Jan. 21, 1947. R. S. AMES 2,414,705

MEANS FOR ATTACHING THERMOPLASTIC SHEETS TO OTHER MATERIALS

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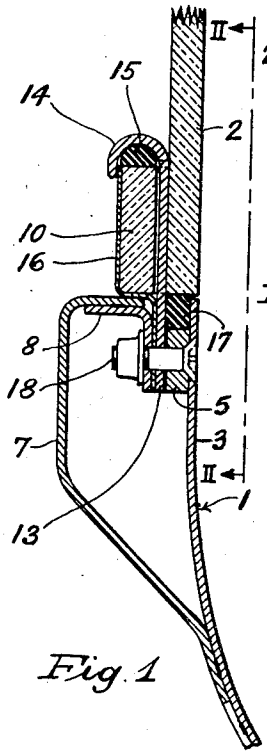


Fig. 1

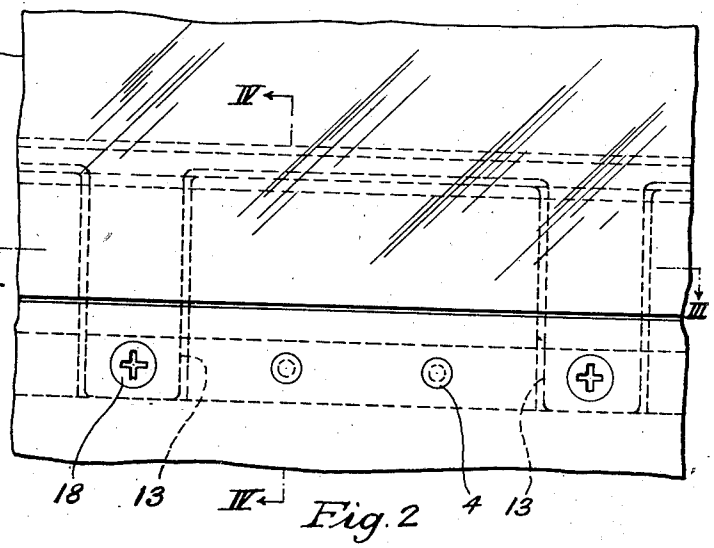


Fig. 2

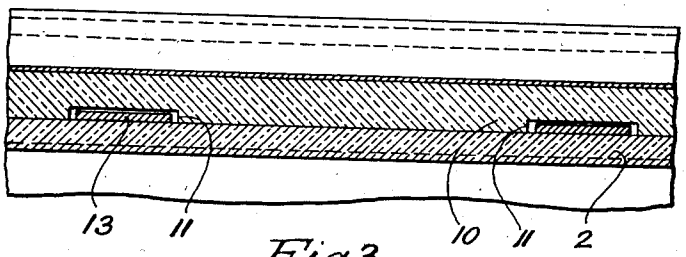


Fig. 3

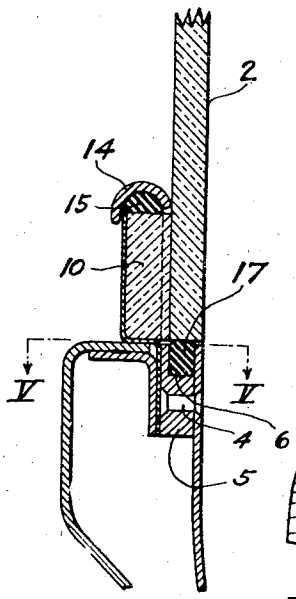


Fig. 4

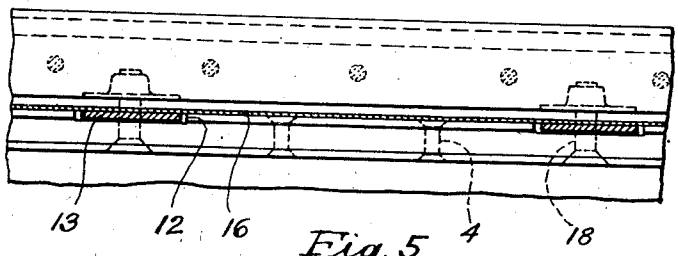


Fig. 5

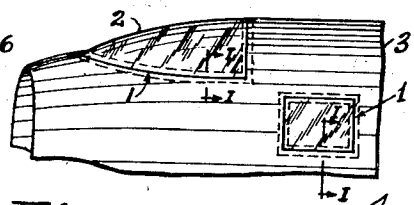


Fig. 6

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MEANS FOR ATTACHING THERMOPLASTIC SHEETS TO OTHER MATERIALS

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17 Claims. (Cl. 189—64)

1

This invention relates to the attachment of "Plexiglas," a thermoplastic, and similar plastics to other materials, and, in particular, to such attachments which do not require bolts, rivets, or other fastening means passing through the Plexiglas surface.

