Sept. 25, 1962 E. R. HOREJS ET AL 3,055,468

THERMALLY INSULATED PANELED WALL STRUCTURE

Filed July 27, 1960 2 Sheets-Sheet 1

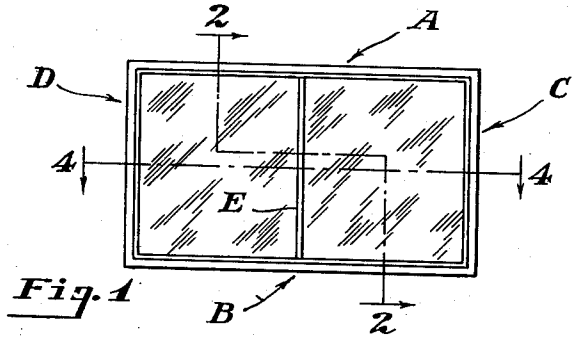



Fig. 1

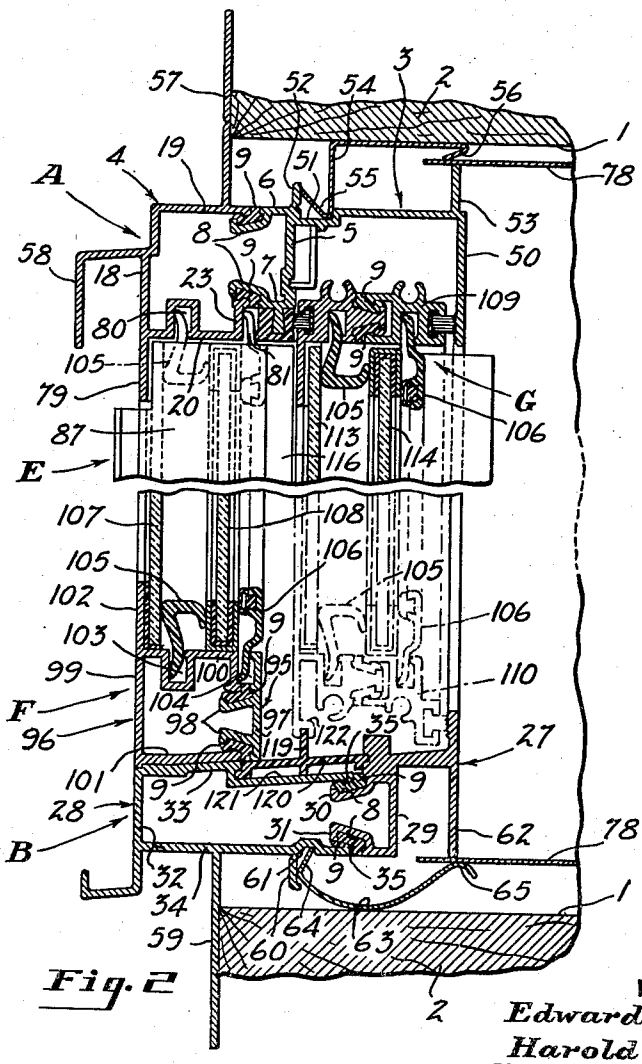



Fig. 2

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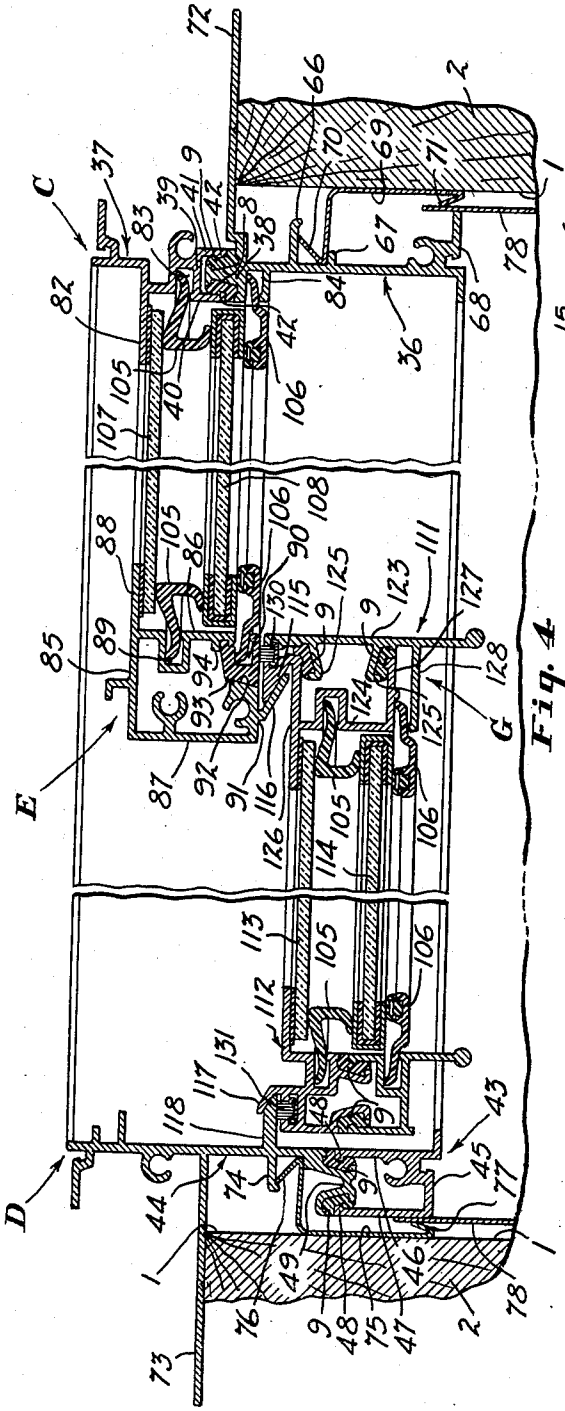


Fig. 4

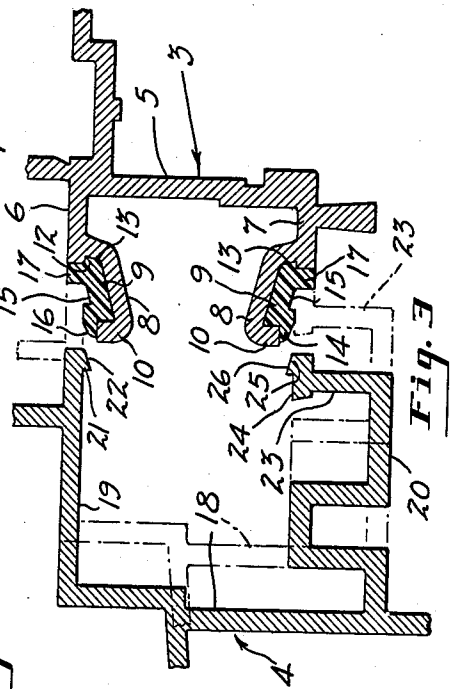


Fig. 3

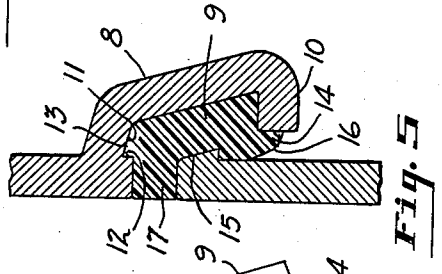


Fig. 5

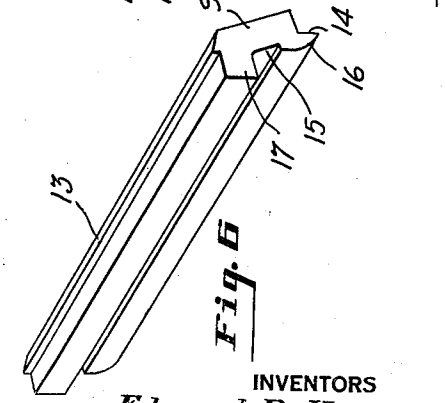


Fig. 6

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# THERMALLY INSULATED PANELED WALL STRUCTURE

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This invention relates to thermally insulated paneled wall structures and more particularly to a metal window construction in which all metallic structural members of the window framework are so constructed that the parts thereof that are exposed to the atmosphere interiorly of the window are thermally insulated from the parts thereof exposed to the atmosphere exteriorly of the window.

