Aug. 27, 1963 M. K. SNYDER ET AL 3,101,820

WINDOW STRUCTURE FOR PANEL TYPE BUILDINGS

Filed March 14, 1960 3 Sheets-Sheet 1

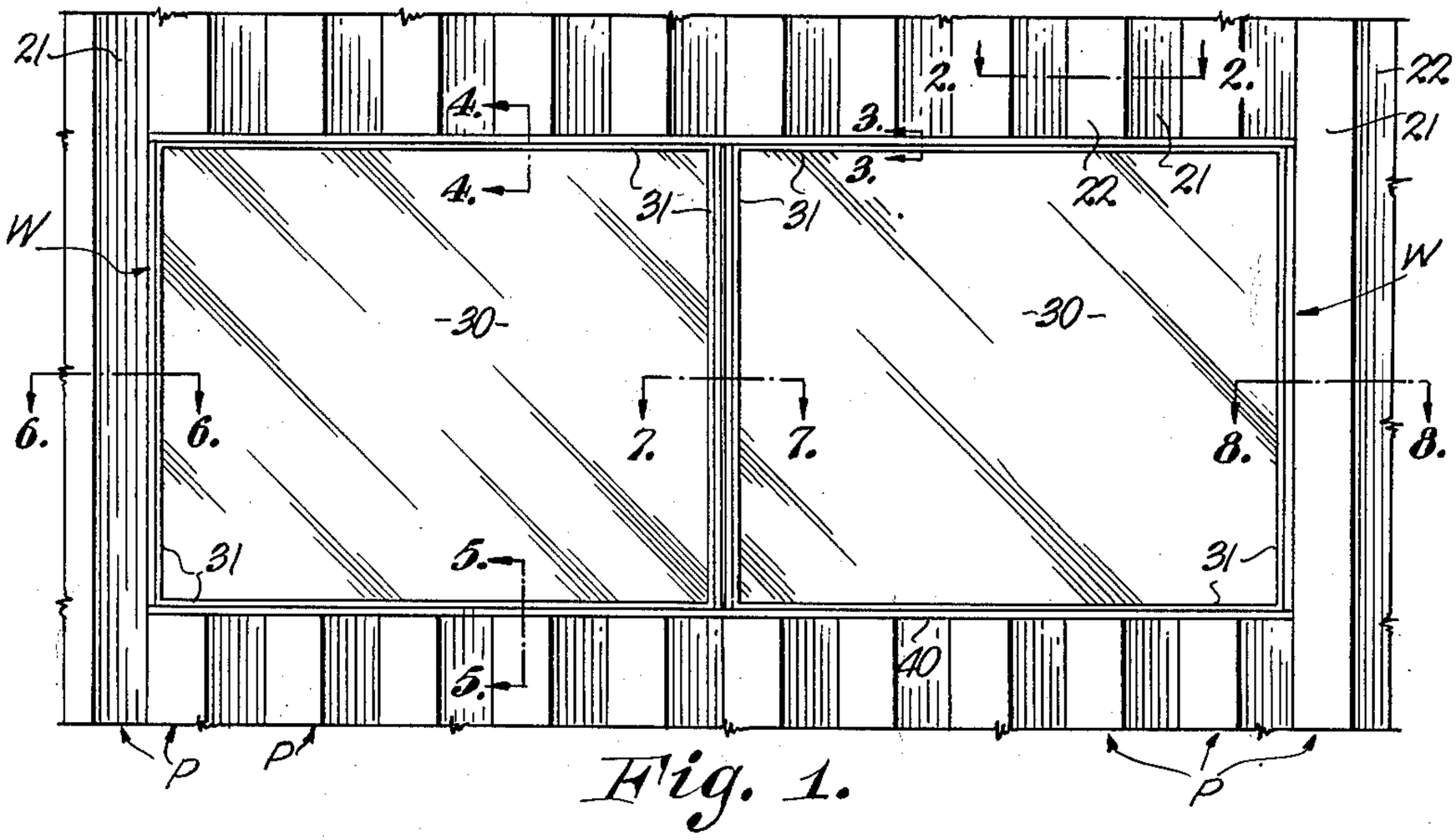

Fig. 1.

