June 24, 1947. G. H. LENKE 2,422,837

PANEL CONSTRUCTION

Filed Nov. 30, 1945 3 Sheets-Sheet 1

Fig. 1

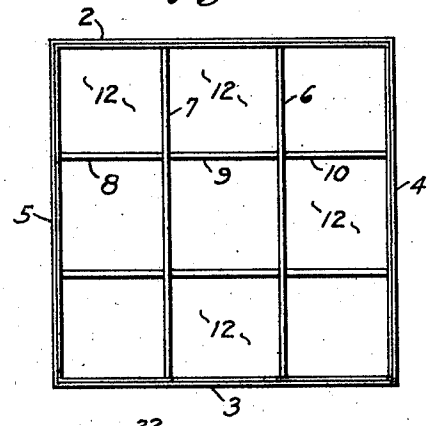


Fig. 3

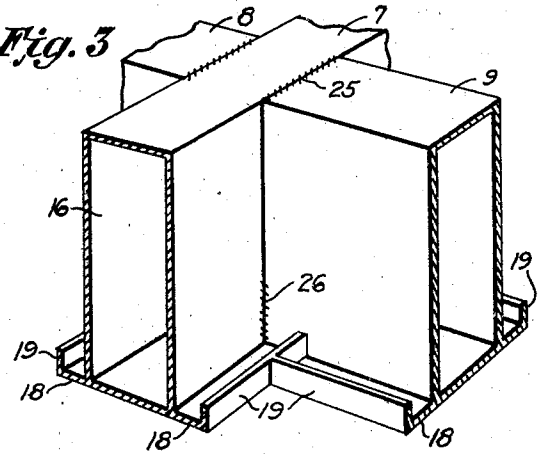


Fig. 2

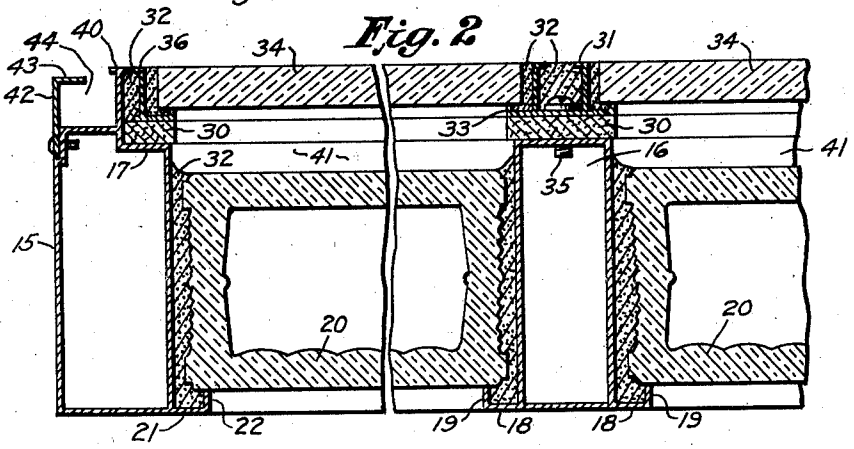
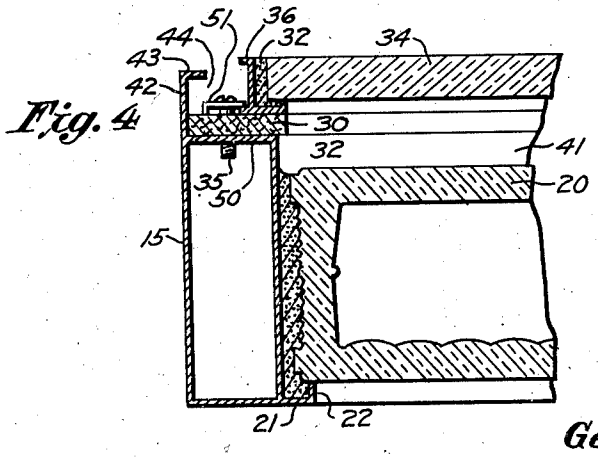


