressible material carried by said flexible metal attaching member.

8. A multiple glazing unit, comprising two

sheets of glass arranged in face to face relation and spaced from one another, metallic coatings applied to the inner faces of the glass sheets around the marginal portions thereof, metal separator means arranged between the glass sheets and secured to the metallic coatings thereon, a flexible metal attaching member carried by said separator means and projecting outwardly beyond the edges of the glass sheets inwardly of the outer faces of said sheets, and a mounting strip of resilient, compressible material engaging the peripheral edges of the glass sheets and having said flexible metal attaching member embedded therein.

9. A multiple glazing unit, comprising two sheets of glass arranged in face to face relation and spaced from one another, metallic coatings applied to the inner faces of the glass sheets around the marginal portions thereof, a substantially L shaped metal member arranged between the glass sheets and secured to the metallic coatings thereon, one leg of said member constituting separator means securing the glass sheets together and the other leg of said member constituting a flexible metal attaching flange and projecting outwardly beyond the edges of the glass sheets.

10. A multiple glazing unit, comprising two sheets of glass arranged in face to face relation and spaced from one another, metallic coatings

applied to the inner faces of the glass sheets around the marginal portions thereof, a substantially L shaped metal member arranged between the glass sheets and secured to the metallic coatings thereon, one leg of said member constituting separator means securing the glass sheets together and the other leg of said member constituting a flexible metal attaching flange and projecting outwardly beyond the edges of the glass sheets, and a mounting strip of resilient, compressible material carried by said flexible metal attaching flange.

11. A multiple glazing unit, comprising two sheets of glass arranged in face to face relation and spaced from one another, metallic coatings applied to the inner faces of the glass sheets around the marginal portions thereof, a substantially L shaped metal member arranged between the glass sheets and secured to the metallic coatings thereon, one leg of said member constituting separator means securing the glass sheets together and the other leg of said member constituting a flexible metal attaching flange and projecting outwardly beyond the edges of the glass sheets, and a mounting strip of resilient, compressible material engaging the peripheral edges of the glass sheets and having said flexible metal attaching member embedded therein.

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