Since a window framework such as herein shown may serve as a panel mounting framework for all or part of a paneled building wall or partition and since the same or a similar framework may be used with opaque panels of metal, wood or plastic as well as with glass panes, the term "paneled wall structure" is employed as broadly descriptive of the window structure herein shown and described.

Thermal insulation between the interiorly and exteriorly exposed parts of the metal framework of the window of the present invention is obtained by constructing the window frame members, namely, the head, sill and jambs, each with an inner part that is exposed to the atmosphere interiorly of the window and an outer part that is exposed to the atmosphere exteriorly of the window. The metal parts of each frame member so exposed are permanently joined together by interlocking joints that extend the full length of each member, each joint including locking members composed of a material of high thermal resistance that extend the full length thereof, that are interposed between the two metal parts of each frame member to space them apart and that have an interlocking fit with the metal parts to hold them against separation. Interior glass supporting members such as sash bars which are exposed to the atmosphere interiorly and exteriorly of the window are also formed of interiorly and exteriorly exposed metal parts that are permanently joined together by interlocking longitudinal joints that include interlocking members composed of thermal insulating material interposed between the metal parts throughout the length of each of such members.

When the window includes one or more movable sashes, weatherstrips or other sealing means are commonly provided between contacting portions of the sash and window frame when the sash is in closed position and the longitudinal insulated joints of the members forming the window framework are located inwardly of such seals.

In order to provide insulating joints which enable the metal parts of the members forming the window framework to be quickly and easily assembled and which serve to premanently secure said parts together, the insulating and locking members are in the form of bars composed of a suitable plastic material of adequate strength and low heat conductivity which are permanently interlocked with the metal parts which form the structural members of the framework. The insulating bar may be formed by extruding a suitable thermoplastic material. Various plastics may be employed such as vinyl chloride or polyethylene, but polystyrene has been found to be particularly desirable because of its high compressive strength and low heat conductivity. The bars of insulating material are interposed between and engaged throughout their lengths by the metal parts with which they are interlocked and each bar is so secured to one of said metal parts that said bars form rigid insulating spacing and locking members which serve to permanently hold said metal parts against relative movements.



Each insulating and locking bar is preferably permanently retained in a groove formed along an edge portion of one of the metal parts of each pair that are joined together to form a structural member, and is provided with a longitudinal groove to receive a longitudinal rib that extends along the adjoining edge portion of the other metal part.

The metal parts of the structural members forming the frames and sashes of the window may be welded or otherwise secured to the corners so that the insulating bars are held in place in the finished frame or sash and are relieved of stresses to which they might otherwise be subjected.

The frame and sash members are preferably so constructed that the inner and outer metal parts of each structural member are securely interlocked prior to their assembly in the window framework. In order to provide metal parts that can be easily joined together throughout their length by merely pressing them together, one of the metal parts is provided with spaced flanges which straddle a portion of the other metal part and the insulating bars are located between the flanges and the portion of the other metal member that is straddled by the flanges. The insulating bars are attached to one of the metal parts and are formed to interlock with the other metal part when the two metal parts are pressed together. The insulating bars are preferably mounted in grooves provided in the portion of one of the metal parts which is inserted between the flanges of the other and the bars are provided with external grooves which receive ribs provided along the edges of the flanges of the other metal part, the flanges having sufficient resilience to permit them to be sprung apart and entered into the grooves of the insulating bars.

The insulating bars may be provided with beveled faces which serve to pry the ribbed edges of the flanges apart as the metal parts are pressed together. The metal parts of the structural members may be in the form of extruded metal sections and the extruded plastic bars may be secured in the retaining channels formed in an extruded bar so that the extruded metal strips may be cut to suitable lengths for different window sizes and afterwards be assembled and built into the window framework.

