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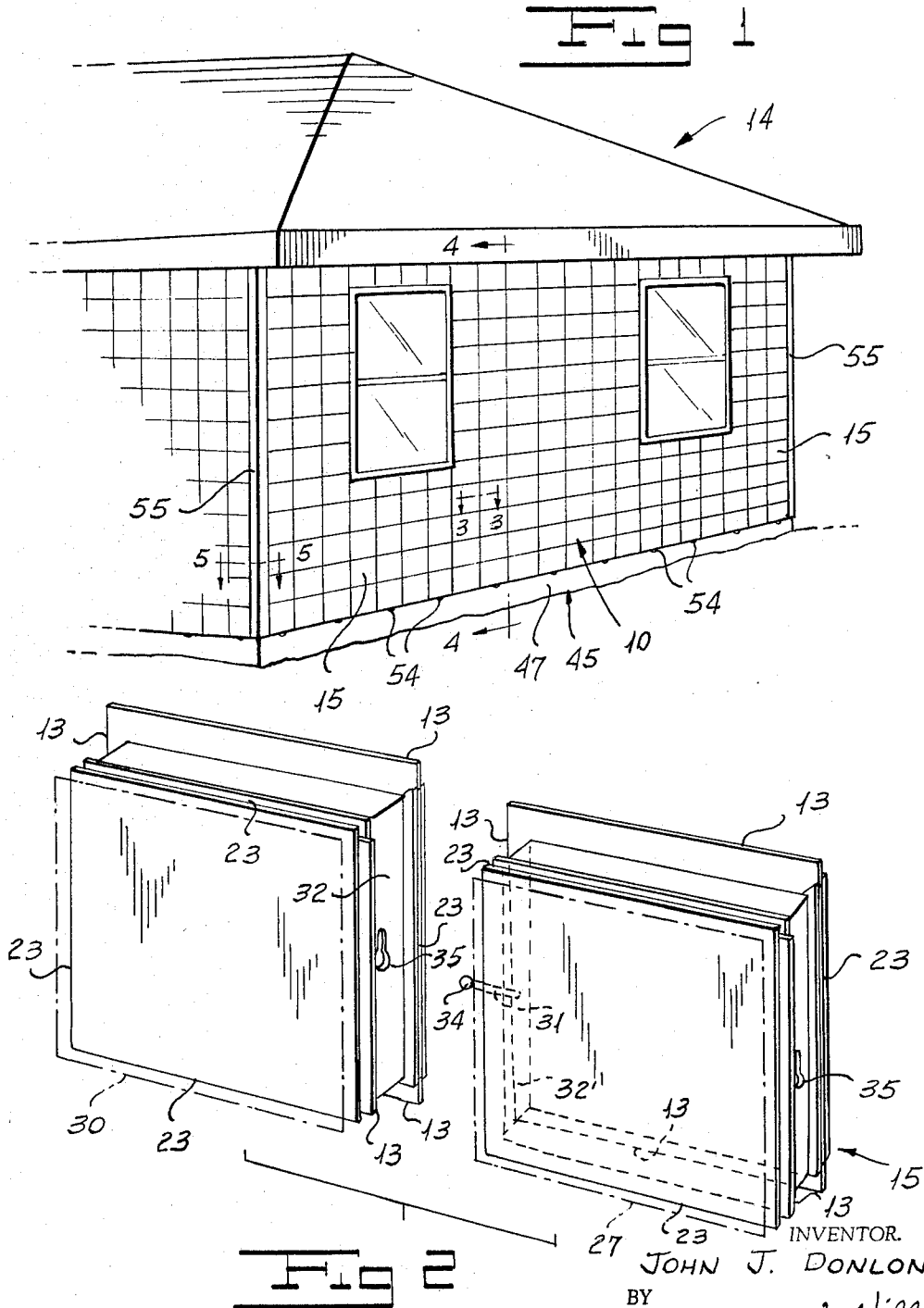
J. J. DONLON