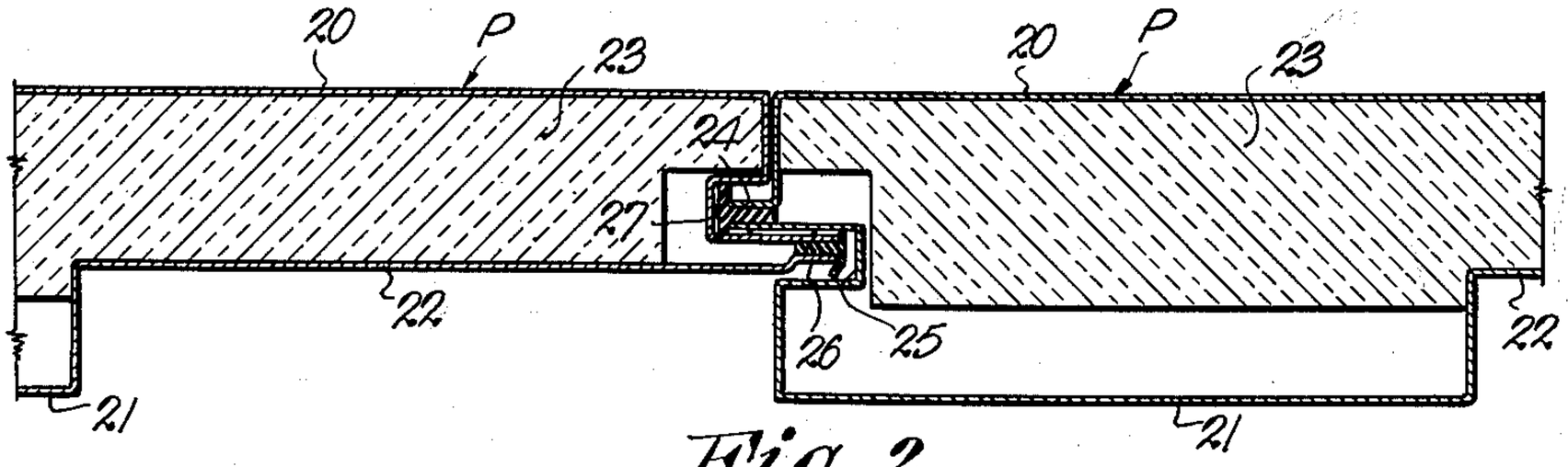

Fig. 2.

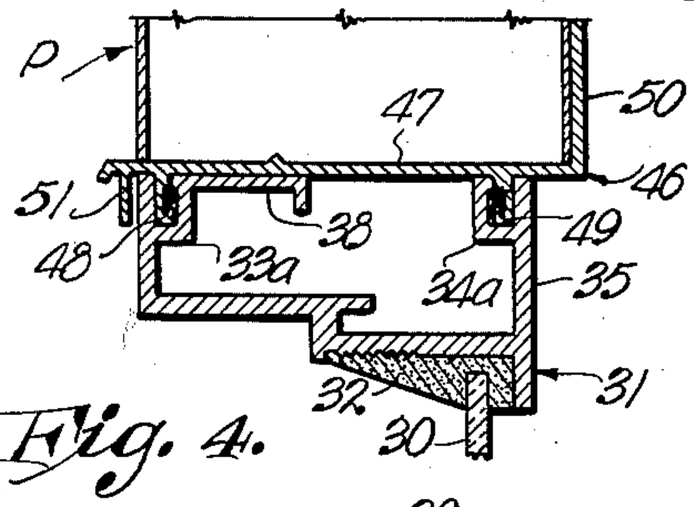

Fig. 4.

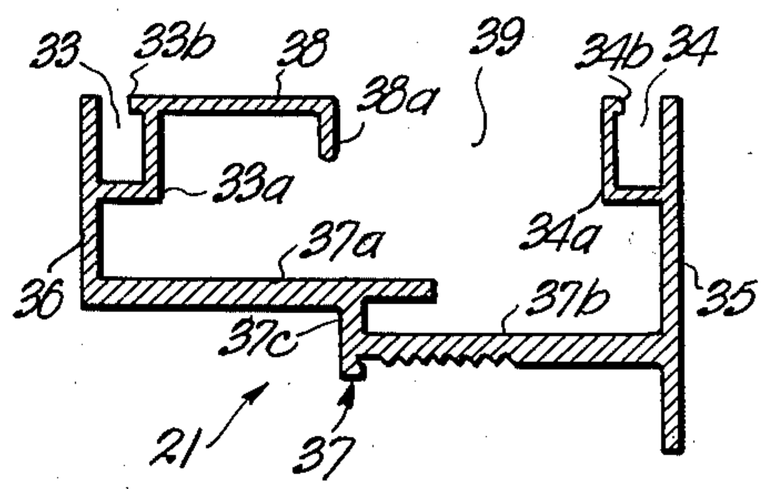

Fig. 3.

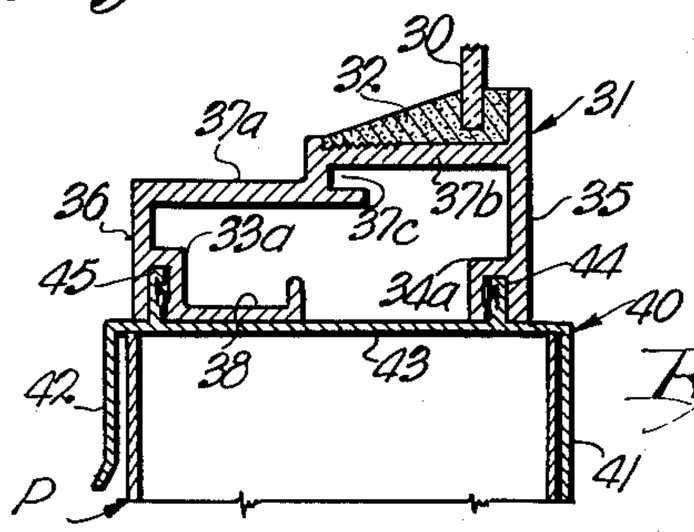

Fig. 5.

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Aug. 27, 1963 M. K. SNYDER ET AL 3,101,820

WINDOW STRUCTURE FOR PANEL TYPE BUILDINGS

Filed March 14, 1960 3 Sheets-Sheet 2

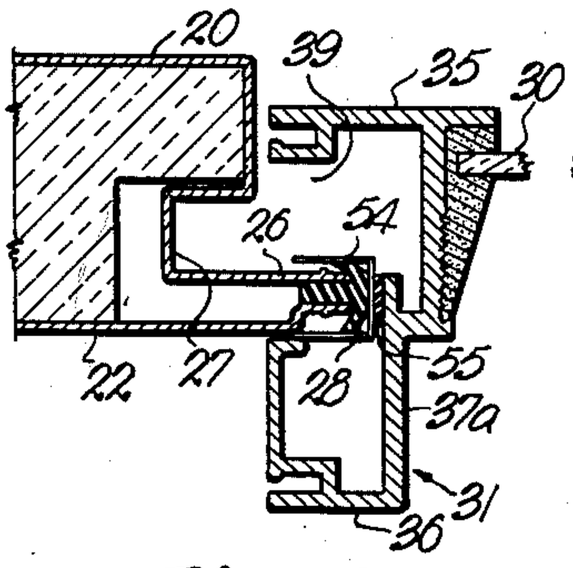

Fig. 6.