Fig. 4



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June 24, 1947. G. H. LENKE 2,422,837

PANEL CONSTRUCTION

Filed Nov. 30, 1945 3 Sheets-Sheet 2

Fig. 5

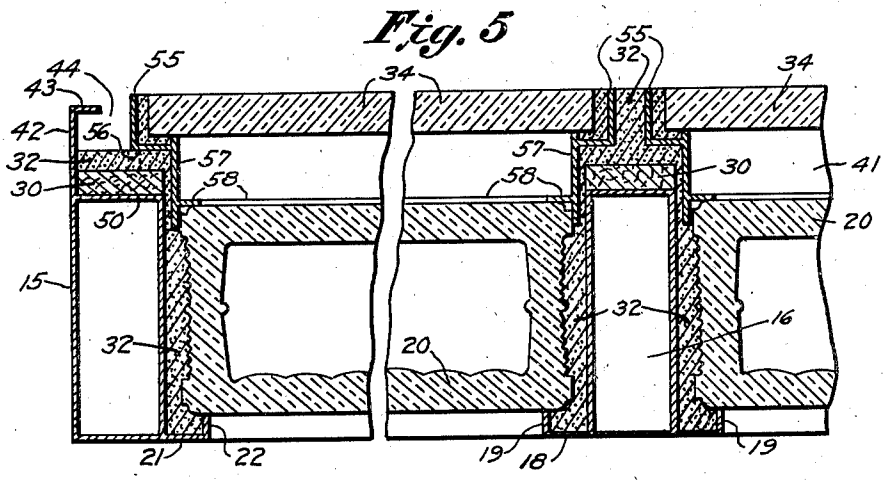


Fig. 6

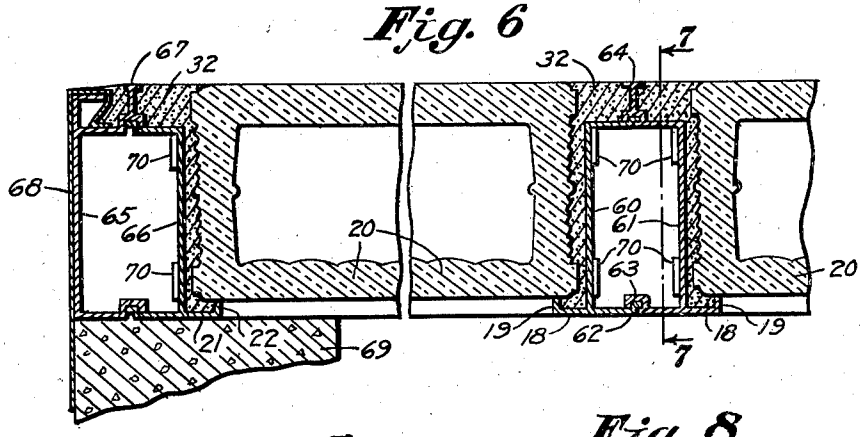


Fig. 7

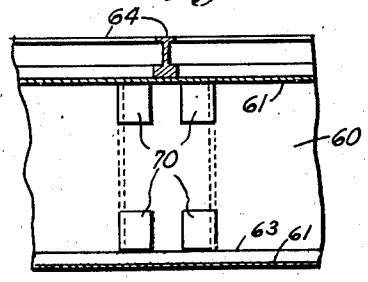
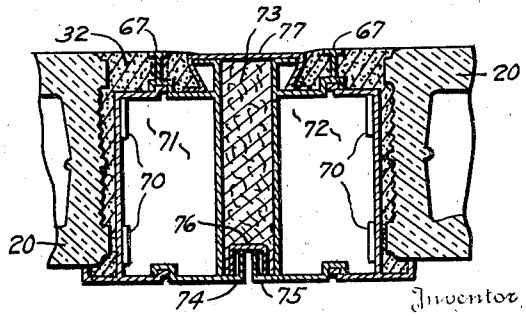