The insulating and locking bars and the channeled metal part which receives them are preferably so formed that the insulating bars may be pressed into the channels and be firmly secured therein either by the resilience of the plastic bar or by upsetting a portion of the metal forming each channel to grip the plastic bar.

Reference should be had to the accompanying drawings forming a part of this specification in which:

FIGURE 1 is a side elevation of a window of the type herein illustrated;

FIG. 2 is a vertical section taken on the broken line indicated at 2—2 in FIG. 1, the section being upon an enlarged scale and the sectional form of the glass supporting members opposite those crossed by the section line being shown in dotted lines;

FIG. 3 is a fragmentary sectional view on an enlarged scale showing the inner and outer parts of the structural elements positioned for assembly;

FIG. 4 is a horizontal section taken on the line indicated at 4—4 in FIG. 1;

FIG. 5 is a transverse section on an enlarged scale through one of the locking and insulating bars and the metal parts between which it is placed; and

FIG. 6 is a perspective view of the locking and insulating bar.

In the accompanying drawings the invention is shown

applied to a window having a single horizontally sliding sash and a fixed window behind which the sash may be moved. The frame of the window is composed of a head A, a sill B and glass mounting jambs C and D. Fixed vertical and horizontal glass mounting rails E and F are secured in fixed position in the frame, the rail E extending from the head A to the sill B midway between the jambs C and D and the rail F being mounted on the sill and extending from the rail E to the jamb C, the rails E and F providing, with the jamb C a rectangular framework for one or more fixed window panes. A sliding sash G is mounted inwardly of the rails E and F for sliding movement between the jambs C and D. The window is mounted in an opening 1 in a building wall 2 as shown in FIGS. 2 and 3.

As shown in FIGS. 2 and 3 the head A comprises inner and outer metal parts 3 and 4 which are in the form of extruded aluminum sections. The inner metal part 3 has a vertical web 5 provided with vertically spaced outwardly projecting flanges 6 and 7 which are formed to provide retaining channels 8 which are offset oppositely and toward one another with respect to the portions of the flanges 6 and 7 that are adjacent the web 5, the channels 8 being formed to receive plastic locking and insulating bars 9.

Since, as herein illustrated, the insulating joints of all the members forming the window framework have identical insulating bars, these bars and the channels in which they are mounted are identified by the same numerals throughout the drawings.

As best shown in FIGS. 3, 5 and 6, one wall of the strip retaining channel 8 is formed by a short flange 10 and the opposite wall 11 of the channel is recessed to received a shoulder 12 at the end of the bar 9 opposite that engaged by the flange 10, the end of the bar on which the shoulder 12 is formed being provided with an inclined face 13 to facilitate entry of the plastic bar into the channel 8. The insulating strip 9 has a lip 14 that overlies the edge of the flange 10 and intermediate the ends thereof its outer face is provided with a longitudinal groove 15. The end of the strip 9 that overlies the flange 10 has a beveled face 16 and at the opposite end thereof the bar 9 is provided with a projecting portion 17 of substantial thickness.

The outer part 4 of the head is provided with a web 18 and with upper and lower flanges 19 and 20 that project inwardly from the web 18. The upper flange 19 is provided with a short rib 21 along its inner edge which projects downwardly and which has a beveled edge face 22. The lower flange 20 has a vertical inner portion 23 provided with a widened top portion 24 which carries a short upwardly projecting rib 25 which is directly opposite the rib 21 and which has a beveled top face 26.

As shown in FIG. 3, the ribs 21 and 25 are spaced apart a distance slightly less than the space between the upper and lower faces of the insulating locking bars 9 mounted in the channels 8 of the inner metal member 3 and the beveled faces 22 and 26 are engageable with the beveled faces 16 of the locking bars so that when the metal members 3 and 4 are pressed together the flanges 19 and 20 are pried apart by the beveled faces 16 to permit the ribs to ride over the outer portions of the bars 9 and snap into the grooves 15. When the ribs 21 and 25 engage with the grooves 15, the parts of the flanges 19 and 20 which overlap the insulating bar are spaced from the metal parts of the inner member 3 throughout their length, the portions of the bars 9 outwardly of the grooves 15 spacing the adjacent portions of the flanges 19 and 20 from the end flanges 10 of the inner member and the rib portions 17 of the bar 9 separating the end portions of the end flanges 19 and 20 from the portions of the flanges 6 and 7 which form the inner walls of the channel 8. When the inner and outer metal parts of the head are assembled they are firmly attached together by the plastic locking and insulating bars 9.