3,286,423

BUILDING WALL AND PARTITION STRUCTURE

Filed March 19, 1963

3 Sheets-Sheet 1



INVENTOR.
JOHN J. DONLON
BY *Alfred W. Viller*
ATTORNEY

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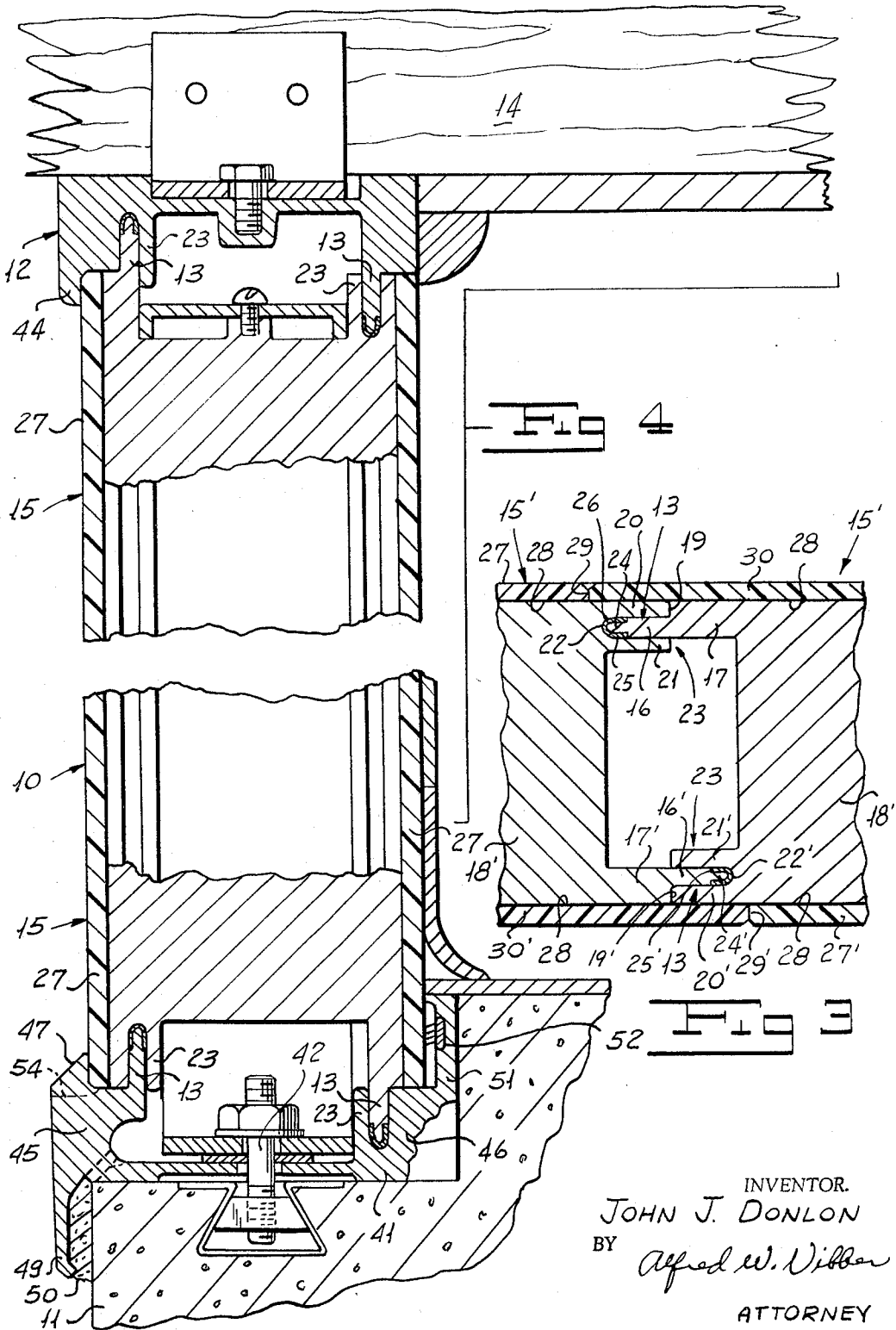
J. J. DONLON