Fig. 8



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June 24, 1947. G. H. LENKE 2,422,837

PANEL CONSTRUCTION

Filed Nov. 30, 1945 3 Sheets-Sheet 3

Fig. 9

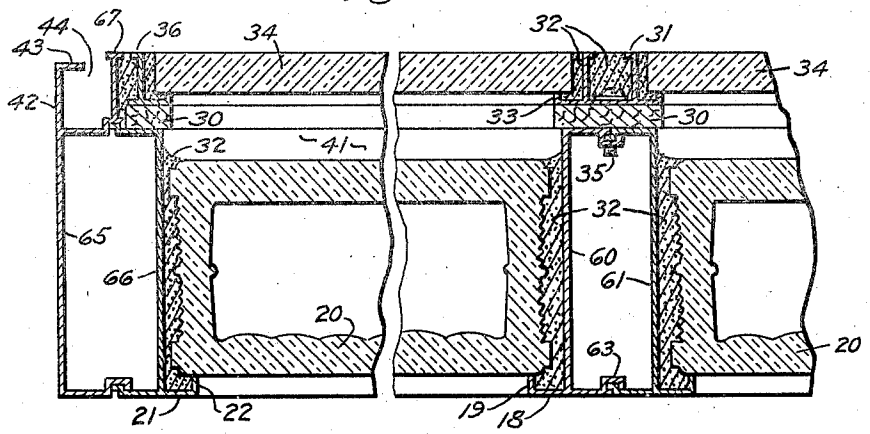
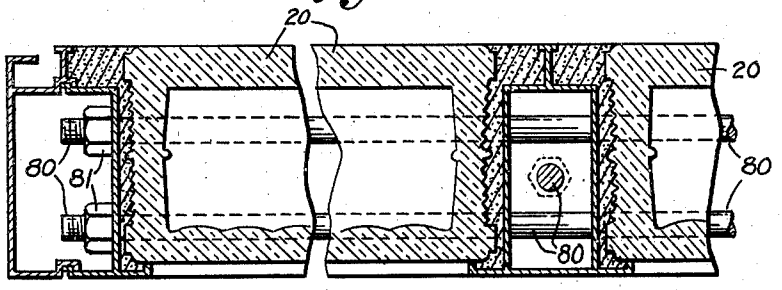


Fig. 10



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UNITED STATES PATENT OFFICE

2,422,837

PANEL CONSTRUCTION

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Application November 30, 1945, Serial No. 631,910

7 Claims. (Cl. 108—16)

1

This invention relates to light-transmitting panels, and has for its object to provide a construction which is simple in fabrication and less costly to manufacture than those heretofore proposed.

With these and other objects in view, the invention resides in the novel details of construction and combinations of parts as will be disclosed more fully hereinafter and particularly covered by the claims.

Referring to the accompanying drawings forming a part of this specification, and in which like numerals designate like parts in all the views—

Fig. 1 is a diagrammatic representation of a panel comprising a plurality of glazing units which may be prefabricated at the factory, for example, and sent to the job for installation as a unit;

Fig. 2 is a vertical sectional view of a panel construction comprising double glazing, and made in accordance with this invention;

Fig. 3 is a fragmentary perspective view of a joint formed by two intersecting ribs of the metallic framework of the panel;

Figs. 4 and 5 are vertical sectional views of modifications of the double glazing panel construction illustrated in Fig. 2;

Fig. 6 is a vertical sectional view of a panel provided with single glazing and comprising a hollow rib construction somewhat similar to that illustrated in Fig. 2;

Fig. 7 is a sectional view taken as on the line 7—7 of Fig. 6 and looking in the direction of the arrows;

Fig. 8 is a vertical sectional view of the construction which may be employed as in the case of a roof opening of such large dimensions that a plurality of skylights, or panel units such as illustrated in Fig. 6, are to be used, this figure illustrating the joint between two of such skylights or panels;

Fig. 9 is a vertical sectional view of a further modification of the panel construction shown in Fig. 2; and

Fig. 10 is a vertical sectional view of a modification of the panel construction illustrated in Fig. 6.