"Plexiglas," in sheet form, is used to a great extent for windows, and especially for hoods or canopies for airplanes, like navigator domes, noses, gun turrets, and the like; however, it may be used for any vehicle or for any wall which is to be transparent. Constructions of this nature hitherto in use have had the disadvantage that, frequently, unfavorable stresses are set up due to concentrated local forces or to forces not acting in the direction of the plane of the window surface. In other cases routing of the edges of the formed "Plexiglas" sheets is required for cementing thereto fastening ledges made of the same material, or for making their outer surface flush with said frame.

It is the general object of this invention to avoid and overcome the foregoing and other difficulties of and objections to prior-art practices, and to provide fastening means whereby the "Plexiglas" is subjected only to forces which are directed substantially in the direction of its surface.

Another object of this invention is to fit and to fasten transparent plastic into or around an opening flush with the outer surface of a vehicle structure without the need of cutting the edges of the plastic, thereby saving labor and expense.

Another object of this invention is to provide fastening means which uniformly tighten the plastic to its supporting frame without creating bending stresses therein which might lead to crazing or cracking.

The aforesaid objects of the invention, and other objects which will become apparent as the description proceeds, are achieved by providing the fastening edges of the "Plexiglas" or other plastic hood or panel, as the case may be, with a reinforcing ledge of suitable width and of the same kind of material which is directly cemented to the inside of the hood without the necessity of routing the edges. Into this reinforcing ledge, on the side to be cemented, notches are cut. These are suitably spaced apart and take up the resiliently-supported fastening means which are secured outside the "Plexiglas" hood edge to the vehicle structure. A rubber or similar gasket inserted in the hood support and pressing against the edge of the hood serves as a weather seal.

For a better understanding of the invention, reference should be had to the accompanying drawing, wherein Fig. 1 is a fragmentary cross-sectional view of one embodiment of the invention taken on lines I—I of Fig. 6; Fig. 2 is a fragmentary side view of Fig. 1, looked at from the outside in the direction II—II; Fig. 3 is a horizontal cross-sectional view taken on line III—III; Fig. 4 is a cross-sectional view taken on line IV—IV of Fig. 2; Fig. 5 is a horizontal cross-sectional view taken on line V—V of Fig. 4; and Fig. 6 is a fragmentary side elevational view of an airplane fuselage.

2

Although this construction is broadly applicable for "Plexiglas" coverings of any kind, it is especially adapted for the purpose of fastening aircraft hoods and hence it has been so illustrated and will be so described.

With specific reference to the form of the invention illustrated in the drawing, the numeral 1 indicates, as a whole, the frame on an airplane fuselage surrounding an opening, for instance, at the pilot seat, covered by a hood or canopy 2 made out of "Plexiglas" or similar thermoplastics.

The frame 1 is formed by the outer skin 3 of the airplane to which is fastened by rivets 4, a reinforcing strip 5, which, together with the skin 3, forms a groove 6, and by the channel-shaped part 7 attached to the inside of the skin. A reinforcing angle 8, with one leg pointing downwardly, facing and spaced from the reinforcing strip 5, is attached, preferably by spot welds, to the channel 7.

The hood 2 has cemented to its inside, substantially flush with the bottom, a reinforcing or fastening ledge 10, preferably of the same material as the hood, into which are cut notches 11 suitably spaced apart and facing the hood 2. Similar notches 12 are cut into the inside of the reinforcing strip 5. Into these notches are inserted tongues 13 extending from a continuous grip molding 14, made of longer or shorter adjoining length, under which is placed a rubber cushion 15, thereby uniformly distributing the hold-down pressure upon the hood and preventing objectionable stresses therein. A metal backing strip 16 overlapped by the molding 14 covers the inside of the hood ledge 10 and extends into the space between the strip 5 and the angle 8. The rubber packing 17 inserted in the groove 6 provides a weather-seal between the hood and its supporting frame, to which the hood is fastened by means of the tongues 13, and screws 18, which tie together the inner and outer portion of the frame.

It will be recognized that the invention, as illustrated and described, achieves the desired objects, since the attachment of the hood to the frame is accomplished in a most direct and positive manner so that undesirable stresses which may cause crazing or cracks in the "Plexiglas" are avoided. The attachment of the hood requires very little space and is entirely hidden from view; it is simple and can be readily carried out by placing the hood on the frame and then inserting the tongues of the grip moldings, which may be advantageously used in lengths best suited for quick insertion of the tongues into the slots, which allow expansion of the hood due to changes in temperature.