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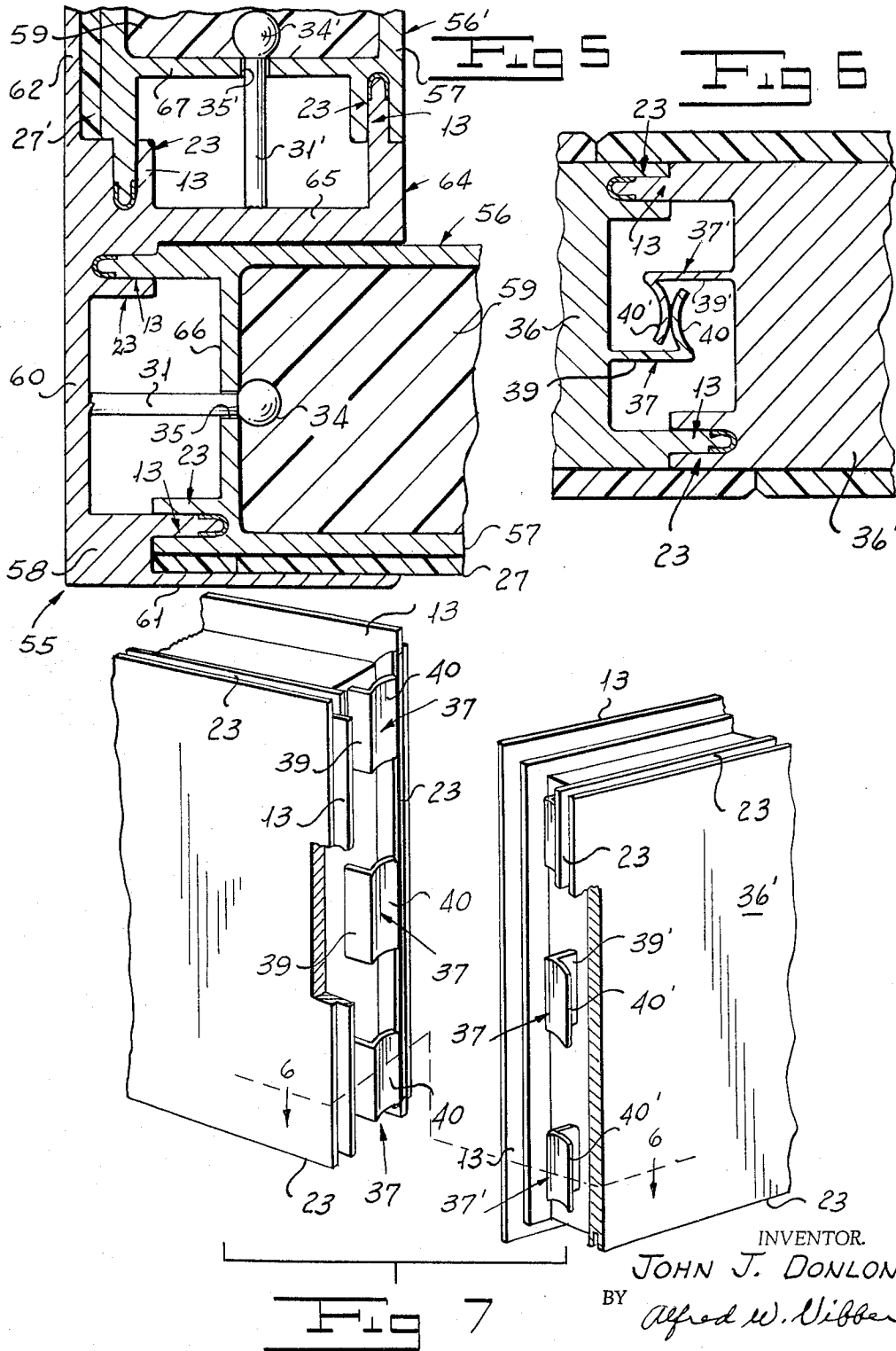
J. J. DONLON

3,286,423

BUILDING WALL AND PARTITION STRUCTURE

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3 Sheets-Sheet 3



INVENTOR
JOHN J. DONLON
BY *Alfred W. Nibben*
ATTORNEY

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3,286,423

BUILDING WALL AND PARTITION STRUCTURE

John J. Donlon, 953 Hastings St., Baldwin, N.Y.

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7 Claims. (Cl. 52-288)

This application is a continuation-in-part of application Serial No. 64,604, filed October 24, 1960, now Patent No. 3,160,246.

This invention relates to improved building structures, and particularly relates to building structures useful as walls, partitions, ceilings, and the like.

The invention has among its objects the provision of an improved wall structure, such structure being fabricated from a plurality of assembled panels, the wall structure being characterized by its economy, its attractiveness of appearance, and the ease with which it may be erected.

Another object of the invention resides in the provision of a novel building structure composed of a plurality of aligned edge-interfitting panels, such wall structure in preferred embodiments thereof being particularly adapted for use as outer walls of buildings.

Yet another object of the invention, in preferred embodiments thereof, resides in the provision of novel sealing means between successive panels, whereby the resulting wall structure becomes weather-tight upon its assembly.

Still a further object of the invention lies in the provision of novel locking means for securing successive panels together, the locking means being of such construction that the panels may be readily locked together and will remain thus locked if desired throughout their operative life.

