Jan. 28, 1969 D. D. BURRIS 3,423,891

BUILDING STRUCTURE WITH THE MEANS BETWEEN SPACED PANELS

Filed Aug. 25, 1965

Sheet 1 of 9

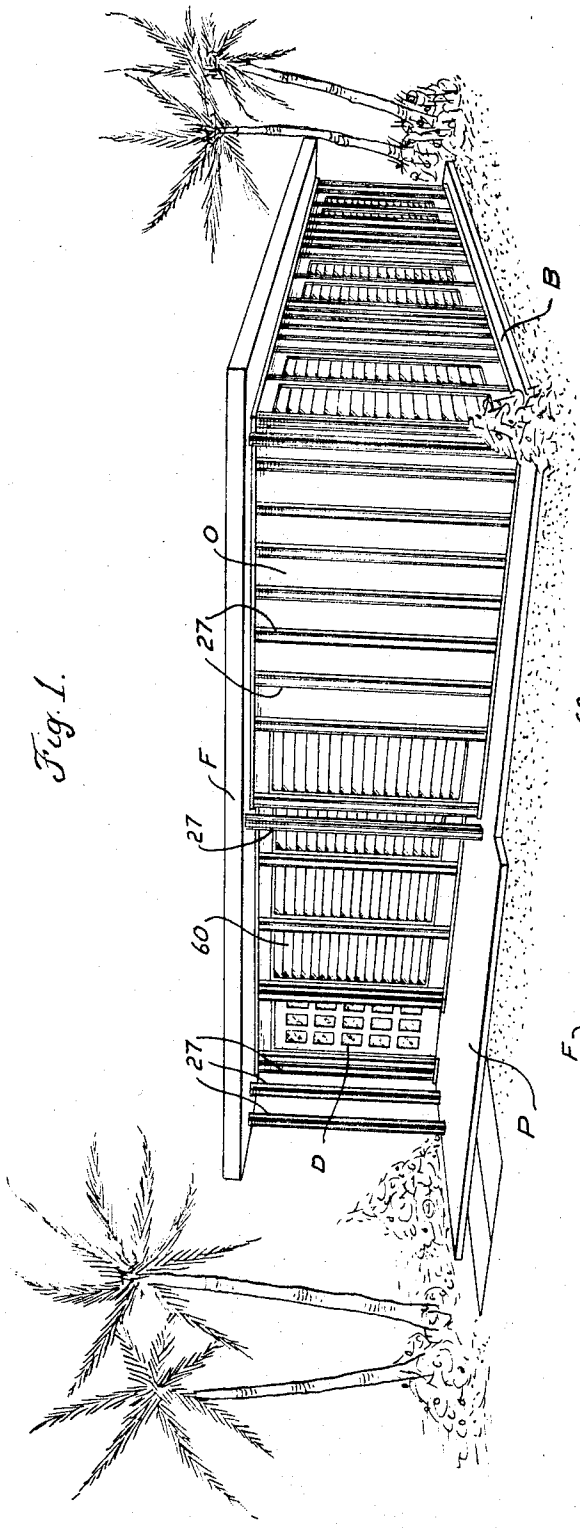

Fig. 1.

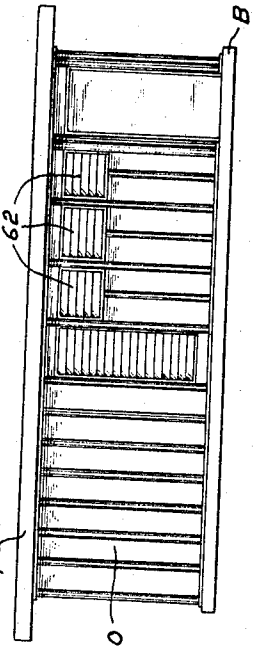

Fig. 2.

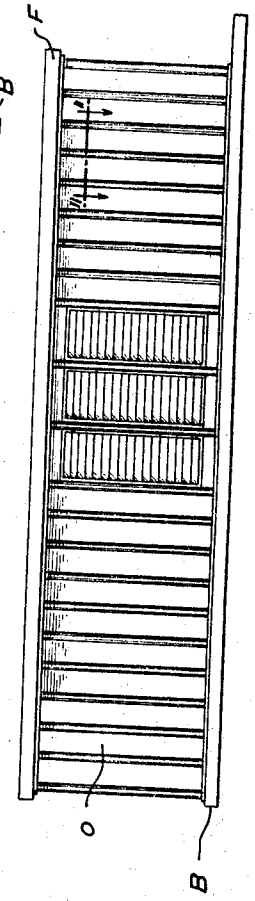

Fig. 3.