As shown in FIG. 2, the sill B has inner and outer parts 27 and 28 which are joined together in a manner similar to the parts 3 and 4 of the head. The inner metal part 27 has a vertically disposed web 29 that is provided with outwardly projecting flanges 30 and 31 that are provided with retaining channels 8 for plastic locking and insulating bars 9. The outer part 28 of the sill is provided with a web 32 and upper and lower walls or flanges 33 and 34 that are provided at their inner edges with ribs 35 for engagement with the grooves 15 of the insulating bars 9, parts of the sill being connected together in the same manner as the parts 3 and 4 of the head A.

As shown in FIG. 4, the jamb C is provided with inner and outer metal parts 36 and 37 and the inner metal part 36 is provided with a projecting portion 38 at its outer edge that is formed on opposite sides with retaining channels 8 for insulating and locking bars 9. The outer metal part 37 of the jamb C has a vertical web 39 and spaced flanges 40 and 41 that project inwardly from the web 39, flanges 40 and 41 straddling the portion 38 of the inner part 36 and being provided with edge ribs 42 that engage in the grooves 15 of the insulating and locking bars 9.

The jamb D is provided with inner and outer metal parts 43 and 44 and the inner part 43 is provided with a vertical web 45 having spaced outwardly projecting flanges 46 and 47 provided along their end edges with short ribs 48. The outer part 44 of the jamb D has a laterally offset inwardly tapering portion 49 at its inner edge that projects into the space between the flanges 46 and 47 and which has retaining channels for locking and insulating bars 9 which receive the ribs 48 in their grooves 15.

The head A, the sill B and each of the two jambs C and D are composed of inner and outer metal parts that are interlocked and spaced from one another by the insulating bars 9 which impede the conduction of heat through the metal frame members from the interior to the exterior of the window. The head A is provided with a downwardly extending, vertically disposed flange 50 spaced inwardly from the web 5 to provide a sash receiving channel. The inner part 3 of the head A is provided on the top thereof with a longitudinal recess 51 and a short flange 52 extending along the outer side of the recess. Adjacent its inner edge the part 3 is provided with an outwardly projecting flange 53. The recess 51 and the flanges 52 and 53 serve to position a centering spring 54 formed of resilient sheet metal which has a flange 55 at its outer edge engaging in the recess 51 and with the flange 52 and a second flange 56 at its inner edge which bears against the outer edge of the flange 53. The outer section 4 of the head A is provided with an outwardly projecting nailing flange 57 and a drip flange 58 projecting outwardly and downwardly from the web 18 may also be provided.

The outer part 28 of the sill B has a downwardly projecting nailing flange 59 in the plane of the nailing flange 57 and inwardly of the flange 59 is provided with a short downwardly extending flange 60. A longitudinal recess or groove 61 is provided inwardly of the flange 60 and the inner part 27 has a downwardly projecting flange 62 spaced inwardly from the web 29, the lower edge of the flange 62 being substantially flush with the bottom face of the sill. A resilient sheet metal centering spring 63 is interposed between the sill and the bottom of the opening 1 and is provided with a flange 64 at its outer edge that engages the flange 60 and the recess 61. The spring 63 also has an inner edge portion 65 that bears against the flange 62.

The inner part 36 of the jamb C is provided with spaced exterior flanges 66 and 67 and adjacent its inner edge with an exterior flange 68. A centering spring 69 has a flange 70 positioned between the flanges 66 and 67 and at its inner end has a flange 71 that bears against the outer

edge of the flange 68. Adjacent its outer edge the inner part 36 has a nailing flange 72 which projects laterally outwardly in the plane of the flanges 57 and 59.