The above and further objects and novel features of the invention will more fully appear from the following description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

FIG. 1 is a fragmentary view in perspective of a building such as a house incorporating an outer wall made of assembled panels in accordance with the invention;

FIG. 2 is an exploded view in perspective of two panels in accordance with the invention, such panels being shown in the relationship which they have as they are about to be joined;

FIG. 3 is a fragmentary view in horizontal section through the wall of the building of FIG. 1 at the location of an edge joint between two panels thereof, the section being taken along the line 3-3 of FIG. 1, the panels shown in FIG. 3 omitting the locking means between panels shown in FIG. 2;

FIG. 4 is a fragmentary view in vertical section through the wall of the building of FIG. 1, the structure there shown being shortened in height by the breaking away of an intermediate portion of the wall, the section being taken along the line 4-4 of FIG. 1;

FIG. 5 is a fragmentary view in horizontal section taken through a corner of the building which is fragmentarily shown in FIG. 1, the section being taken along the line 5-5 of FIG. 1;

FIG. 6 is a fragmentary view in horizontal section through a vertical joint in a wall incorporating panels made in accordance with a second embodiment in accordance with the invention, the section being taken, in the same manner as that of FIG. 3, along a line generally represented by the broken section line 6-6 of FIG. 7; and

FIG. 7 is a fragmentary view in perspective of two panels made in accordance with the embodiment of FIG. 6, such panels being separated and having such relative positioning as to permit them to be assembled by movement toward each other followed by the sliding of the panels into edge alignment.

The building structure of the present invention is disclosed in connection with the three embodiments of vertical wall which may be employed, for example, as the outer wall of a building such as a house. It is understood, however, that the building structure in accordance with the invention is capable of much wider use, such structure lending itself admirably to use as inner walls or partitions of buildings, ceiling for rooms of buildings, and roof structures of buildings.

In FIG. 1 the illustrative wall structure is generally designated by the reference character 10. Wall 10 is shown (FIG. 4) as extending between a floor slab 11 and a horizontally extending cap structure 12 which forms the support for the lower edge portion of a pitched roof 14. The wall structure 10 is made up of a plurality of similar panels 15, each such panel except those in the edge courses thereof edge-abutting other similar panels. The configuration of the panels at the edges thereof is somewhat similar to that disclosed and claimed in the above referred to prior application Serial No. 64,604. The panels of the present invention, however, are preferably made in a manner which is different from that shown in the said prior application, and incorporate novel edge sealing means. In two of the panels disclosed (FIGS. 2 and 6, 7), novel panel locking means are employed. A novel corner fascia is also here disclosed (FIG. 5), such fascia lockingly interfitting with panels made in accordance with FIG. 2 of the present invention.

The first embodiment of panel made in accordance with the present invention is shown in FIG. 2. The body of such panel is preferably made as an integral member molded from tough strong plastic material such as phenol formaldehyde, with or without a reinforcing filler as required by the load to which the panels are subjected. Panels made of phenol formaldehyde reinforced with glass fibers have proved to be particularly satisfactory. Panels 15 may have solid bodies, as shown at 18' in FIG. 3, or may be formed generally as a side-panelled frame which may be left hollow or may be filled with sound and heat insulating material (FIG. 5) such as a foamed plastic material, foamed polyurethane and foamed polystyrene being examples of such insulating materials.

The panels 15, which in the illustrative embodiment are generally of square contour in elevation, are of a size, for example, of 8" by 8". It will be understood, however, that the panels may be of other polygonal shape, such as rectangular, and have any feasible heights and widths. The construction of the interfitting vertical edges of two successive horizontally aligned panels 15, which is generally the same in all of the disclosed embodiments, is shown in FIGS. 3 and 6. Turning to FIG. 3, the panels 15' there shown differ from the panels 15 of FIGS. 1 and 2 only by the omission of the pin and key-hole slot locking means, to be described, employed with panels 15, as shown in FIG. 2.

As shown in FIG. 3, the panels 15' have interfitting edge configurations along opposite sides of an edge of the panel which are reverse mirror images of each other. Thus the right hand panel 15' has a vertical flange 16 on its upper (inside) edge, such flange projecting from a thicker root portion 17, there being an inwardly projecting shoulder 19 at the junction of flange 16 with root 17. The left hand panel 15' has a similar vertical flange 16' on its lower (outer) edge, a similar root 17', and a similar shoulder 19'. Such flanges 16, 16' with their

attendant parts are herein designated the "male" parts of the edge joints between panels, and are generally designated by the reference character 13. The left hand panel 15' has spaced parallel vertical flanges 20 and 21 on its upper (inner) edge, and the right hand panel 15' has similar vertical flanges 20' and 21' on its lower (outer) edge. Flanges 20, 21 and 20', 21' are spaced so as accurately to receive the corresponding flanges 16 and 16' therebetween, as shown, the flanges and grooves being of such height and depth that the ends of flanges 20 and 20' engage the shoulders 19 and 19', respectively, when the panels are interfitted as shown. Such flanges 20, 21, and 20', 21' with their attendant parts are herein designated the "female" parts of the edge joints between panels, and are generally designated by the reference character 23. The outer surfaces of flanges 20 and 20' lie coplanar with the extended outer surfaces of the bodies of the respective panels, so that they form coplanar extensions of the extended outer surfaces of the other, confronting panel. The border-forming edges 19 and 19' of the frame member 27 lie in a common transverse plane which is normal to the opposite broad surfaces of the frame member 27 and thus of the panel in which it is incorporated.