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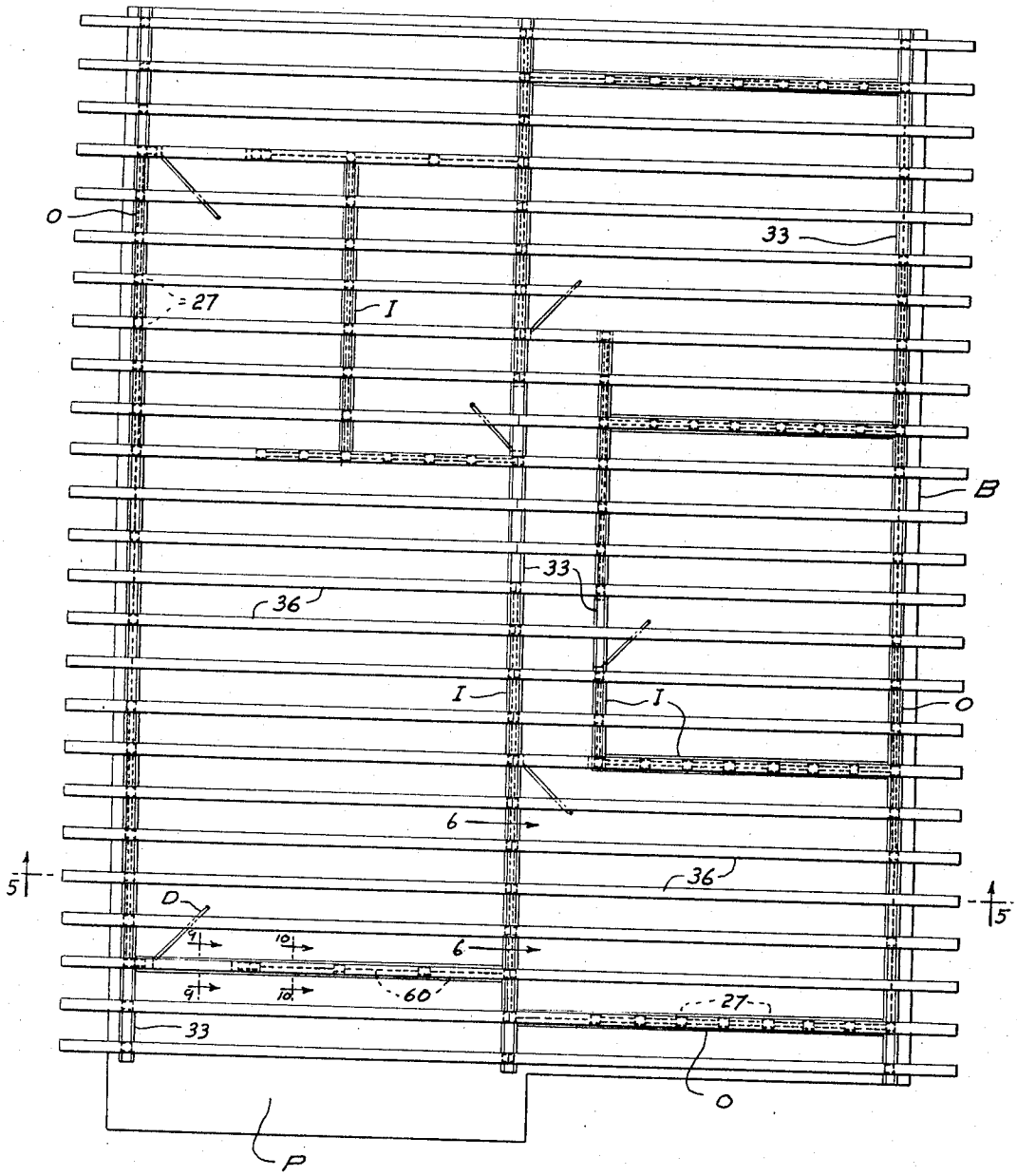
Fig. 4.



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BUILDING STRUCTURE WITH THE MEANS BETWEEN SPACED PANELS

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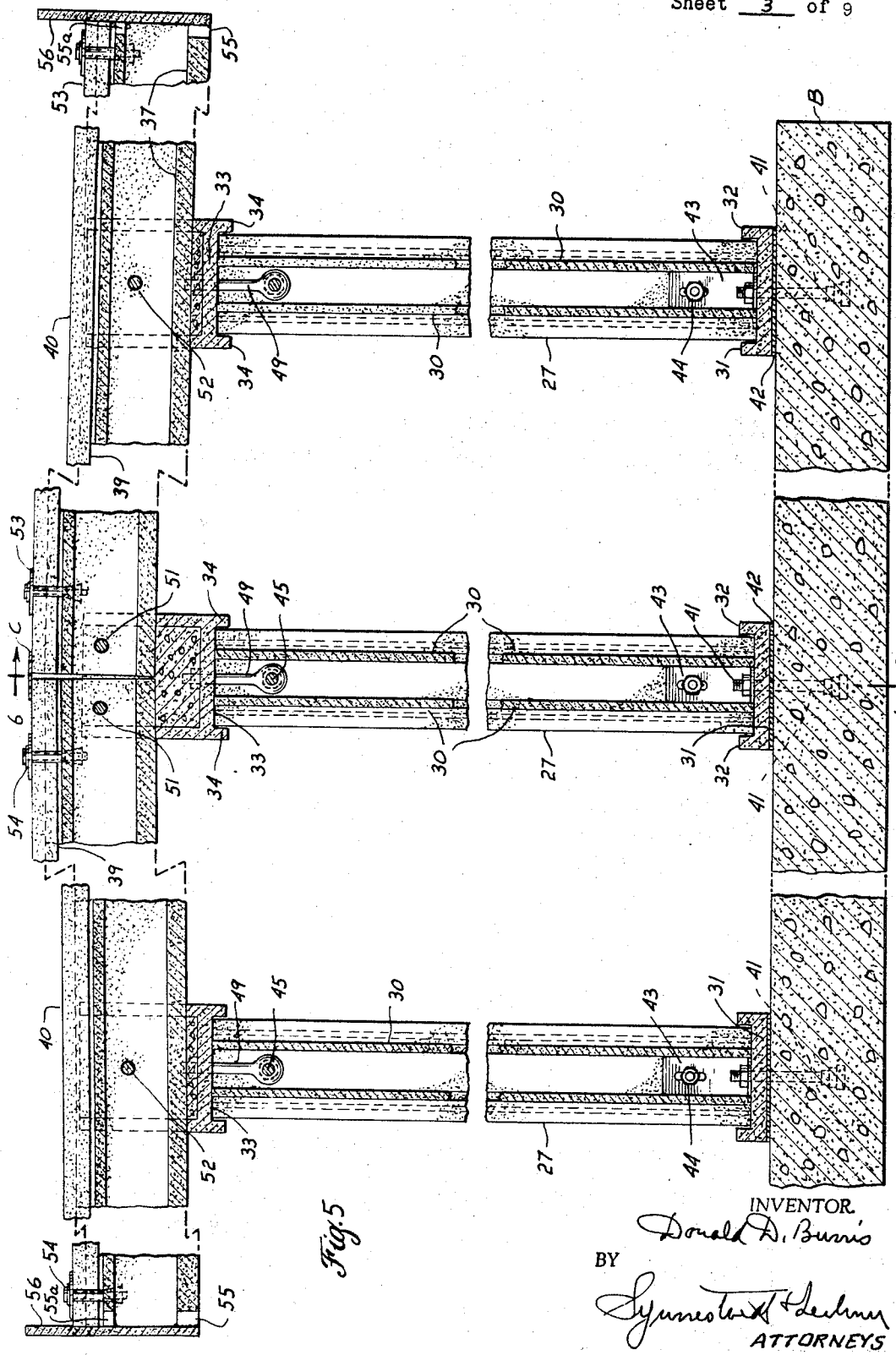