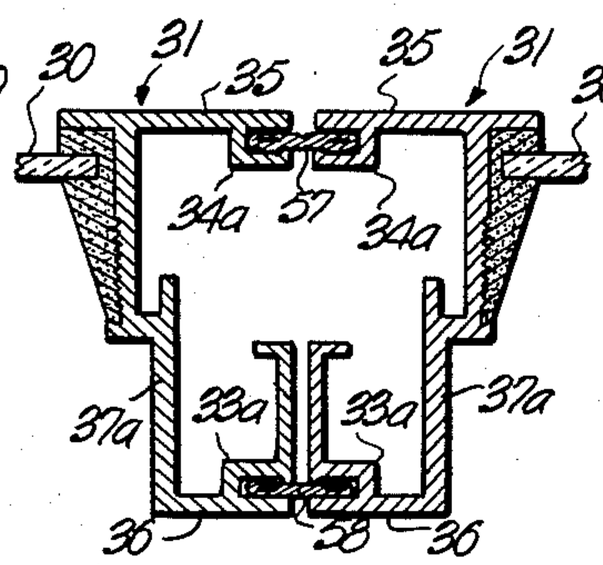

Fig. 7.

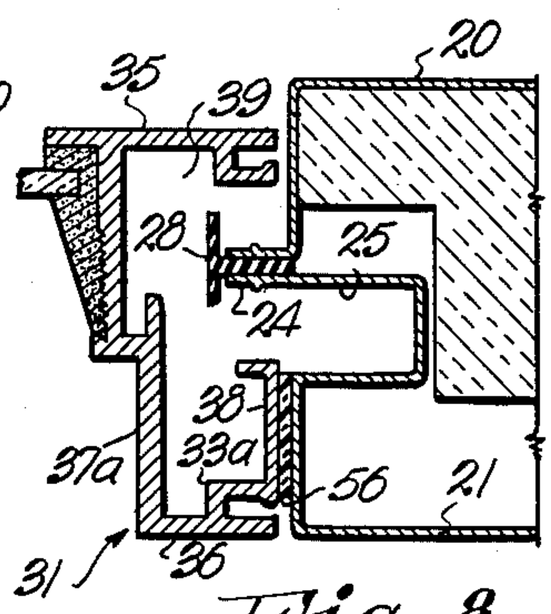

Fig. 8.