In the interests of simplicity, this invention hereinafter will be described as applied to skylights, but it is to be understood that the principles involved are equally applicable to the construction of building walls and/or partitions. According to this invention, there is provided an opening in the roof of a building into or over which opening a skylight is desired to be placed,

2

said skylight being of the type which becomes a more or less permanent part of the roof and which is relatively fixed as distinguished from other skylight constructions which provide ventilation as well as passage of light rays, and therefore the skylight of this invention is more or less horizontally disposed as an entity although it is to be understood that some inclination may be given to the skylight if desired. In such roof construction, the roof opening usually is defined by an upstanding curb and/or wall extending about the periphery of the opening and upon which the skylight is mounted. Further, but not necessarily, the such curb and/or wall may be of poured concrete.

This invention contemplates the prefabrication of a skylight unit, of overall dimensions corresponding to the roof opening and its circumscribing curb, wherefore the skylight in its complete formation can be made at the factory and shipped to the job for immediate installation, or conversely the skylights may be made in standard sizes by the manufacturer, and the roof opening with its curb designed by the architect with dimensions for receiving a standard prefabricated skylight.

In skylight construction, the individual glass panes and/or hollow glass blocks may be of different sizes and shapes, but usually in any one skylight the plurality of glasses are individually of the same size and shape, wherefore adjacent glasses may be separated by a rib extending from one side of the skylight to an opposite side, with intersecting ribs running transversely and thus dividing the entire skylight structure into a grid comprising a plurality of light admitting cells, the outermost ends of the ribs terminating in and secured to an encircling frame construction.

Such a skylight is diagrammatically illustrated in Fig. 1 wherein the numeral 2 designates one side frame member, 3 the opposite side frame member, 4 and 5 parallel frame members disposed transversely of the members 2 and 3 and joined thereto at their ends to create a completely closed frame. At 6 and 7 are indicated ribs which are parallel to each other and to the side frame members 4 and 5, said ribs being continuous between the frame side members 2 and 3; and intercostal ribs such as 8, 9 and 10 are provided, the ends of which terminate in and are supported by the continuous ribs 6 and 7 and/or the side frame members 4 and 5, said intercostal ribs being parallel to the side frame members 2 and 3.

Hence the frame is divided by all of the ribs into a plurality of light admitting cells each of

which is generally identified by the numeral 12 and is adapted to receive therein a glass as will be described later. The arrangement and number of the ribs may be varied as desired, but all of the ribs are substantially of the same height from top to bottom, with their top surfaces lying in a common plane, the such height being in accordance with the dimension of a glass insert comprising a portion of the skylight glazing, the such insert being as desired and either in the form of a single pane of glass or of a hollow glass block, and the term "glass" is intended to cover any material suitable for skylight constructions and which is capable of transmitting rays of light.

According to the construction shown in Fig. 2, the frame side member 5 and the continuous rib 7, heretofore described, are indicated in detail at 15 and 16 respectively and as being hollow, formed either by casting, moulding, extrusion or other methods including welding of individual sheets, the frame and the rib in transverse section being generally rectangular and assembled with their bottom walls in a common plane and the top walls of all ribs being in another common plane, which latter plane includes the shelf portion 17 of the frame. The bottom wall of each rib is extended laterally as at 18, with the outer edge portion thereof upturned as at 19 to provide not only a seat for the lower surface of a hollow block, generally identified by the numeral 20, but also a gutter or pocket for retaining sealing compound. In similar manner the bottom wall of each frame side member is extended as at 21 inwardly of the frame, and has its edge portion correspondingly upturned as at 22 to provide a similar block seat and pocket. It is to be understood that the extreme edges of all such upturned portions will lie substantially in a common plane so that when the skylight is assembled, the hollow blocks may be inserted in the cells 12 and abut, rest upon, or be supported by said seats in substantial horizontal alignment with each other as clearly shown in the drawing.