Fig. 5

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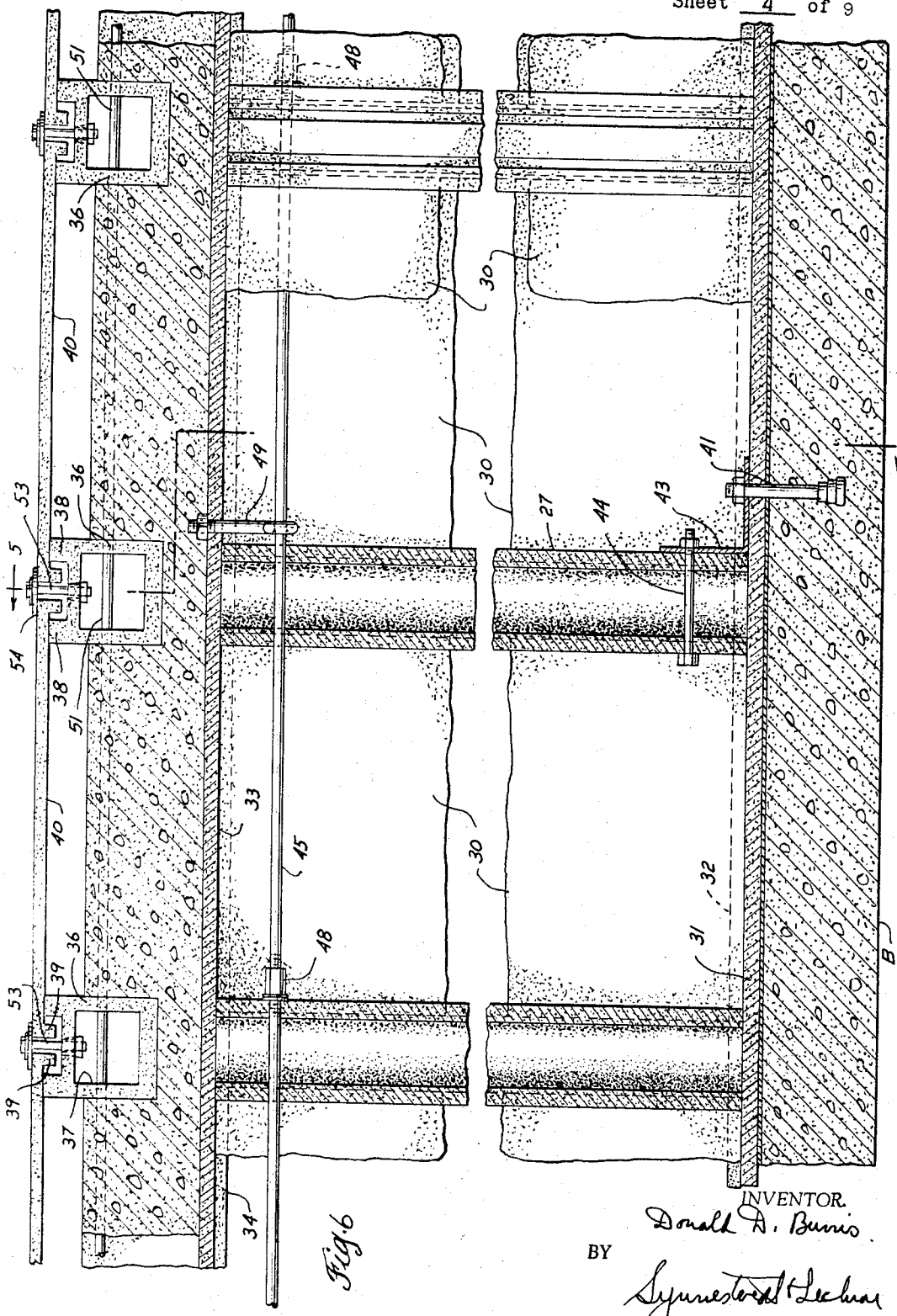