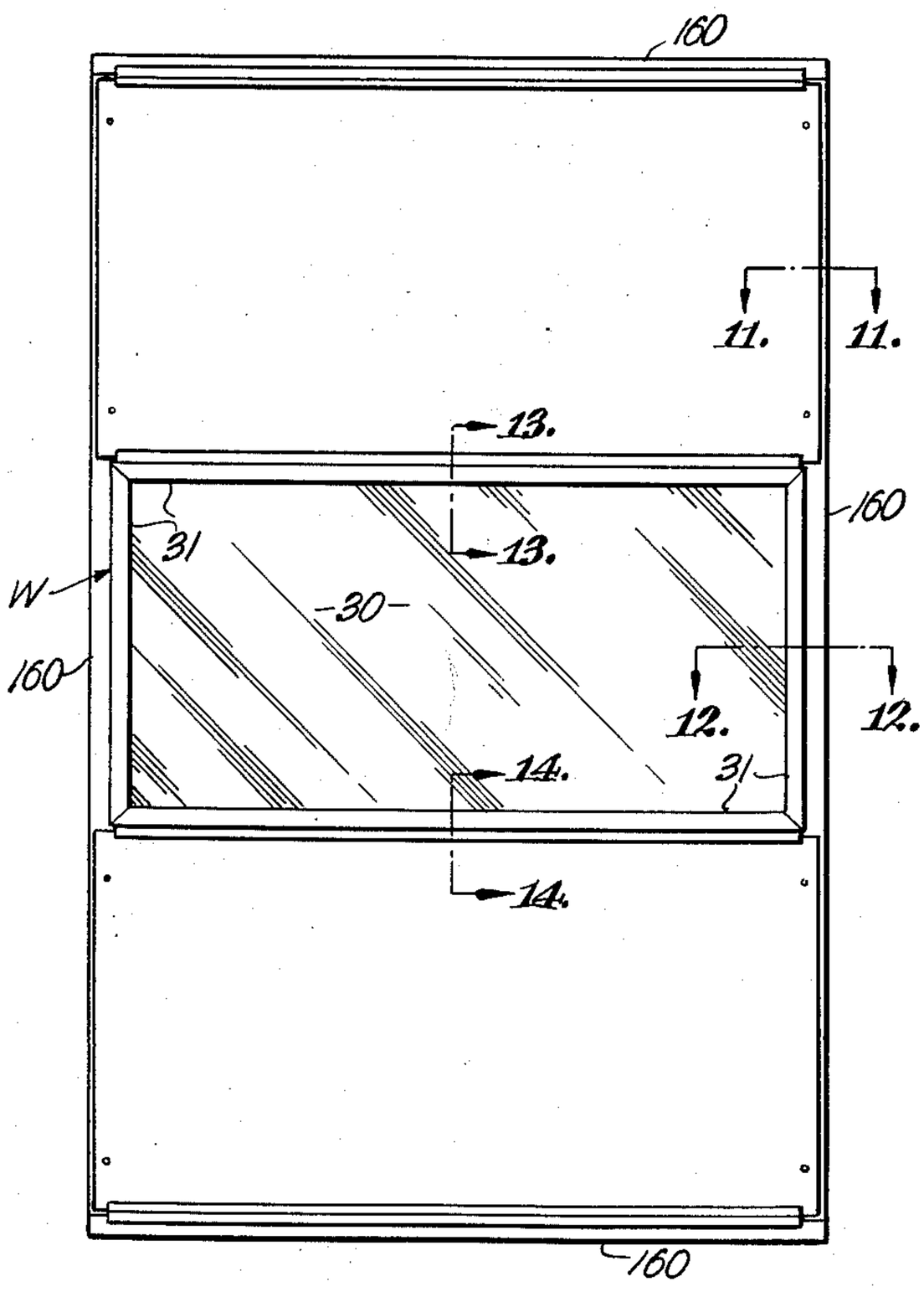

Fig. 10.

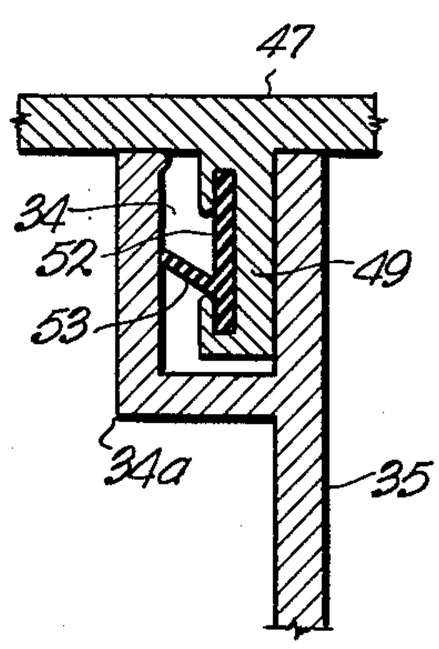

Fig. 9.

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Aug. 27, 1963 M. K. SNYDER ET AL 3,101,820

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Filed March 14, 1960 3 Sheets-Sheet 3

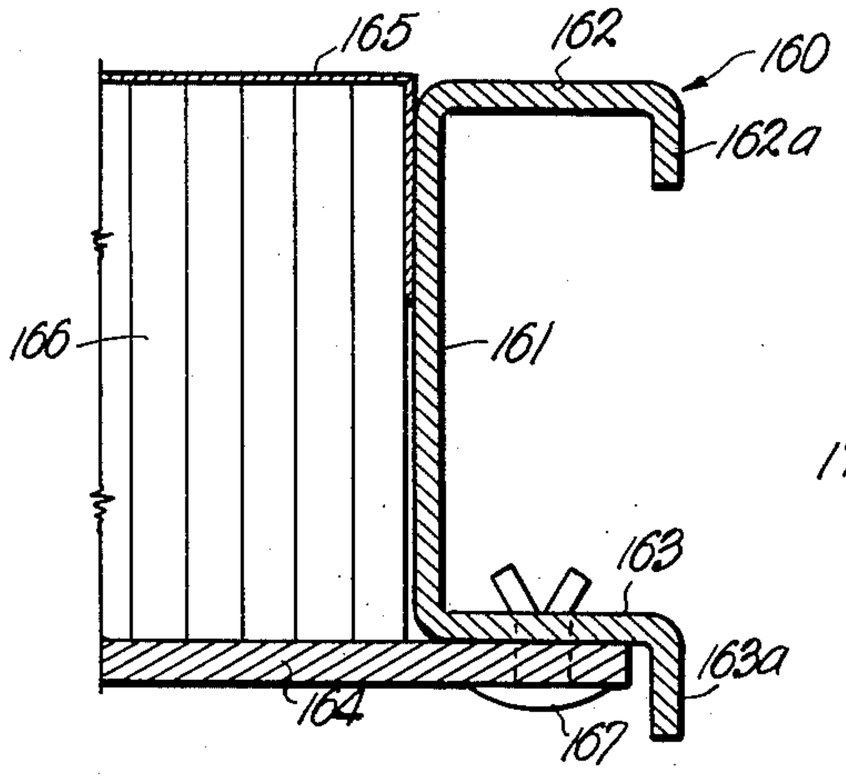

Fig. 11.