In Fig. 3 there is illustrated a typical joint between the ribs, the continuous rib such as 7 receiving in surface abutment the ends of intercostal ribs such as 8 and 9, the ribs being secured together, as also to the frame side members, preferably by welding which may be applied as at 25 at the top surface edges thereof, and welding such as indicated at 26 which may be applied in the lower regions of the joint made by the meeting sides of said ribs and members. The lowermost end portion of the intercostal rib may be cut suitably to accommodate the continuous rib and a frame side member.

When double glazing is desired, and as illustrated in Fig. 2, the vertical height of the ribs is made greater than the corresponding dimension of the hollow block 20, and strips 30 of cushioning material such as saturated felt, cork or the like are provided over the top surfaces of the ribs and shelf 17 of the frame, and above said strips there is disposed an auxiliary frame to hold the plurality of glass panes constituting the double glazing.

This auxiliary frame comprises rib portions which are generally of channel or U shape as indicated at 31 with their upper edge portions turned inwardly as shown to assist in the retention of packing and/or sealing compound generally identified by the numeral 32. The bottom wall of this channel-like rib structure is laterally extended with upturned edges providing the seats such as 33 for the bottom surfaces of the glass panes 34. Thus it will be seen that this rib structure is quite similar to the construction of the main ribs such as 16, and it may comprise continuous and intercostal members which are assembled and secured in substantially the same manner as are the corresponding parts of the main frame. This auxiliary frame may be secured to the main frame as by bolts or screw fasteners such as 35 inserted through the channel-like ribs 31 and extending through the cushioning strips 30 for threaded engagement with the top wall of the main frame ribs 16.

The outside member 36, constituting the periphery of the auxiliary frame, is of general L-shape in vertical section, with its lower leg lying in the same plane with the bottom wall of the channel-like ribs 31, and having the edge portion of said leg upturned to provide a pane seat which is a substantial duplicate of the pane seat 33 provided by said ribs. The light-transmitting cells, formed by the intersecting ribs of both the main and auxiliary frames, are of such size as to accommodate their respective glasses with a surrounding space between the sides of a glass and the vertical walls of the encompassing cell, which space is for the reception of sealing compound such as 32.

Each frame side member of the main frame, at the end of the shelf 17, has an upstanding wall 40 of such height that its upper edge will lie substantially in the plane of the top surfaces of the auxiliary frame and its glass panes 34 when the skylight is completely assembled, and the space between this wall and the outer members such as 36 of the auxiliary frame is likewise filled with sealing compound, said compound extending downward to the top surface of the cushioning strip 30 and effectively preventing the transmission of air and/or liquid to or from the space 41 between the upper and lower glazings. The glass blocks are similarly cemented in position in their light cells by sealing compound extending down to and into the pocket formed by the seats such as 19 and 22 created by the upturned edges of the bottom walls of the ribs and side members of the main frame. The cushioning strips, due to the inherent yieldability of the material thereof, will compensate for the expansion and contraction of the air in the space 41 due to changes in temperature, wherefore such air is confined in said space until the glazing seal becomes broken, either intentionally or accidentally, and hence said space is an insulating chamber with respect to temperatures.

In order to complete the skylight structure, a plate-like member 42 may be secured to or formed integrally with the outermost side wall of the main frame, which member extends upwardly and has its topmost portion in-turned as at 43 to provide, with the wall member 40, a pocket or gutter-like chamber 44 which may serve to conduct liquids such as rain away from the skylight or which may be filled with sealing compound, or which may receive an edge of a sheet of covering material or flashing where flashing is desired and as will be more specifically described hereinafter.