Fig 6

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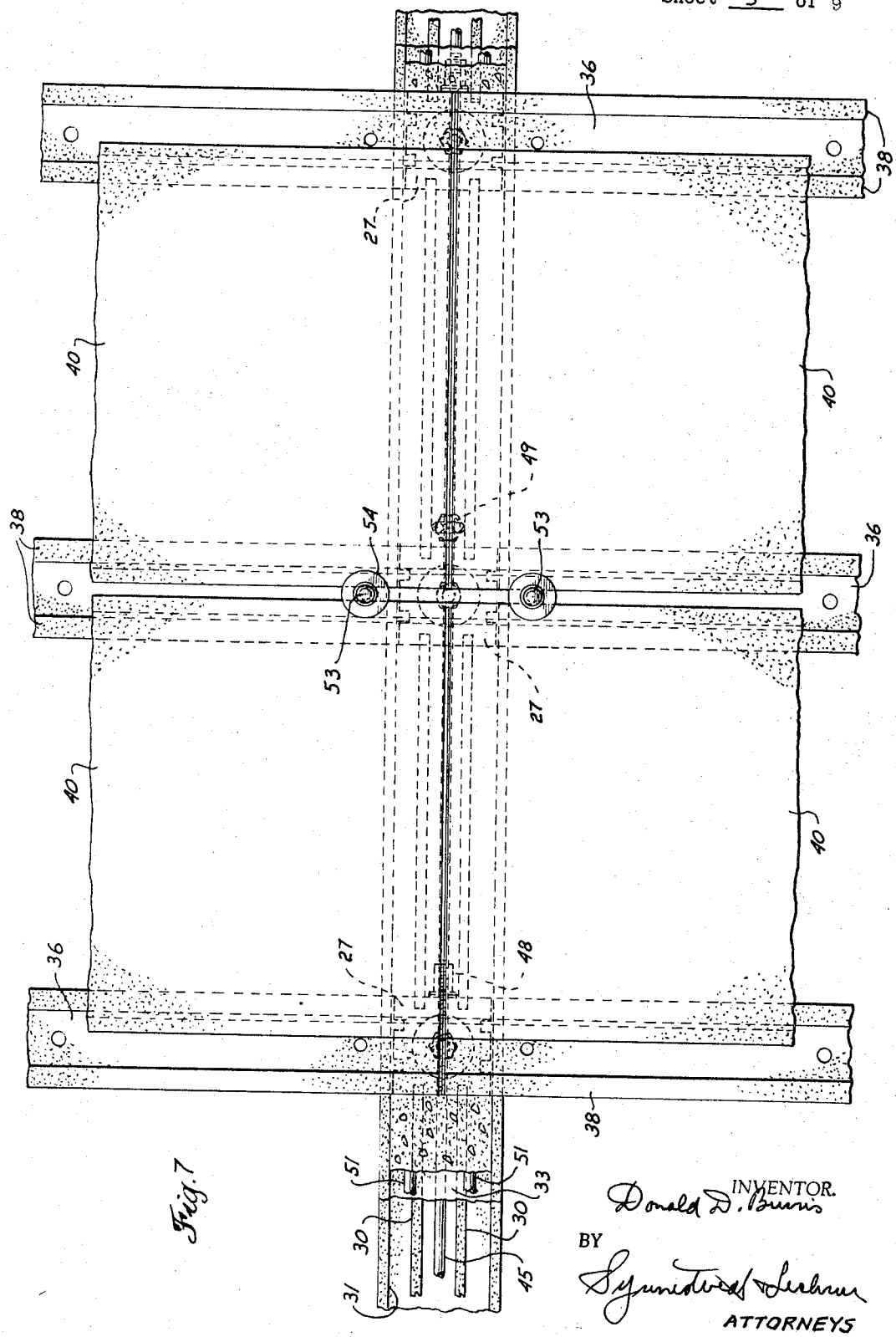