Whereas this invention is particularly suitable for fastening hoods made of thermoplastic material, like "Plexiglas," any other material, either transparent or impervious to light, may be employed wherever the basic features of this construction can be applied to advantage.

While, in accordance with the patent statutes, one known embodiment of the invention has been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby, but that the inventive scope is defined in the appended claims.

I claim:

1. A vehicle body structure containing an opening and a frame surrounding the opening, a wall consisting of a thermoplastic sheet closing said opening, a holding ledge provided with longitudinally spaced-apart transverse notches cemented with its notched side to the inside of and along the edge of said wall and being substantially flush therewith, a grip molding running along the top of said holding ledge and having at least at one side fastening tongues extending therefrom past the edge of said wall and lying in said notches and pressing said wall against said frame, and connecting means for securing said tongues to said frame.

2. A vehicle body structure containing an opening and a frame surrounding the opening, a wall consisting of a thermoplastic sheet closing said opening, a holding ledge provided with longitudinally spaced-apart transverse notches cemented with its notched side to the inside of and along the edge of said wall and being substantially flush therewith, a cushioning strip on the inside edge of said holding ledge, a grip molding enclosing and resting against said cushioning strip being provided at least at one side with fastening tongues extending therefrom past the edge of said wall and lying in said notches and pressing said wall against said frame, and connecting means for securing said tongues to said frame.

3. A vehicle body structure containing an opening and a frame surrounding said opening, a wall made of a thermoplastic sheet for said opening with its outside surface flush with the outer surface of said frame, a holding ledge provided with longitudinally spaced-apart transverse notches cemented with its notched face to the inside of and along the edge of said wall and being substantially flush therewith, a cushioning strip on the inside edge of said holding ledge, a grip molding enclosing and resting against said cushioning strip being provided at least at one side with fastening tongues extending therefrom past the edge of said wall and lying in said notches and pressing said wall against said frame, and connecting means for securing said tongues to said body structure.

4. A vehicle body structure including a skin containing an opening, a frame surrounding said opening said frame being partially formed by the skin, a reinforcing strip provided on the inside with longitudinally-spaced transverse notches and attached to the inside of said skin and shaped to form an open groove therewith, a resilient sealing gasket inserted in said groove, a channel forming the inner portion of said frame and having one flange fastened to said skin, a reinforcing angle attached to the opposite flange of said channel and having one leg turned inwardly thereof facing and being adjacent said reinforcing strip, a wall made of thermoplastic sheet material closing said opening, a holding ledge provided with longitudinally-spaced-apart transverse notches cemented with its notched face to the inside of and along the edge of said wall and being substantially flush therewith, a cushioning strip on the inside edge of said ledge, a grip molding enclosing and resting against said cushioning strip being provided at least at one side with fastening tongues extending therefrom past the edge of said wall and lying in said notches and pressing said wall against said gasket in said frame, and connecting means for securing said tongues between and to said frame portions.

5. A vehicle body structure including a skin containing an opening, a frame surrounding said opening, said frame being partially formed by the skin, a reinforcing strip provided on the inside with longitudinally-spaced transverse notches and attached to the inside of said skin and shaped to form an open groove therewith, a resilient sealing gasket inserted in said groove, a channel forming the inner portion of said frame and having one flange fastened to said skin, a reinforcing angle attached to the opposite flange of said channel and having one leg turned inwardly thereof facing and being spaced from said reinforcing strip, a cover strip inserted in said space and extending therefrom, a wall made of thermoplastic sheet material closing said opening, a holding ledge provided with longitudinally-spaced-apart transverse notches cemented with its notched face to the inside of and along the edge of said wall and being substantially flush therewith, a cushioning strip on the inside edge of said ledge, a grip molding enclosing and resting against said cushioning strip and overlapping the free edge of said cover strip and being provided at least at one side with fastening tongues extending therefrom past the edge of said wall and lying in said notches and pressing said wall against said gasket in said frame, and connecting means for securing said tongues between and to said frame portions.

6. A vehicle body structure containing an opening, a frame split on the inside surrounding said opening, a wall made of "Plexiglas" closing said opening and being flush with the outside contour of said frame, holding ledges cemented along the edges of and to the inside of said wall, a sealing strip in said frame pressing against said wall, slidable fastening means substantially in the plane of the inner surface of said wall for gripping the inner edge of said ledges and partially extending into said split frame, and connecting means uniting said fastening means with said split portions of said frame.