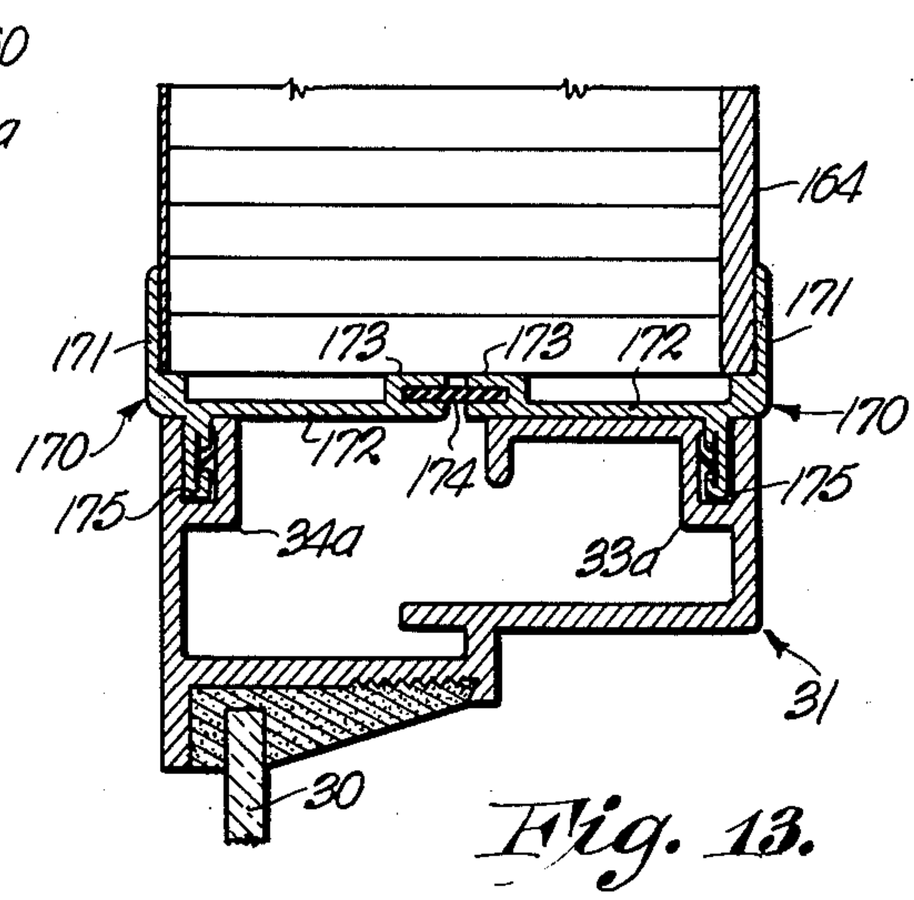

Fig. 13.

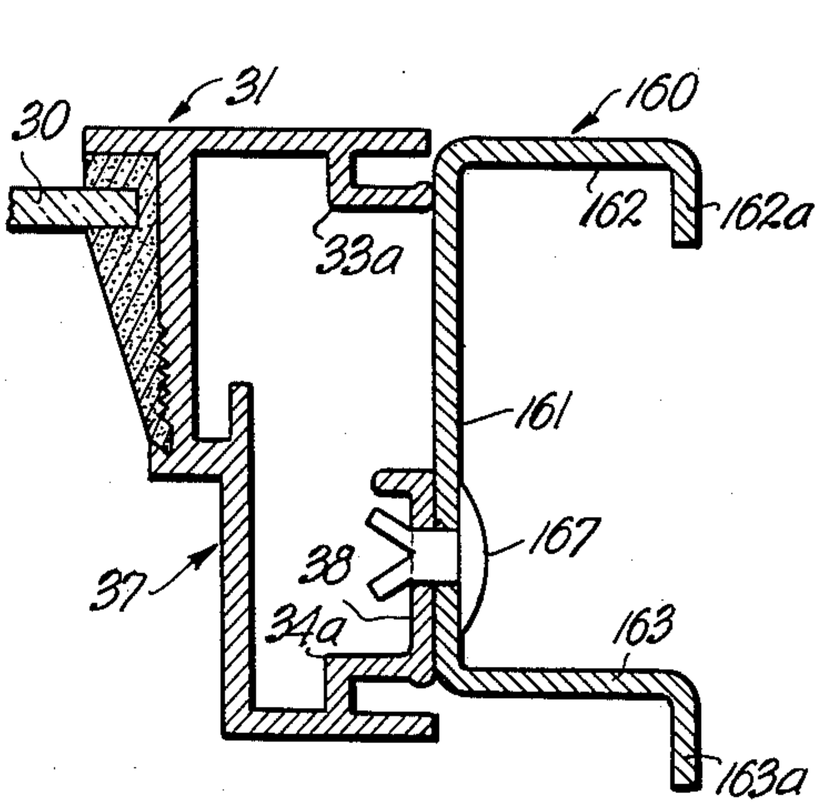

Fig. 12.