Fig. 7

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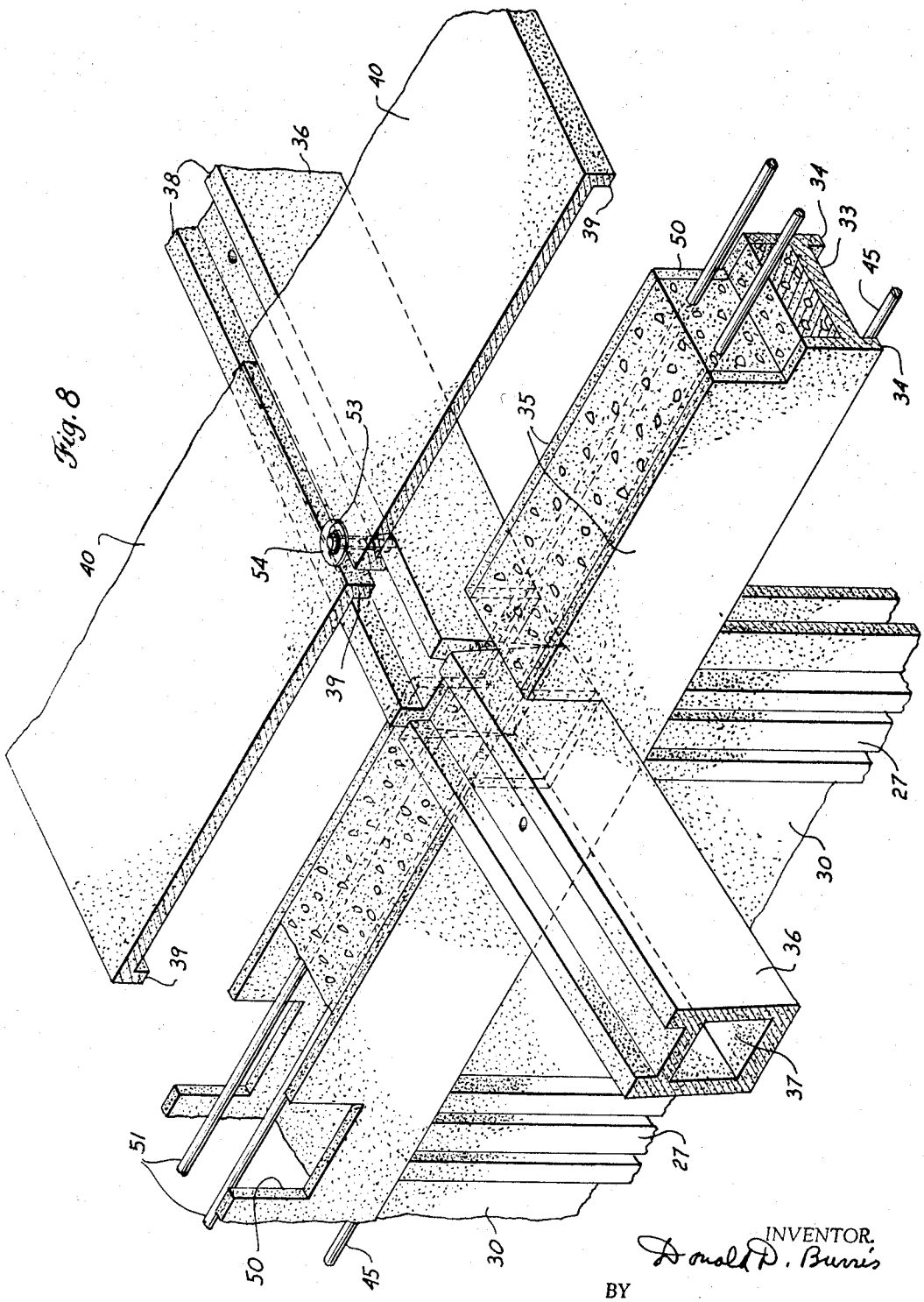
Fig. 8



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BUILDING STRUCTURE WITH THE MEANS BETWEEN SPACED PANELS

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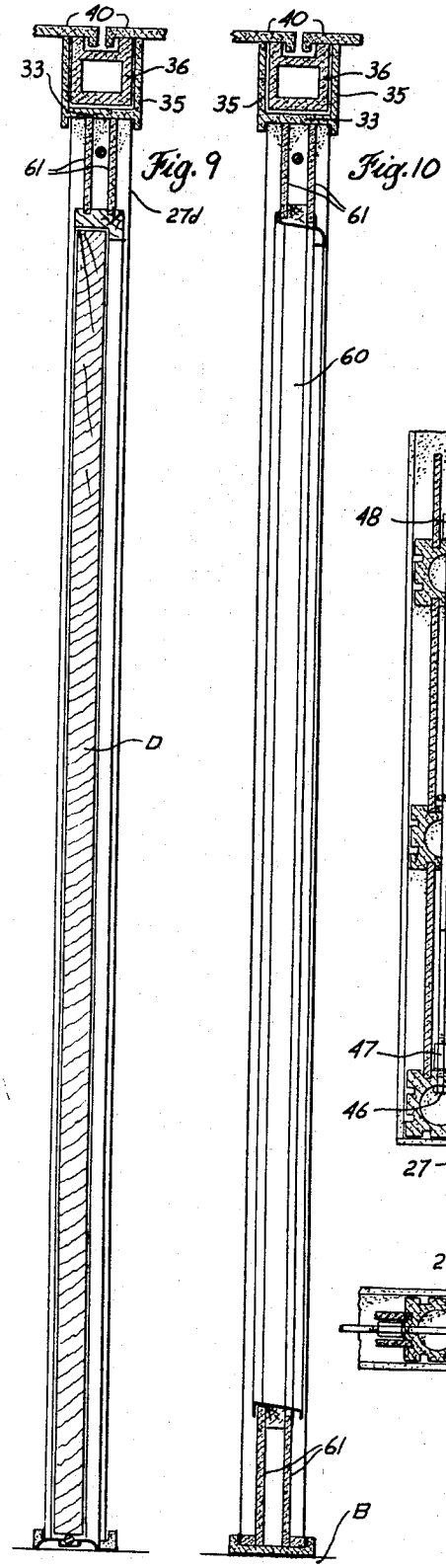


Fig. 9

Fig. 10

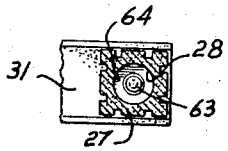


Fig. 14

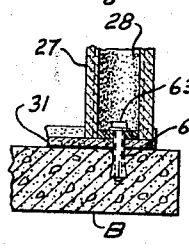
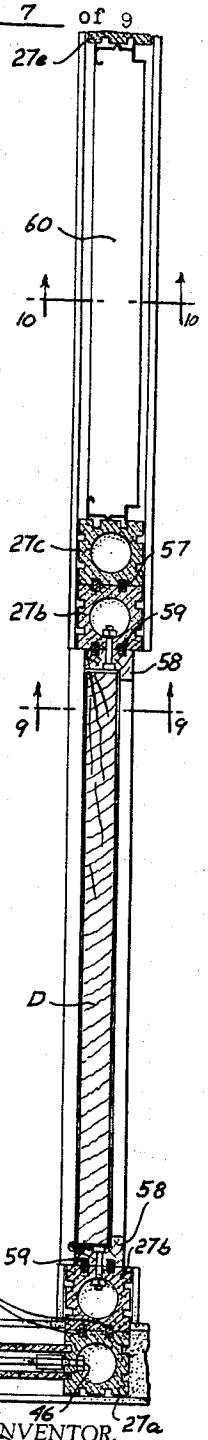