The outer part 44 of the jamb D has a nailing flange 73 in the plane of the flange 72 and inwardly of the flange 73 the outer part 44 of the jamb D has a short flange 74 that is spaced outwardly from the outwardly projecting portion 49. A sheet metal centering spring 75 has a flange 76 at its outer edge which is positioned between the flange 74 and the downwardly projecting portion 49 and a flange 77 at its inner edge which bears against the outer edge of the inner part 43.

The nailing flanges 57, 59, 72 and 73 position the window with respect to the building wall 2. The springs 54, 63, 69 and 75 may also serve to clamp a sheet metal trim frame 78 to the exterior of the window frame, the trim frame 78 serving to cover the wall opening inwardly of a window frame.

The head A and jamb C cooperate with the rails E and F to provide a fixed glass pane support. The head A is provided with a glass retaining flange 79 that projects downwardly in the plane of the web 18 and the underside of the head A is formed to provide spaced downwardly opening channels 80 and 81 extending throughout the length thereof. The jamb C is provided with a glass retaining flange 82 in the plane of the flange 79 and spaced inwardly opening channels 83 and 84 that are alined with the channels 80 and 81.

The vertical meeting rail E is provided with a glass retaining flange 88 in the plane of the flanges 79 and 82 of the head A and jamb C and with inwardly opening channels 89 and 90 that are aligned with the channels 80 and 81 of the head A and the channels 83 and 84 of the jamb C. The tubular rail E has a portion 91 of its inner wall integral wilth the wall 87 and the wall portion 91 has a wide inclined face 92 facing the wall 86. A plastic bar insert 93 is interposed between the inclined face 92 and the interior of the wall 86, having a rib and groove connection 94 to the wall 86. The insert 93 extends past the inner edge of the wall 86 and the channel 90 is formed in this insert.

The mounting rail F has inner and outer metal parts 95 and 96, the inner part 95 having a web 97 provided with outwardly projecting flanges 98 that are formed to provide retaining channels for plastic insulating and locking strips 9. The outer metal part 96 is provided with a web 99 and upper and lower walls or flanges 100 and 101 which straddle the flanges 98 and interlock with the insulating bars 9 in the same way as in the other structural elements above described. The rail F has a glass retaining flange 102 that is in the plane of the retaining flanges 79, 82 and 88 of the head A, jamb C and rail E. The rail F is also provided with channels 103 and 104 that are alined with the channels 80 and 81 of the head A, 83 and 84 of the jamb C and 89 and 90 of the rail E.

Plastic glazing splines 105 are mounted in the alined channels 80, 83, 89 and 103 of the head A, jamb C, rail E and rail F and plastic glazing splines 106 are mounted in the alined channels 81, 84, 90 and 104. The splines 105 serve to hold a glass pane 107 against the retaining flanges 79, 82, 88 and 102 and splines 106 serve to hold an inner glass pane 108 against the splines 105 which serve to space the panes apart.

The sash G is composed of top and bottom rails 109 and 110 and tubular vertical rails 111 and 112, each of the sash rails being composed of two metal parts that are insulated from one another by means of locking and sealing bars 9. The sash has inner and outer glass panes 113 and 114 positioned by retaining flanges along the outer sides of the sash rails by splines 105 mounted in inner channels corresponding to the retaining channels for the splines of a fixed window and the inner pane 114 being held in place by splines 106 mounted in a second set of grooves corresponding to the grooves for the splines 106 in the fixed window.

As shown in FIG. 4, the vertical rail 111 of the sash G has an inclined stop flange 115 at the outer side thereof that engages with an inclined flange 116 integral with the portion 91 of the rail E to provide a seal between the rail E and the sash rail 111 (including weather strip 130) when the sash is in closed position. The vertical rail 112 has an integral inclined stop flange 117 at its outer side which engages with a beveled inwardly projecting rib 118 integral with the outer part 44 of the jamb D to provide a seal between the sash and jamb (including weatherstrip 131) when the sash is in closed position.