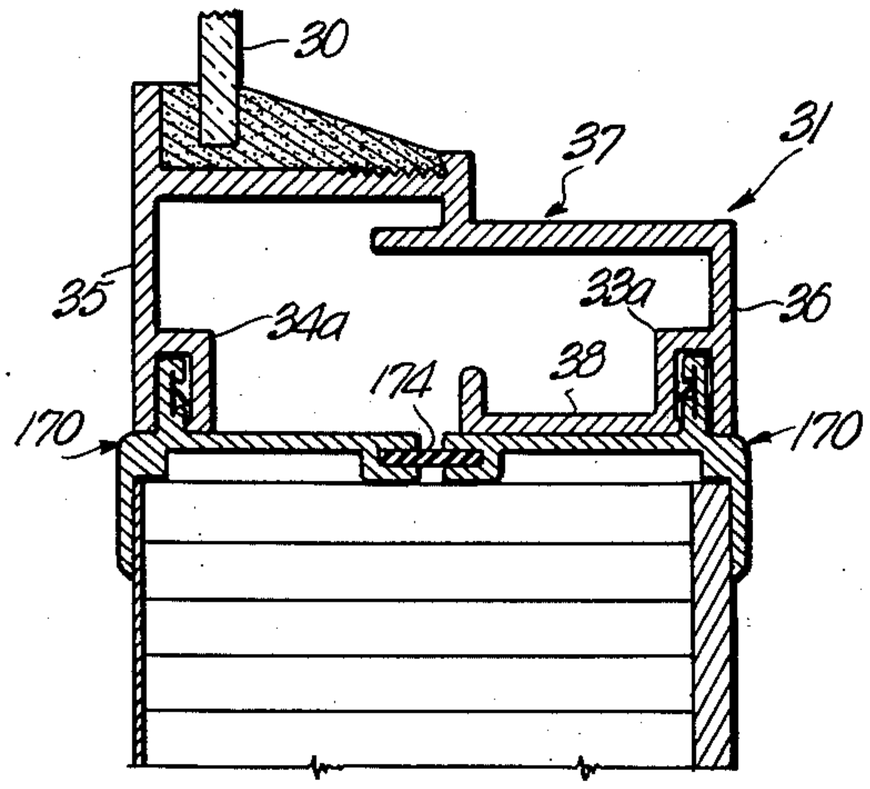

Fig. 14.

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WINDOW STRUCTURE FOR PANEL TYPE BUILDINGS

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2 Claims. (Cl. 189—65)

The invention relates generally to accessories for prefabricated panel type buildings, and refers more particularly to a window structure for use in such buildings.

One of the principal objects of the present invention is to provide a window structure for use in panel type buildings, which window structure has many advantages over previously known window structures with respect to cost, ease of assembly into the paneling system, and adaptability to various arrangements within the system and panels of different types.

Another object of the invention is to provide a novel window structure of the character described which is capable of being joined with like window structures in edge to edge relationship to provide serially joined windows which do not require a central mullion or bracing structure for purposes of supporting the respective components of the window assembly. It is a feature of our invention in this respect that the joining of adjacent windows with one another can be accomplished with ease and facility, and that the joint between the windows is weather-tight.

Still another object of the invention is to provide a window structure which is capable of being connected into a wall panel system with any given edge of the window uppermost, and without requiring any modification of the panels themselves in order to fit the window into the assembly.

Yet another object of the invention is to provide a window structure which has features of construction rendering it suitable for incorporation as an integral part of a rectangular building panel, as well as permitting its use as a separately added component of a differently constructed wall system. By our construction we have provided a single versatile window structure which may be incorporated without change into various panel arrangements.

Still another object of the invention is to provide a window structure of the character described which can be produced on a mass production basis and which can be assembled into a suitable panel system with a minimum number of supplemental fasteners and sealing agents.

Other and further objects of the invention together with the features of novelty appurtenant thereto will appear in the course of the following description.

In the accompanying drawings which are to be read in conjunction with the specification and in which like reference numerals indicate like parts in the various views;

FIG. 1 is a fragmentary front elevation of the outside of a panel type wall in which a pair of windows according to our invention are mounted in serially connected fashion;

FIG. 2 is a fragmentary section on an enlarged scale taken along the line 2—2 of FIG. 1 in the direction of the arrows;

FIG. 3 is a greatly enlarged cross-section of a typical side of the window frame, the section being taken along the line 3—3 of FIG. 1 in the direction of the arrows;

FIG. 4 is an enlarged fragmentary section taken along the line 4—4 of FIG. 1 in the direction of the arrows;

FIG. 5 is an enlarged fragmentary section taken along the line 5—5 of FIG. 1 in the direction of the arrows;

FIG. 6 is an enlarged fragmentary cross-section taken along the line 6—6 of FIG. 1 in the direction of the arrows;

FIG. 7 is an enlarged fragmentary section taken along the line 7—7 of FIG. 1 in the direction of the arrows;

FIG. 8 is an enlarged fragmentary section taken along the line 8—8 of FIG. 1 in the direction of the arrows;

FIG. 9 is a greatly enlarged fragmentary section showing the typical rib and groove connection between the window frame and adapter element;

FIG. 10 is a front elevation of a panel in which is integrally mounted the window structure of the present invention;

FIG. 11 is an enlarged fragmentary section taken along the line 11—11 of FIG. 10 in the direction of the arrows;

FIG. 12 is an enlarged fragmentary section taken along the line 12—12 of FIG. 10 in the direction of the arrows;

FIG. 13 is a fragmentary section taken along the line 13—13 of FIG. 10 in the direction of the arrows, and

FIG. 14 is an enlarged fragmentary section taken along the line 14—14 of FIG. 10 in the direction of the arrows.

Referring now to the drawings and initially to FIGS. 1–9, inclusive, in FIG. 1 we have illustrated two typical windows W embodying the features of our invention as incorporated in serially connected fashion in a wall system made up of a plurality of interlocking panels P.

So far as the panels are concerned, each panel has a flat inside face 20 which is joined with an outside face having stepped surfaces 21 and 22 to form a hollow structure. Within the panel body is contained insulation 23 which may be of glass fiber or other suitable composition. Each vertical edge of a panel P is so formed as to provide a tongue which is adjoined by a trough, one edge having the tongue 24 adjoined by trough 25 and the other having tongue 26 adjoined by trough 27. The tongues 24 and 26 on the opposite edges of the panel are offset from one another in the direction of the thickness of the panel so that when the panels are brought together in edge abutting relationship (FIG. 2) the tongues 24 and 26 will lap one another and be received in the respective troughs 25 and 27 to form a double tongue joint. Preferably each tongue includes a gasket 28 in the form of an extruded T shape of rubber or the like having the central web sandwiched between the panel portions forming the tongues, with the cross bar of the T positioned to wedge between the opposed walls of the troughs in which the tongue is received.