Fig. 13

Fig. 12



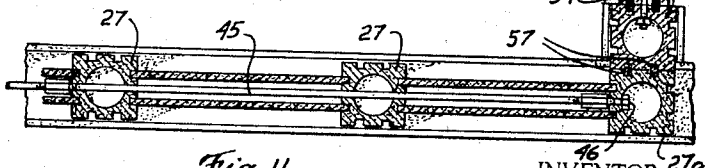


Fig. 11

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Fig. 15

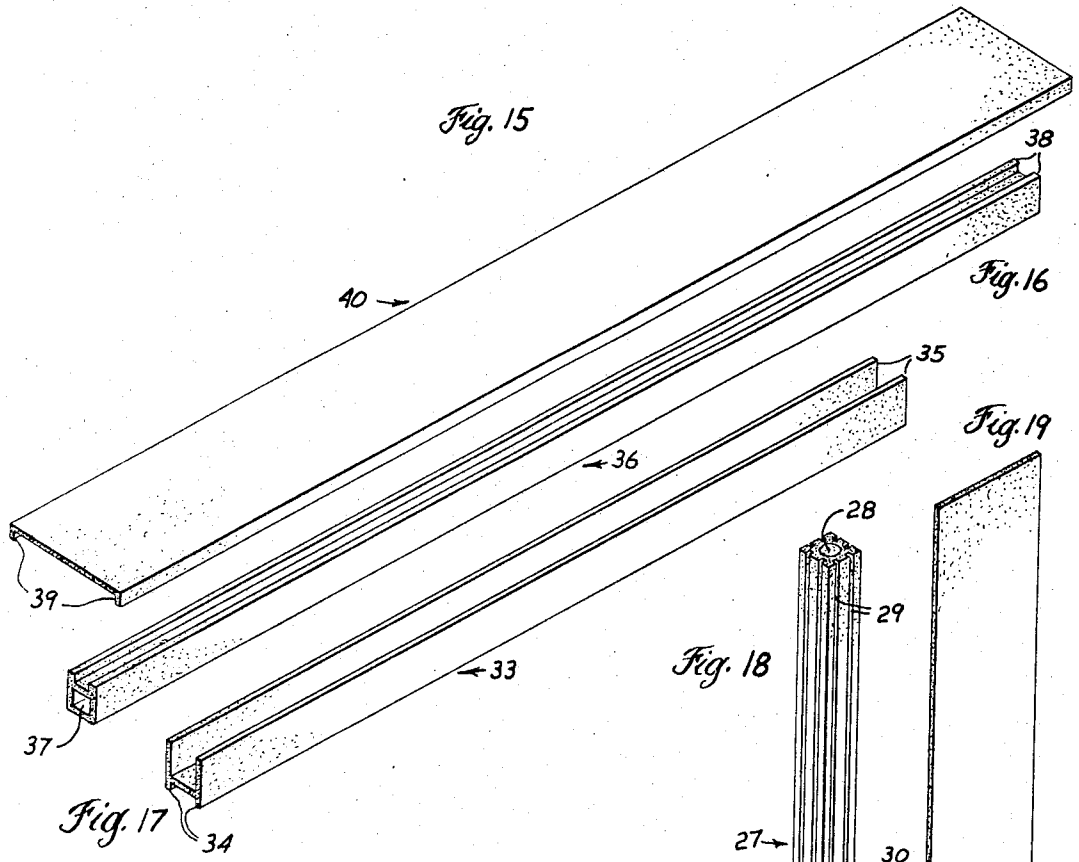


Fig. 16

Fig. 17

Fig. 18

Fig. 19

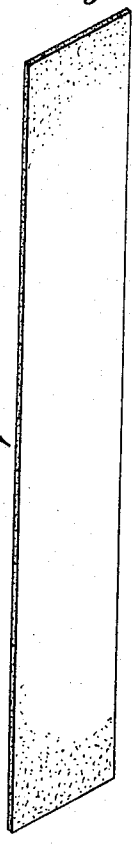
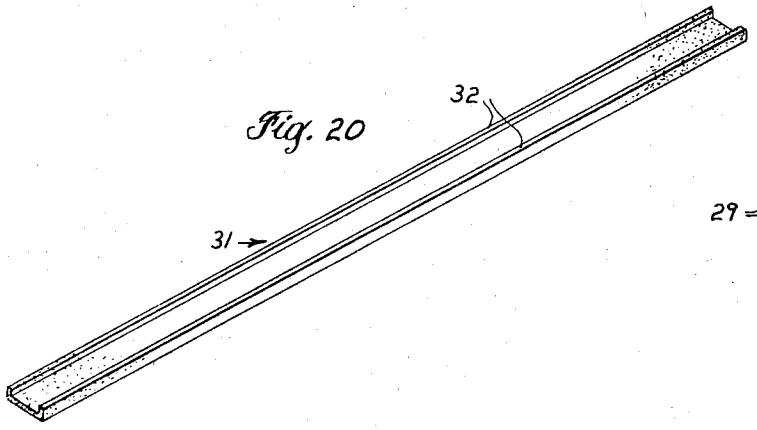