The modification illustrated in Fig. 4 provides for double glazing comprising the lower hollow glass blocks such as 20 and the upper solid glass panes such as 34 with the insulating air space 41 therebetween. The chief departure in construction from that shown in Fig. 2 resides in the arrangement of parts in the peripheral portion of the skylight.

That is to say, the frame side member 15 is devoid of the vertical wall 40 and the angularly formed shelf 17 heretofore described, the entire top wall 50 of this member being planar and constituting the support for the cushioning strip 30. Also, the outer member 36 of the auxiliary frame is secured in position through the instrumentality of a clip 51 overlying a flange of said member and held by a fastener such as the bolt 35 passing through the cushioning strip and threaded into or otherwise engaging the top wall 50 of the frame side member 15.

In Fig. 5 there is illustrated a construction wherein the upper glazing is supported by the lower glazing. In other words the main frame is substantially the same as that heretofore described with respect to Figs. 2 and 4, wherefore the same numerals 15, 16, 18, 19, 20, 21, 22, 30, 32, 34, 41, 42, 43, 44 and 50 have been applied to represent the same or substantially the same construction. The unitary auxiliary frame is replaced by a plurality of polygonal shields, a shield for each solid glass pane, said shield extending down into a light-transmitting cell and being supported by the hollow glass block in that cell, the said pane being disposed within the upper portion of the shield, as should be clear from the drawing.

Each shield has an L-shaped upper portion comprising a vertical wall 55 and a horizontal inwardly extending wall 56, these two walls forming an angular pocket into which the lower edges of the glass pane extend. The lower portion of the shield is stilt-shaped, and comprises a vertical wall 57, the upper edge of which extends slightly above the wall 56 to provide a seat for the pane, and a horizontal inwardly extending wall 58 adapted to rest upon the upper edge surface of the hollow block 20, the said vertical wall 57 extending slightly below the wall 58 and adapted to relatively closely fit the side edge surface of said block. Each shield has as many sides as the pane and block with which it is associated, and all of the sides of the shield are suitably joined at the corners of its polygonal shape, as by welding.

Each shield is of a size, naturally, to fit within the cell defined by the intersecting ribs 16 and frame side member 15, but a slight space is provided therebetween, as well as between adjacent shields, to receive the sealing compound 32 commonly employed in skylight constructions.

The modification shown in Fig. 6 provides for single glazing only, and comprises hollow frame side members and hollow ribs which are individually formed in plural parts which are interfitted and secured together as by welding during the assembly of the skylight. More specifically, each rib comprises two parts 60 and 61 which, when assembled as shown, provides a hollow rectangular rib of the general characteristics of those heretofore described. To assist in the securement of these two parts together, the edge portions such as 62 of one part are complementally formed with respect to the corresponding edge portions such as 63 of the other part, for interfitting relation, which relation may or not, as desired, also be interlocking as shown.

One of the parts of each rib is provided with a separator strip or shield such as 64 extending upwardly from the top of such rib and disposed substantially centrally of the completely assembled rib. The upper end of this shield preferably is formed with laterally extending flanges as shown to assist in the retention of the sealing

compound 32, and the overall vertical height of the rib plus said shield is such that said upper end terminates substantially in the plane of the top surfaces of the adjacent hollow glass blocks 20 constituting the glazing.

The frame side member is similarly formed of two parts 65 and 66 whose edges are also complementally formed for interfitting and/or interlocking relation, one of said parts likewise provided with a shield 67 which is substantially a duplicate of the shield 64. However, the outer part such as 65 of this frame member has its vertical wall extended above the top thereof, with an inturned upper edge portion, in a manner substantially the same as was indicated by the numerals 42 and 43 in Fig. 4. Flashing 68 of any suitable and/or required type may be applied over the sides of the skylight and the outer side surface of the curb wall 69 of the skylight opening, the upper edges of such flashing being extended over the inturned member 43 and into the space or pocket formed thereby with the shield 67, and anchored in such pocket by any convenient means including asphaltic or other packing as well as sealing compound.