7. A vehicle body structure containing an opening, a frame split on the inside surrounding said opening, a wall made of "Plexiglas" closing said opening and being flush with the outside contour of said frame, holding ledges

cemented along the edges of and to the inside of said wall, a sealing strip in said frame pressing against said wall, slidable fastening means substantially in the plane of the inner surface of said wall for gripping the inner edge of said ledges and partially extending into said split frame, and connecting means within said frame and uniting said fastening means with said split portions of said frame.

8. A vehicle body structure containing an opening, a frame surrounding said opening, a hood made of "Plexiglas" conforming to the shape of said opening and being flush with the outer contour of said frame, a holding ledge cemented along the edges of and to the inside of said hood and slidable fastening means inserted intermediate said ledge and said hood and gripping said ledge for securing said hood to and within said frame.

9. A vehicle body structure containing an opening, a frame surrounding said opening, a hood made of "Plexiglas" conforming to the shape of said opening and being flush with the outer contour of said frame, a holding ledge cemented along the edges of and to the inside of said hood, resilient means weather-sealing said hood and said frame, and slidable fastening means inserted intermediate said ledge and said hood and gripping said ledge for securing said hood to and within said frame.

10. A vehicle body structure containing an opening, a frame surrounding said opening, a hood made of "Plexiglas" covering said opening and being flush with the outer contour of said frame, a holding ledge provided longitudinally with spaced-apart transverse notches and cemented with its notched side to the inside of and at the base edge of said hood, gripping means in engagement with said ledge and slidable between said ledge and the hood for securing said hood to said frame.

11. A vehicle body structure containing an opening, a frame surrounding said opening, a hood made of "Plexiglas" covering said opening and being flush with the outer contour of said frame, a holding ledge provided longitudinally with spaced-apart transverse notches and cemented with its notched side to the inside of and at the base edge of said hood, gripping means in elastic engagement with said ledge and slidable between said ledge and the hood for securing said hood to said frame, and a weather seal between said hood and said frame.

12. A vehicle body structure including a skin containing an opening, a frame partially formed by said skin and surrounding the opening, a wall of sheet material for closing said opening and being substantially flush with said skin, fastening attachments adjacent the edge of and united with said wall, said attachments being provided with longitudinally spaced transverse notches facing said wall, fastening means in pressure engagement with the inner edge of said attachment and extending through said notches, past the edge of said wall, and connecting means uniting said wall with said frame by said fastening means.

13. For mounting a panel of "Plexiglas" in a rigid frame flush with one side thereof, holding ledges cemented to the opposite side of said panel along the edges thereof, said holding ledges being provided with longitudinally spaced transverse notches facing said panel, a grip molding in surrounding contact with the inner edge of said ledges substantially along the full length thereof, said molding being provided with tongues lying in said notches and extending beyond the edges of said panel for fastening said panel to said frame.

14. For mounting a panel of "Plexiglas" in a rigid frame flush with one side thereof, holding ledges cemented to the opposite side of said panel along the edges thereof, said holding ledges being provided with longitudinally spaced transverse notches facing said panel, a resilient cushion placed upon and along the inner edge of said ledges, a grip molding in surrounding contact with said cushion substantially along the full length thereof, said molding being provided with tongues lying in said notches and extending beyond the edges of said panel for fastening said panel to said frame.

15. A vehicle body structure containing an opening, a frame surrounding said opening, a hood made of "Plexiglas," including a holding ledge cemented at the edges of and to the inside of said hood, a slidable grip molding being inserted intermediate said ledge and said hood and holding said ledge in elastic engagement along the entire length of its inner edge, a weather seal between said hood and said frame, and fastening means for securing said grip molding to said frame.

16. A vehicle body structure containing an opening, a frame surrounding said opening, a wall made of "Plexiglas" closing said opening and being flush with the outside contour of said frame, holding ledges cemented along the edges of and to the inside of said wall, a sealing strip between said frame and said wall, and fastening means between said wall and said frame inserted intermediate said ledges and said wall extending past said wall for mounting in the frame.

17. A vehicle body structure containing an opening, a frame surrounding said opening, a wall made of "Plexiglas" closing said opening and being flush with the outside contour of said frame, holding ledges cemented along the edges of and to the inside of said wall, a sealing strip between said frame and said wall, and fastening means in resilient engagement between said wall and said frame inserted intermediate said ledges and said wall and extending past said wall for mounting in the frame.

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