The vertical grooves 22, 22' between flanges 20, 21 and 20', 21', respectively, have a depth which somewhat exceeds the effective height of flanges 16, 16'. The outer ends 24, 24' of flanges 16, 16' are of reduced section, terminating at shoulders 25, 25'. Thus there are presented vertical spaces within which sealing material 26, 26' may be located, as shown, to be forcibly and sealingly engaged between the root and sidewalls of the grooves 22, 22' and the tip and sidewalls of flange portions 24, 24', and the shoulders 25, 25' thereof. A suitable material 26, 26' is one in the form of a water impervious elastomeric material which may be, for example, a thin-walled vinyl tubing which is pressed into the grooves 22, 22'. When such tubing is engaged by the ends of flanges 16, 16' it is collapsed and deformed as shown.

The panels 15 (and 15', FIG. 3) are provided with covering layers of substantial thickness and rigidity which may be secured as by layers 28 of adhesive between the broad faces of the bodies of the panels and the inner surfaces of the covering layers. Such covering layers will be made of material which is appropriate to the building; such material may differ as between that on the outside of the building and that on the inner surface of the wall. The covering layers may be made of any suitable self-sustaining material such as rigid or semi-rigid plastic material, wood veneer, sheet metal, etc., those on the outside of the building preferably being made of water impervious material.

The covering layers are preferably disposed in the novel manner shown in FIGS. 2 and 3, whereby they aid, when made of water impervious material, in forming a water and weather-tight seal between the confronting, interengaging edges, both vertical and horizontal, of successive panels. Thus the covering layer 27 on the upper (inside) surface of the left hand panel 15 (FIG. 3) extends to the right a distance somewhat short of the bottom of groove 22 to terminate at a vertical edge 29 having an outer bevelled edge. A similar covering layer 27' is provided on the lower (outer) surface of the right hand panel 15', layer 27' terminating in a vertical edge 29'. The upper (inner) surface of the right hand panel 15' is provided with a covering layer 30 which extends to the left snugly to overlies the surface of flange 20 and so that its left hand vertical edge snugly engages edge 29 of layer 27 when the panels are fully interengaged as shown. The lower surface of the left hand panel 15' is provided with a similar covering layer 30' which similarly overlies the outer surface of flange 20' and engages the edge 29' of covering layer 27'.

The panels 15 of FIGS. 1 and 2 have the same mating

edge configurations as those above described in connection with panels 15' in FIG. 3, and have the same relative horizontal disposition of the respective covering layers thereon. Consequently, the same reference characters are employed to designate parts of the panels 15 as are employed in connection with panels 15'. In FIG. 2 the surfaces of the panels 15 inwardly of the building face the reader, the surfaces of such panels outwardly of the building lying remote from the reader.

The upper edge configurations of panels 15 in FIG. 2 are disposed in the same manner, that is, with the higher flange or "male side" 13 corresponding to flange 16 of the vertical joint to the outside of the building and the two parallel flanges or "female side" 23 corresponding to flanges 20 and 21 of the vertical joint to the inside of the building. The male side is continued on the outside of the building down the left hand vertical edge of each of panels 15 in FIG. 2 and extends along the bottom of each panel. A female side is present on the outside of the building at the right hand vertical edge of each of the panels.

Considering the edges of panels 15 at the inside of the building, the right hand vertical edge of each panel is provided with a male side. All of the others of such edges are of the female type. There is thus provided a panel which interfits with abutting panels along vertical and horizontal joints in the same manner. The covering layers 27, 27', and 30, 30' of the panels are in reality the same for each panel, being displaced on the inside of the building somewhat downwardly and to the right (FIG. 2) of the panel proper, and being displaced on the outside of the building somewhat downwardly and to the left (FIG. 2) of the panel proper. There is thus produced at each vertical joint between successive panels the staggered relationship between the panels proper and the covering layers shown in FIG. 3. The covering layers on one horizontal course of panels overlies the upper edge of the panels proper of the next lower course of panels. This is important particularly as regards the covering layers on the outside of the building, since it protects the horizontal joints between successive horizontal courses of panels from the intrusion of water and moisture. The vertical joints between successive panels in a horizontal course of panels is protected by the overlying covering layers in generally the same manner.