In Figs. 6, 7 and 8 there are shown reinforcing means for the spot and/or tack welds used to secure the ribs and frame members. In other words plates, blocks or other stiff and rigid suitable means indicated by the numeral 70 are provided on the inner surfaces of said ribs and frame members at those locations where the welding is to be performed.

Fig. 8 illustrates a construction which may be used where the skylight opening is of such a large area that plural skylights are required to cover the opening. That is to say one skylight is represented as having the side frame member 71, the other skylight having the side frame member 72, the two skylights being closely adjacent each other with a space 73 therebetween which is filled with asphaltic or other packing, and/or sealing compound. The bottom walls of these side frame members are provided with outward extensions having upturned edge portions as indicated by the numerals 74 and 75, and these said portions are covered by an inverted channel-like strip 76. The upper portions of these side frame members are constructed similarly to those shown in Fig. 6, wherefore flashing 77 may be applied over the joint space 73, with the edges of such flashing secured in the side frame pockets as above described with reference to the flashing 68 of said Fig. 6.

The modification illustrated in Fig. 9 is for double glazing and comprises a combination of the structural features heretofore disclosed. That is to say, the side frame member is substantially a duplicate of that shown in Fig. 6, except for height. Each rib is generally similar to the rib 16 of Fig. 2, except it is formed in two parts such as 60 and 61 with interfitting edge portions such as 63 as shown in Fig. 6. The upper glazing and its mounting is substantially a duplicate of that shown in Fig. 2.

In Fig. 10 there is provided a construction for single glazing wherein the side frame member is substantially a duplicate of that shown in Fig. 6, but the rib differs from the rib of Fig. 6 in that it is made in one piece instead of two pieces. Additionally, this construction differs from the previously described structures, in the provision of reinforcing tie rods such as 80 which are disposed within the ribs and which extend from one side frame member to the opposite side frame member;

one or more tie rods may be in a rib. Where such tie rods are used, it will be necessary to have the side frame members made in two parts, in order that the nuts such as 81 may be actuated in the absence of the outer one of the frame parts.

From the foregoing it will therefore be seen that by this invention there is provided generically a light-transmitting panel construction comprising framing and glazing, the framing comprising closed hollow members establishing a light-transmitting cell, said members having projections such as 22 extending inwardly of said cell at one face thereof, the glazing comprising a light-transmitting hollow block disposed in said cell and abutting said projection, thereby covering a single cell construction with single glazing. More specifically the invention comprises framing members the walls of which are formed of sheet metal by any convenient method, the bottom wall being extended to provide the block supporting projections 22, and there being provided additional projections such as 40 and 42 at the opposite face of the cell, which additional projections establish the pocket 44.

The term panel is also capable of covering a larger structure comprising a plurality of cells formed by intersecting closed hollow ribs which, together with the outer frame members such as 15, provide a grid into each cell of which is fitted a glass block. In addition, the outer frame members may be formed, as also each rib, in two interfitting parts, this interfitting relation with respect to the outer frame members being particularly advantageous to permit access to tie rods which may be disposed for reinforcing purposes in each rib, the nuts such as 81 constituting, with a wall of the outer frame member, an anchorage for the tie rods.

Where double glazing is desired, the invention contemplates the provision of a shield such as shown in Fig. 5, encompassing a glazing such as the solid pane 34 in any one cell, said shield having inwardly extending flanges 58 adjacent its lower edge which are adapted to rest upon the upper surface of the hollow block 20, there being provided in the upper portion of said shield a pocket into which the side edge portions of the pane 34 are received, thereby resulting in the support by the block 20 of said pane and its shield in spaced relation to provide the insulating air chamber 41 between the two glazings. According to the construction shown in Fig. 2 the second or upper glazing is disposed, as individual panes, in each of a plurality of cells formed by intersecting separator elements of general U-shape and secured to the ribs of the main frame in spaced relation, likewise to provide the insulating air chamber 41. In all modifications of the invention sealing compound or its equivalent is provided to prevent passage of air and liquids, and of course the hollow blocks 20 have dead air spaces therein which add to the insulation value of the air chamber 41 in the double glazed construction.