Fig. 20



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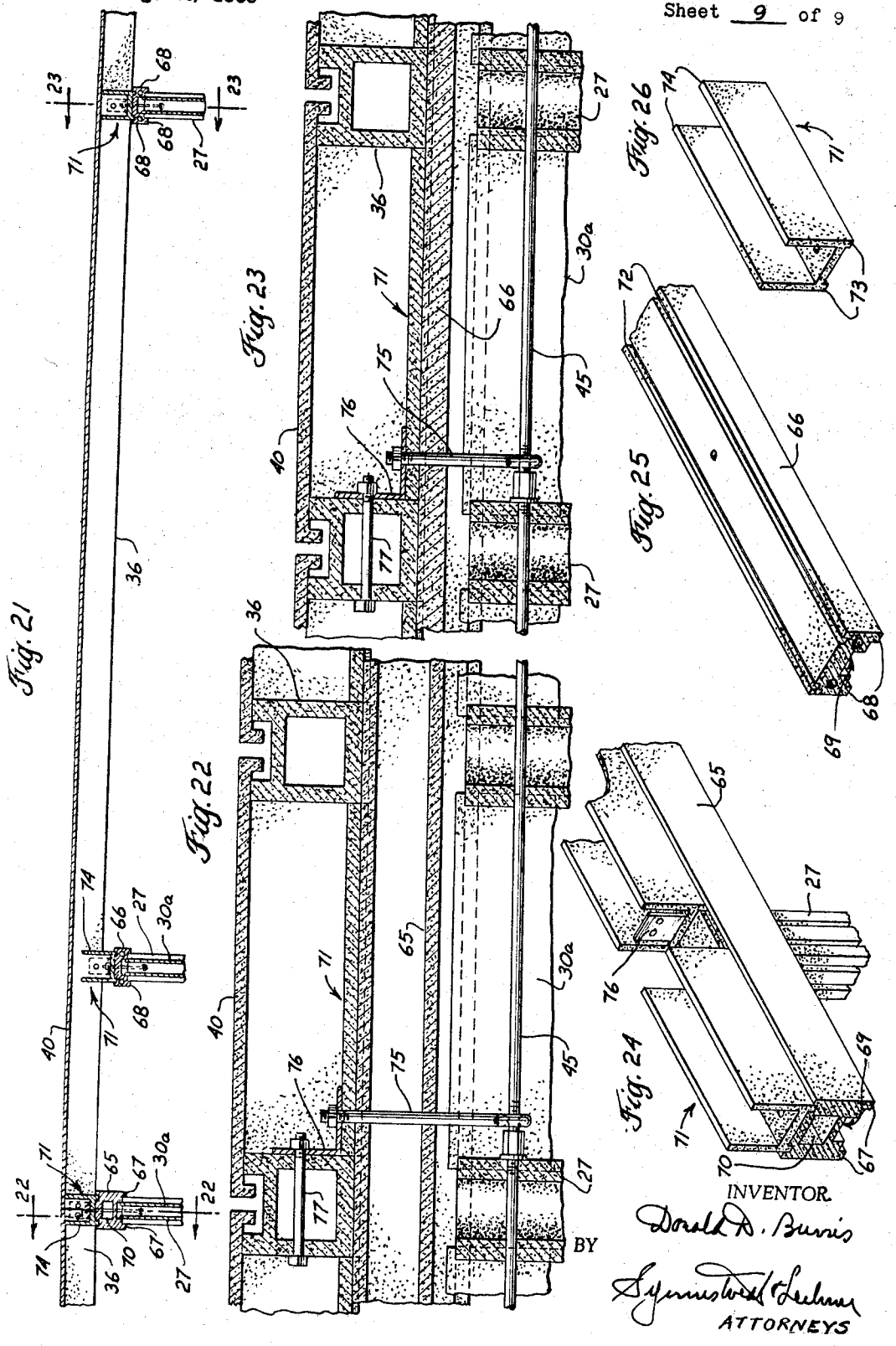

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Patented Jan. 28, 1969

3,423,891

BUILDING STRUCTURE WITH THE MEANS BETWEEN SPACED PANELS

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Filed Aug. 25, 1965, Ser. No. 482,350
U.S. Cl. 52—241 13 Claims
Int. Cl. E04h 1/02; E04b 2/66, 5/04

ABSTRACT OF THE DISCLOSURE

Building structure made of components especially adapted for fabrication as asbestos-cement extrusions, and including specially formed vertical posts adapted for universal use at either corner or intermediate locations of either outside or inside walls or partitions, whether or not load bearing, the posts being configured to cooperate with either single or double wall or partition boards. The structure also includes specially formed cap rails for use at the top edge of walls and partitions for support of a roof structure and also to provide a chase for wiring or piping.

This invention relates to building structure and is particularly concerned with the structure and construction of houses or homes.

There is widespread need for improvement in low-cost housing in many areas of the world, and it is a principal object of the present invention to provide structural features attaining substantial fulfillment of that need in the sense that the building structure of the present invention provides housing equivalent to that afforded by prior types of structure or construction running to a cost several times that made possible by the present invention.

In attaining this major general objective of the present invention, provision has been made for the fabrication of the individual pieces of which the house is constructed from asbestis-cement compositions. Still further the invention provides for so shaping the required structural pieces that they may readily be produced by extrusion of asbestos-cement compositions. Since the pieces are formed of asbestos-cement compositions and further since they are so shaped as to be capable of extrusion, the cost of the structural pieces is greatly reduced as compared with various other materials employed for building purposes.

In connection with the feature just referred to, it should further be noted that it is an object of the invention to provide for minimization of the total number of pieces or shapes required. Thus, in one of the illustrative embodiments herein illustrated and described, only six different shapes are required for the basic structure of a typical house, these same six shapes being readily adapted to the fabrication of houses of a variety of plans, with partitions, doors and windows or jalousies located in a wide variety of positions.