The panels P to the immediate left and right hand of the window structure are full length panels, while those above and below terminate at their juncture with the window structure. While not shown, it will be understood that suitable mounting structure is provided to hold the panels upright. If further details are sought they can be found in the co-pending application of William R. Callahan et al., Serial No. 652,005, filed April 10, 1957.

Each window W is identical to the other, and it will be understood that in describing one window, the same description applies to the other.

In the arrangement illustrated, each window W simply comprises a rectangular pane of glass 30 which is contained within a frame having the four identical interconnected sides 31. The pane 30 is joined with the frame by a suitable glazing compound 32. It will be understood that while we have shown only a simple single pane window, other types may be employed, the only requirement being that they be surrounded by and affixed to a frame of the character here involved.

As shown in the typical cross-section in FIG. 3, each side 31 of the frame is composed of an extruded struc-

ture having a pair of parallel outwardly open grooves 33 and 34, respectively, which are spaced from one another in the direction of the thickness of the window. Each groove runs the full length of the frame side and communicates at its ends with the like grooves in the adjoining frame sides. The grooves are formed in the preferred embodiment by angular portions 33*a* and 34*a* which are integral with and extend inwardly toward one another from the front wall 35 and rear wall 36 of the frame. It will be evident the front and rear walls 35 and 36 are joined by a web portion generally indicated by reference numeral 37. The web is subdivided into two offset elements 37*a* and 37*b* joined by an interconnecting transverse leg portion 37*c*. It will be noted that the portion 37*a* of the web extends in cantilever fashion past the transverse connecting leg 37*c*.

Extending forwardly from the angular portion 33*a* is the web 38 terminating in the inturned leg 38*a* which is spaced from the angular portion 34*a* to define therebetween an enlarged outwardly open cavity 39. The web portion 37*a* extends into this cavity and provides a surface for abutment of other parts during assembly, as will later be described.

It will be further noted that as to the outwardly open grooves 33 and 34, each is provided with a restricted throat portion formed by beads 33*b* and 34*b* which run the length of the respective grooves.

For reasons which will become apparent as the description proceeds, the width of the opening of cavity 39, that is, the spacing between the inwardly turned leg 38*a* and angular portion 34*a*, is at least equal to the combined thickness of tongues 24 and 26 of the panel, and preferably slightly greater. The distance from the outer face of web 38 to the face of web portion 37*a* is approximately the depth of the tongue 24 or 26.

The joints formed between the window frame and the panel structure both above and below and to the sides of the window assembly are illustrated in FIGS. 4–6, inclusive, and 8, while the joint between the windows themselves is shown in FIG. 7.

As shown in FIG. 5, the lower frame sides 31 are joined with the panels therebelow by superimposing the frame on the upper ends of the panels. To establish a connection between the frame and panels there is provided a channel-like adapter 40 which may run the complete length of the window opening. Channel 40 has the front leg 41 and rear leg 42 which are adapted to engage therebetween the front and back walls of the panel. The web portion 43 of channel 40 overlies the top of the panel; provided on the upper surface of web 43 are two spaced ribs 44 and 45 which are adapted to register with and fit within the grooves 33 and 34 of the window frame. The ribs 44 and 45 preferably run the full length of the channel 40.

The connection of the upper side of the window frames with the upper panels is quite similar to that just described. Referring to FIG. 4, it will be noted that a similar adapter 46 has a web portion 47 overlying the upper edge of the upper frame sides. The web portion 47 is provided with downwardly extending ribs 48 and 49 which are received respectively in the outwardly open grooves formed in the angle portions 33*a* and 34*a* of the frame side 31. The forward edge of the upper adapter 46 has the upwardly extending flashing 50 which engages the front of the panel. It is not absolutely essential in the upper adapter 46 to have a rear flashing for engaging the rear face of the panel. For purposes of appearance a depending flashing 51 may be provided to overhang and cover the joint.

Referring to FIG. 9, each of the ribs 44, 45, 48 and 49 is provided with a weatherstripping, which in the illustrated embodiment comprises a strip having the base portion 52 which is received within and retained in an undercut recess running the length of the rib. FIG. 9 shows only the rib 49, but it will be understood that the same arrangement is employed at the other rib and groove joints. Extending outwardly from the recess and integral with portion 52 is the flexible lip 53 which is of sufficient length as to resiliently engage the inside wall of the groove to provide a tight seal. The weatherstrip 52, 53 is preferably formed of a resilient material such as vinyl plastic, although other resilient materials such as neoprene or other synthetics may be employed with equal success. Alternately, a mastic may be employed to seal between the rib and surfaces of the groove.

FIGS. 6 and 8 illustrate respectively the manner of connection of the vertical ends of the window assembly with the adjacent panel structures. Referring first to FIG. 6, it will be noted that tongue 26 extends into the cavity 39 of the side frame. In order to provide a weather seal a channel 54 extends the full length of the cavity, the channel being fitted over the tongue and providing a sealing base for the gasket 28. The base of channel 54 engages a weathership 55 which is interposed between the channel base and the surface 37*a* projecting into cavity 39. It will be understood that the strip 55 is of any suitable mastic capable of being retained between the metallic surfaces. Naturally, it runs the full length of the joint.

In the case of the connection of the right hand panel with the window assembly as shown in FIG. 8, tongue 24 projects into cavity 39, thus permitting the edge wall of the panel to be brought closely adjacent the window frame and in abutment with the extension 38 on the frame. A mastic strip 56 is interposed between the edge wall of the panel and surface 38 to provide a weather-tight seal.