Successive panels may be further locked to each other by locking means such as that shown in FIG. 2 or that shown in FIGS. 6 and 7. In FIG. 2 the locking means between the vertical edges of successive panels takes the form of a stud or rod 31 which projects from the broad surface 32' of the edge of a panel normal to such broad surface. Stud 31 has a head 34 which is designed to pass through the larger end of a keyhole slot 35 in the broad surface 32 of a mating panel and to be retained behind the borders of the smaller end of the keyhole slot when the panels are in full mating aligned relationship. To mate such panels, it is necessary only to bring the panels together in edge-mating relationship with the stud 31 projecting through the larger end of the keyhole slot, following which the panels are slid relatively to each other to bring them into locked condition and in edge alignment.

In FIGS. 6 and 7 there is shown a second embodiment of locking means which may be employed between successive panels, there designated 36 and 36', respectively. The male and female portions 13 and 23, respectively of the edge formations of the panels are the same as those described in connection with FIGS. 2 and 3 above, and need not be further described here. For simplicity, the covering layers on the panels have been omitted in FIGS. 6 and 7.

In the construction of FIGS. 6 and 7 a plurality (three shown) of shallow hook-like members 37 are spaced along a vertical edge of panel 36, and the same number (one broken away for clarity of illustration in FIG. 7),

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of oppositely disposed members 37' are spaced along the mating vertical edge of panel 36'. Members 37 and 37' have the same relative locations along the edges of the respective panels, and are spaced from each other along such edges by distances which somewhat exceed their vertical width. Members 37 and 37' have a first vertical leg or pedestal portion 39 and 39' and a second vertical leg 40 and 40', respectively, the first and second vertical legs being of appreciable length in the directions along the edge of the respective panels, as shown in FIG. 7. Such first and second vertical legs of the respective members 37 and 37' form an acute solid angle with respect to each other, the vertex of such solid angle being a line which lies parallel to the edge of the panels and thus parallel to the abutting edges of successive panels at the joint therebetween. Each of the second vertical legs is formed so as to be concave in a direction outwardly from the edge of its respective panel, the second leg as a whole, however, extending generally at a right angle to its respective first leg. The thus formed shallow hooks are open at opposite sides when the panels are positioned as in FIG. 7. The inner confronting faces of legs 40 and 40' are preferably of convex contour, as shown, so that they contact each other along surfaces which are little broader than a line, whereby the engaging hook-like members readily adjust to each other and do not tend to cause the inter-engaging male and female portions of the edges of the panels to bind. The hook-like members 39, 40 and 39', 40' are of such section and height measured from the broad surfaces of the panels from which they project that they spring at least slightly when they are engaged, and maintain tight engagement between panels. The panels 36 and 36' may be lockingly engaged by advancing them toward each other when they are vertically relatively displaced, as shown in FIG. 7, until the male and female portions of the edges are fully engaged, following which the panels are shifted relative to each other in a vertical direction to cause the hook-like members to engage and overlie each other.

If desired, the hook-like members 39, 40 and 39', 40' may be made continuous, thus extending throughout all or a predominant part of the length of the edges of the panels. With such latter construction, the panels must be fitted together by relative movement thereof solely along the edges being joined. The hook-like members, when made to be either discontinuous or continuous, as described, may if desired, be made as inserts of metal or of a plastic material different from the body of the panel, rather than as integral parts of the panel.

In FIG. 5 there are shown two modified panels 56 and 56' which are of the above-referred-to type wherein a frame is filled with heat and/or sound insulating material. Thus the panel 56 has a hollow frame 57 which may be molded or cast from plastic material. The space within the frame is filled with material 59 such as foamed-in-place polyurethane.

The manner in which the wall of the building made up of panels 15 may be secured to the floor or foundation slab 11 and to the cap structure 12 is illustrated in FIG. 4. An elongated upwardly open base channel member 41 is secured to the edge of slab 11 as by being cast therein to lie along the upper corner thereof, and by the use of anchoring bolts 42 secured to the slab. Channel member 41 has an outer male edge formation 13 and an inner female edge formation 23 thereon spaced to receive formations 23 and 13, respectively, of the lowermost course of panels 15. The cap 12 is in the form of an elongated downwardly open channel member having an outer female formation 23 and an inner male formation 13 which receive the formations 13 and 23, respectively, on the top of the uppermost horizontal course of panels. The roof structure 14 is secured to cap 12, as shown.