It is obvious that those skilled in the art may vary the details of construction and arrangements of parts without departing from the spirit of this invention, wherefore it is desired not to be limited to the exact foregoing disclosure except as may be required by the claims.

What is claimed is:

1. A light-transmitting panel construction having heat and sound insulating characteristics, comprising framing and glazing, the framing comprising closed hollow members establishing a light-transmitting cell, said members having projections extending inwardly of said cell at one face thereof and additional projections at the opposite face of said cell, the latter projections establishing a pocket for receiving and retaining sealing means around the periphery of the glazing, the glazing comprising a light-transmitting hollow block disposed in said cell and supported by said first mentioned projections.

2. A light-transmitting panel construction having heat and sound insulating characteristics, comprising a grid and glazing, the grid comprising closed hollow frame members and intersecting closed hollow ribs establishing a plurality of light-transmitting cells, the bottom wall of each frame member and rib extended inwardly of a cell and provided with a flange, reinforcing means for said grid comprising a tie rod disposed in each rib and terminating in a frame member, the glazing comprising a light-transmitting hollow block disposed in each cell and supported by said flanges.

3. A light-transmitting panel construction comprising a grid and glazing, the grid comprising closed hollow frame members and intersecting closed hollow ribs establishing a plurality of light-transmitting cells, each frame member formed in two interfitting parts one removable from the other, the bottom wall of each frame member and rib extended inwardly of a cell and provided with a flange, the glazing comprising a light-transmitting hollow block disposed in each cell and supported by said flanges.

4. A light-transmitting panel construction comprising a grid and glazing, the grid comprising closed hollow frame members and intersecting closed hollow ribs establishing a plurality of light-transmitting cells, each frame member formed in two interfitting parts one removable from the other, the bottom wall of each frame member and rib extended inwardly of a cell and provided with a flange, a tie rod disposed in each rib and anchored to one of the parts of a frame member, the such anchorage being accessible upon removal of the other part of the frame member, the glazing comprising a light-transmitting hollow block disposed in each cell and supported by said flanges.

5. A light-transmitting panel construction comprising framing and double glazing, the framing comprising members establishing a light-transmitting cell, said members having projections extending inwardly of said cell, a glazing disposed in said cell and supported by said projections, a second glazing and a shield therefor, said shield having inwardly extending flanges adjacent its lower edge establishing a lower angular pocket formation embracing the upper edge portions of said first mentioned glazing, said shield further provided with an upper angular pocket formation to receive and to support said second glazing in spaced relation to said first glazing, and sealing means for said glazings.

6. A light-transmitting panel construction comprising framing and double glazing, the framing comprising members establishing a light-transmitting cell, said members having projections extending inwardly of said cell, a glazing disposed in said cell and supported by said projections, a second glazing and a shield therefor, said shield having a flange at its lower extremity extending inwardly relative the cell and resting upon the upper edge portions of said first mentioned glazing, said shield further provided with an upper angular pocket formation to receive and to support said second glazing in spaced relation

to said first glazing, and sealing means for said glazings.

7. A light-transmitting panel construction comprising double glazing and a grid for each glazing, the grid for the first glazing comprising closed hollow frame members and intersecting closed hollow ribs establishing a plurality of light-transmitting cells, the grid for the second glazing comprising a frame member and intersecting U-shaped separator elements establishing a corresponding plurality of light-transmitting cells, the bottom wall of each frame member, each rib and each separator extended inwardly of a cell and provided with a flange, a glazing disposed in each cell and supported by said flanges, each separator disposed in registry with a rib and secured thereto

in spaced relation to provide an insulating air chamber between the glazings of each cell, and sealing means for said grids.

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