So far as the joint between the windows W is concerned, this is illustrated in FIG. 7. In this case the outwardly open grooves 33 and 34 formed by portions 33*a* and 34*a* directly confront and are aligned with one another. The connection between the adjacent frame sides is effected through the use of spline strips 57 and 58 which are of sufficient width to be received in the confronting grooves and run the full length of the frame sides. Spline strips 57 and 58 are preferably constructed of metal and include weatherstripping similar to that illustrated in FIG. 9 and described in connection therewith.

It will be evident from what has been said that one of the great advantages of our window structure and the way of assembling it with the panel assembly is that the identity of construction of the respective frame sides 31 makes it possible for any given window to be placed in position with any desired side uppermost. Stated otherwise, the windows shown in FIG. 1 can be turned 90° clockwise or counterclockwise so as to make the long axis vertical without requiring any change in the manner of assembly other than using different length upper and lower panels. The width of cavity 39 gives complete flexibility in placement of the windows in the panel structure, either side being capable of joinder with the tongue 26 or 24 of a panel. Moreover, any number of separate window structures can be assembled in serial relationship without requiring mullions or supports between the individual windows.

As is illustrated in FIGS. 10 through 14, inclusive, the window structure also lends itself to the ready adaptability of the window to inclusion in a single panel of different construction than earlier described.

The panel in this instance comprises an external rectangular frame having interconnected sides 160 which are formed as channel members, a typical one of which is shown in FIG. 11. The channel includes a flat web portion 161 with the outwardly turned legs 162 and 163 terminating in similarly bent portions 162*a* and 163*a*. The panel body in this case comprises an outer skin 164 and an inner skin 165 between which is sandwiched a honeycomb structure 166 which gives the panel both structural strength and thermal insulating qualities. Such panels are well known in the building industry. The frame is secured to the panel structure by connecting one leg (for example, leg 163) with an extending marginal portion of the skin 164 as by the fasteners 167.

The window opening in a panel as in FIG. 10 is formed by eliminating the central portion of the skin and honeycombed structure to provide a rectangular opening bordered on the sides by the central portions of side frames **160** and on the top and bottom by exposed edges of the panel body structure.

The upper and lower sides of the window are connected with the panel body as illustrated in FIGS. 13 and 14 respectively.

Referring first to FIG. 13, fitting over the front and back edges of the exposed edge of the panel are identical somewhat L-shaped adapter members **170**. Each adapter member includes a vertical leg **171** adapted to engage the outside face of the panel and a horizontal portion **172** which extends inwardly in the direction of the thickness of the panel. The inner edge of each horizontal portion is provided with a somewhat thicker segment **173** having formed therein a longitudinal groove. As shown in FIG. 13, the grooves in the segments **173** confront one another. To join the adapter portions **170** together a strip **174** is oriented with its opposite edges in the respective grooves. This strip runs the full length of the adapter assembly and serves the function of bridging the two adapters. By increasing or decreasing the width of strip **174** the adapter assembly can be accommodated to panels of varying thickness, as will be evident.

Each adapter **170** is provided with a downwardly depending rib **175** which is arranged to fit within the outwardly open grooves in the portion **33***a* and **34***a* of window frame **31**. As in the case of the preceding embodiment, the ribs **175** are fitted with weatherstripping of the type illustrated in FIG. 9, or other suitable material, such as a mastic, operable to seal between the ribs and grooves.

As shown in FIG. 14 the arrangement is the same at the juncture of the bottom of the window with the lower portion of the panel. Adapters **170** cooperate with the panels and with the grooves in the window frame structure in the same fashion as described above to interengage the frame with the panel body.

The joinder of the vertical frame sides of the panel frame sides **160** is illustrated in the typical cross-section forming FIG. 12. Here the web **161** of the panel frame is firmly secured to the extension **38** on the frame side as by the riveter fastener **167**. It will be understood that a plurality of fasteners may be spaced along the length of the frame side.

As in the preceding embodiment, the window is susceptible of being arranged in any desired position in a panel, that is, with the long axis vertical or horizontal. When assembled with the panel itself, it becomes a part of the panel and a plurality of panels may be connected together to form a wall in the usual fashion. The arrangement of FIG. 10 avoids the necessity of separately mounting the windows in the wall as construction progresses.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects

hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. In a window-wall assembly, the combination of a window structure, a panel disposed substantially in the same plane as the window structure and having a straight edge, said window structure including a frame having a portion forming an edge on the window structure adjoining said edge of said panel, said portion provided with a pair of parallel outwardly open grooves running lengthwise of said portion and spaced from one another in the direction of thickness of said window structure whereby to cause the open sides of said grooves to confront the adjoining edge of said panel, an adapter member disposed between said panel edge and said frame portion having a pair of spaced parallel ribs disposed within said grooves, means on said adapter engaging said panel, said ribs including recesses therein, and resilient sealing means disposed partially in said recesses but extending outwardly therefrom to engage an inside wall of said groove to provide a seal between each rib and its groove.

2. In a window-wall assembly, the combination of a pair of wall forming panels having spaced confronting and parallel edges defining two sides of a window opening, each said edge having a tongue portion and the respective tongue portions being offset from one another in the direction of the thickness of the wall, a window structure having a pair of opposed parallel sides for joinder with said sides of said window opening, said window sides having lengthwise outwardly open tongue receiving cavities running the full distance of said sides and of a width in the direction of thickness of the panels at least equal to the combined thickness of said offset tongue portion whereby to permit coupling of said window structure into said opening with either of the opposite sides of the window structure in coupling engagement with either of the tongue portions.

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