Preferably, channels 41 and 12 include means for sealing the outer edges of the joints between them and the panels 15. Thus channel 12 has an elongated flange

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44 which overlies and snugly engages the upper outer edge portion of covering layer 27 of the top course of panels. Base channel 41 is provided with thickened webs 45 and 46 extending outwardly and inwardly thereof, respectively. Web 45 has an upwardly extending elongated flange 47 extending therealong, the inner face of flange 47 snugly engaging the lower outer edge of the covering layer 27 on the lowermost course of panels 15. A flange 49 extending downwardly from web 45 overlies and is spaced outwardly of the outer side face of slab 11. The space between such side face of the slab 11 and flange 49 may be filled with sealing material 50.

The upper outer face of flange 47 is preferably slanted downwardly and outwardly, as shown, to divert rain water from the junction of the lowermost panels and the base channel 41. The flange 47 may, if desired, be provided with a plurality of scallops 54 of a depth equal to the height of flange 47 to permit drainage and drying moisture from the lower outer edge of the lowermost panels 15.

Projecting upwardly from the inner edge of web 46 of channel 41 is an elongated flange 51 which overlies and is spaced somewhat inwardly of the inner covering layer 27 of the lowermost course of panels. The space between flange 51 and the inner covering layer of the panels is filled with sealing material 52.

The building illustrated in FIG. 1 may be provided with corner fasciae 55 which cap and seal the corner joints between successive walls of the building. The construction of a fascia 55 and its manner of interaction with panels at the corner of the building are shown in FIG. 5. The panels there shown, designated 56, 56', are of the modified "filled" type above described. It will be understood that the panels 15 of FIGS. 1 and 2 may also be joined and sealed by fasciae 55.

The fascia 55 of FIG. 5 has a corner portion 58 from which there project at 90° with respect to each other flange or plate portions 60 and 61. Plate 60 carries a male formation 13 and a female formation 23 which face to the right to mate with formations 23 and 13, respectively, on first panels of which one is shown at 56. The plate 61 of the fascia snugly overlies the covering layer 27 on such panels.

Intermediate the width of plate 60 there is a channel portion 64 integral therewith, channel 64 being open in a direction which lies at 90° with respect to the main extent of panel 56. Channel 64 carries formations 13 and 23 which interfit with formations 23 and 13, respectively, of a vertical row of second panels 56'. The base 65 of channel 64 snugly overlies the inner surface of panels 56. Beyond the formation 23 of channel 64 the plate 60 is continued in a thinner section 62 which snugly overlies the outer covering layer 27' of panels 56'.

A locking stud 31 having a head 34 thereon extends from plate 60 toward each of panels 56, each stud being lockingly received in a keyhole 35 in the edge web 66 of panel 56. A locking stud 31' also extends from base web 65 toward the edge 67 of each of panels 56', each latter stud being lockingly received in a keyhole slot 35' in the edge web 67 of panels 56'.

The fascia 55 is applied to the end of one of two meeting walls of the building, after such one wall has been fully erected, by entering the studs into the larger upper ends of the keyhole slots in the end panels of such wall and then sliding the fascia downwardly. The other wall of the building may now be erected, beginning at the fascia and locking the panels of the second wall progressively to the fascia.

Although only a limited number of embodiments of the wall or partition panel, sealing and locking means between panels, novel corner fascia, have been illustrated in the accompanying drawings and described in the foregoing specification, it is to be especially understood that various changes, such as in the relative dimensions of the parts, materials used, and the like, as well as the suggested

manner of use of the apparatus of the invention, may be made therein without departing from the spirit and scope of the invention as will now be apparent to those skilled in the art.

What is claimed is:

1. A rectangular panel adapted for use in a multi-panel wall structure, said panel having opposite broad parallel surfaces, said panel having four elongated edges which form a closed border around the panel, said edges each having longitudinally extending formations thereon, said formations each comprising a longitudinally extending tongue and a longitudinally extending groove laterally spaced from the tongue, the tongue being adapted to be received within a groove on a mating edge of another panel and the groove being adapted to receive a tongue on said edge of the other panel, three consecutive edges of the panel having tongues on the same one side of the edges and grooves on the same other side of the edges, and the fourth edge having a groove on the said one side of the edge and a tongue on the said other side of said edge.