The sill B is provided with a guide rib 119 which is formed integrally with a bar 120 of plastic insulating material which is mounted in a longitudinal recess 121 of the sill and which extends throughout the length of the sill. A grooved shoe 122 formed integrally with the lower sash rail 110 guides the sash on the guide rib 119. The rails 109, 110 and 112 of the sash G have inner and outer metal parts joined together by means of insulating and locking bars 9 in the same manner as the main frame members. The tubular rail 111, however, has a differently arranged connection between its metal parts because of the fact that the metal part 123 of the rail 111 that faces the jamb C is exposed to the atmosphere interiorly of the window when the sash is in closed position. The metal part 123 of the rail 111 facing the jamb C is insulated from the metal part 124 of the rail that faces the jamb D. The part 123 has flanges 125 projecting toward the jamb D and formed to provide channels for retaining, insulating and locking bars 9. The part 124 has flanges 126 and 127 that straddle the flanges 125 and interlock with the insulating bars 9 retained by the flanges 125. The insulating bars 9 serve to insulate the part 123 from the part 124 with which the stop flange 115 is connected so that heat flow from the part 123 through the flange 115 to the rail E which is exposed to the atmosphere exteriorly of the window is blocked. Since the outer face of the metal part 124 is exposed to the atmosphere exteriorly of the window when the sash G is in closed position, the inner locking spline 106 that fits in the rail 111 is disposed in a groove that is formed between the flange 127 of the part 124 and a flange 128 integral with the metal part 123, so that the spline 106 which is formed of a plastic of low heat conductivity, intervenes between the metal parts 123 and 124 to block the flow of heat.

It is to be understood that in accordance with the provisions of the patent statutes, variations and modifications of the specific devices herein shown and described may be made without departing from the spirit of the invention.

What we claim is:

1. A paneled wall structure comprising upright frame members and transverse frame members joined to the upright members to provide panel supporting means, each of said members comprising a pair of elongated metal parts, one exposed exteriorly of the wall and one exposed interiorly of the wall, one of the metal parts of each pair having flange portions spaced apart throughout its length, the flanges of each pair having short longitudinal locking ribs adjacent their free edges that project inwardly toward one another, the other metal part of each pair having a connecting portion disposed between said spaced flanges, each connecting portion having channels opening toward flanges of the other pair, and means for spacing said metal parts apart and for locking them together comprising a locking bar composed of a thermal insulating material fitting in each channel, forming a rigid spacing and locking member when fitted in its channel and having an outer face that bears against the inner face of one of said flanges and that has a longitudinal locking groove in which the rib of the adjacent flange fits.

2. A paneled wall structure as set forth in claim 1 in which the ribbed flanges are resilient and the locking bars have tapering faces for guiding the ribs to the locking grooves of said bars.

3. A structural member for paneled wall structures comprising two elongated metal parts disposed side by side, one of said metal parts having flanges that are spaced apart that extend throughout the length of said member and that have short oppositely facing locking ribs along their edges, the other of said metal parts having portions that overlap the ribbed edges of said flanges and that are provided with channels that open toward flanges of the other pair, and means for spacing said metal parts apart and for locking them together comprising locking bars of thermal insulating material fitting in said channels forming a rigid spacing and locking member when fitted in its channel and having face portions that engage with said flanges to prevent metal to metal contact between said parts and that are provided with locking grooves in which said ribs fit.

4. A structural member according to claim 3 in which the ribbed flanges are resilient and the bars of insulating material have beveled faces leading to their locking grooves for deflecting said flanges to permit passage of the flange ribs to the locking grooves when the metal parts are pressed together.

5. A structural member for paneled wall structures comprising two elongated metal parts disposed side by side, one of said metal parts having resilient flanges that are spaced apart that extend the full length thereof and that have short inwardly projecting locking ribs along their free edges, the other of the metal parts having a portion that extends throughout its length and that is received between said flanges, and means for locking said metal parts together and for holding them out of contact with one another comprising bars of thermal insulating material secured to said portion and engaging said portion throughout the length thereof, said bars when so secured forming a rigid spacing and locking member and having outer faces that bear against said flanges, said outer faces having longitudinal grooves to receive said ribs and converging portions leading to said grooves for spreading said flanges to facilitate the pressing of the parts into interlocking engagement.



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