2. A wall structure comprising a plurality of interlocked rectangular panels disposed in edge engagement in courses which lie at right angles to each other, the four edges of each of the panels having formations thereon which lie between the broad opposite surfaces of the panels, which extend longitudinally of the edges of the bodies of the panels, and which mutually interfit, the interfitting formations on each of the said panels comprising a longitudinally extending tongue and a longitudinally extending groove laterally spaced from the tongue, the tongue of one panel at a joint between contiguous panels being receivable within the groove on the edge of the other contiguous panel upon relative movement of aligned panels thus to be joined toward each other in their common plane, said panels having broad surfaces on both sides thereof lying parallel to the broad extent of the panels, and a covering layer of material lying on at least one, same side of each of the panels, an elongated bottom rail and an elongated upper cap, said wall structure extending between the rail and the cap, the rail and cap having edge formations which interfit with the lower and upper edges of the wall proper.

3. A wall structure comprising a plurality of interlocked rectangular panels disposed in edge engagement in courses which lie at right angles to each other, the four edges of each of the panels having similar formations thereon which lie between the broad opposite surfaces of the panels, which extend longitudinally of the edges of the bodies of the panels, and which mutually interfit, the interfitting formations on each of the said panels comprising a longitudinally extending tongue and a longitudinally extending groove laterally spaced from the tongue, the tongue of one panel at a joint between contiguous panels being receivable within the groove on the other contiguous panel upon relative movement of aligned panels thus to be joined toward each other in their common plane, said panels having broad surfaces on both sides thereof lying parallel to the broad extent of the panels, and a covering layer of material lying on at least one, same side of each of the panels, an elongated bottom rail and an elongated upper cap, said wall structure extending between the rail and the cap, the rail and cap having edge formations which interfit with and are complementary to the formations on the lower and upper edges of the wall proper, the rail and cap having outer flanges thereon which overlie and snugly engage the lower and upper outer borders of the wall proper.

4. A wall structure as claimed in claim 3, wherein the said flange on the rail has longitudinally spaced passages therein extending generally horizontally outwardly from the root of the flange whereby to drain moisture from the lower edge of the wall proper.

5. A corner fascia for a wall structure composed of two walls substantially meeting at an angle, each of the

walls being composed of a plurality of interlocked panels disposed in edge alignment in courses which lie at right angles to each other, each of said panels having frame members extending along the edges thereof, the frame members along the edges of contiguous panels having formations thereon which lie between the broad opposite surfaces of the panels, which extend longitudinally of the edges of the bodies of the panels, and which mutually interfit, the interfitting formations on each of the said frame members comprising a longitudinally extending tongue and a longitudinally extending groove laterally spaced from the tongue, the tongue of one frame member at a joint between contiguous panels being receivable within the groove on the other frame member upon relative movement of aligned panels thus to be joined toward each other in their common plane, said corner fascia being generally in the form of a channel having two broad plate-like members extending at the angle of the walls with respect to each other and adapted at least partially to overlie the edges of the respective walls, the outer side of one of said plate-like members bearing edge formations which are complementary to those of the edge of the respective wall so as matingly to interfit therewith, the inner side of the other of the plate-like members bearing edge formations which are complementary to those of the edge of the respective wall so as matingly to interfit therewith, whereby the edge of a first wall, to be joined to said one plate-like member, will at least partially overlap the end of a second wall, to be joined to said other plate-like member.

6. A wall structure composed of two walls substantially meeting at an angle, each of the walls being composed of a plurality of interlocked panels disposed in edge alignment in courses which lie at right angles to each other, each of said panels having frame members extending along the edges thereof, the frame members along the edges of contiguous panels having formations thereon which lie between the broad opposite surfaces of the panels, which extend longitudinally of the edges of the bodies of the panels, and which mutually interfit, the interfitting formations on each of the said frame members comprising a longitudinally extending tongue and a longitudinally extending groove laterally spaced from the tongue, the tongue of one frame member at a joint between contiguous panels being receivable within the groove on the other frame member upon relative movement of aligned panels thus to be joined toward each other in their common plane, and a corner fascia overlying said edge between the said walls, said fascia being generally in the form of a channel having two broad plate-like members extending at the angle of the walls with respect to each other and overlying the edges of the respective walls, the outer side of one of said plate-like members bearing edge formations which are complementary to those of the edge of the respective wall and matingly interfitting therewith, the inner side of the other of the plate-like members bearing edge formations which are complementary to the edge of the other respective wall and matingly interfitting therewith, whereby the edge of a first wall, joined to said one plate-like member, at least partially overlaps the end of a second wall, joined to said other plate-like member.

7. A wall structure as claimed in claim 6, comprising means locking the fascia to the confronting edges of the meeting walls.

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RICHARD W. COOKE, JR., *Primary Examiner*.
FRANK L. ABBOTT, *Examiner*.
R. S. VERMUT, *Assistant Examiner*.