Still another object of the invention is the provision of structural shapes or pieces of the kind above referred to which are further so proportioned and sized as to be readily handleable by a pair of workmen, notwithstanding the fabrication of the pieces from asbestos-cement compositions. Thus, no power equipment is required for the erection of houses made from the pieces constructed according to the invention, and the convenient handling thereof by a pair of workmen readily fits into normal building techniques and enables construction of the houses at a minimum cost, as compared with operations requiring the use of power equipment.

By the fabrication of the structural shapes from asbestos-cement compositions, several important objectives are achieved, including high strength of the pieces even when made in relatively thin sections. In addition the various pieces may readily be drilled, trimmed, or cut with commonly available power and hand tools.

The fabrication of the structural shapes employed of asbestos-cement compositions also provides housing which is vermin and rot proof and which is also readily painted according to desired color decoration.

It is also an object of the invention to provide structural pieces so shaped and proportioned as to enable alternative use thereof for either single or double walls, or combinations thereof in the same house. For instance in a typical embodiment as fully disclosed hereinafter, the outside walls of the house may be of double construction, while the interior partitions are of single wall construction, both types of walls being readily constructed from the same pieces. In view of this capability or flexibility, the exterior walls of a house constructed of pieces made according to the present invention may comprise a double and insulated wall, whereas the interior partitions, if desired, may be made of only a single wall. Alternatively both the partition walls as well as the outside walls may be made of double construction and either or both of them may have heat or sound insulating material introduced into the inter-wall space.

In addition to the foregoing, the invention also provides numerous other advantages with respect to the structure of the outside or partition walls and also of the roof of the house, and the manner of mounting of the roof on the walls. In this connection it is an important object to provide certain modular characteristics or features, thereby readily adapting various of the structural pieces themselves and also subassemblies thereof to use in different ways in different parts of the house, for instance in outside walls and also in inside walls or partitions. In order to achieve maximum flexibility in this respect, the modules have been developed in the mean plane of the walls, rather than at one surface or the other thereof, and because of this feature special cutting or trimming at corners and also at points of junction between outside and partition walls is eliminated.

In achieving the foregoing, as will herein be fully explained, the basic structure of both the outside and partition walls of the house comprises vertically extended posts and vertically extended wall panels or boards, both the posts and panels being sized or dimensioned to provide for 16 inch on-center spacing of the posts. The posts are provided with grooves to receive the edges of the panels and thus complete the structure of the wall. This not only provides advantages in relation to the employment of certain standard components, such as doors, windows and jalousies, but is also of importance in achieving one of the other objectives referred to above, namely proportioning and dimensioning of the individual structural pieces so that they may readily be handled by a pair of workmen.

In house structure of the kind above referred to, it is an important object of the invention to provide a post which not only has certain of the dimensional features already mentioned but which further is of square cross section and has a pair of spaced panel receiving grooves in each of its four sides, the disposition of the grooves in each side being symmetrical with relation to the central axis of the post. Exactly the same post, therefore, is adapted for use in any wall in the house whether of double or single construction, whether an outside wall or an inside wall, and it may be used in any position in any wall, including either inside or outside corners, intermediate positions, or positions at points of juncture between an interior or partition wall with an outside wall.

It is also an object of the invention to accomplish all

of the foregoing while at the same time providing a house structure having good appearance or aesthetic appeal.

How the foregoing and other objects and advantages are attained will appear more fully from the following description referring to the accompanying drawings which illustrate one overall embodiment of a house constructed according to the present invention, as well as one modification of a portion thereof. In these drawings:

FIGURE 1 is a perspective view of a typical house constructed according to the present invention and having the plan illustrated in FIGURE 4, FIGURE 1 showing both the front side of the house, which appears at the bottom of FIGURE 4 and also that side which appears toward the right in the plan view of FIGURE 4;

FIGURE 2 is an elevational view looking toward the side of the house presented in the top of FIGURE 4;

FIGURE 3 is an elevational view looking toward the side of the house presented to the left of FIGURE 4;

FIGURE 4 is a plan view of the house shown in FIGURES 1, 2 and 3 but with the roof itself removed in order to show the rafters and partitions;

FIGURE 5 is a vertical sectional view taken as indicated by the line **5—5** on FIGURE 4, FIGURE 5 being on an enlarged scale but with certain portions broken out as is indicated;

FIGURE 6 is a vertical sectional view taken at right angles to FIGURE 5 as indicated by the section line **6—6** which appears on both of FIGURES 4 and 5, FIGURE 6 being on the scale of FIGURE 5 and also having certain portions broken out;

FIGURE 7 is a fragmentary plan view of a portion of the roof and certain roof supports shown in FIGURES 5 and 6, this view also being on the scale of FIGURES 5 and 6;

FIGURE 8 is a fragmentary perspective view, with parts broken out, illustrating a portion of the roof and roof supports adjacent to the ridge of the roof, this view being generally on the scale of FIGURES 5, 6 and 7;

FIGURE 9 is a vertical sectional view of the structure in the region of the front door of the house, the view being taken as indicated by the section line **9—9** on FIGURES 4 and 11, FIGURE 9 being on a scale intermediate that of FIGURE 4 on the one hand and FIGURES 5 to 8 on the other hand;

FIGURE 10 is a view similar to FIGURE 9 but taken on the region of one of the jalousies incorporated in the house of FIGURE 1, the view representing a section taken about as indicated by the line **10—10** on FIGURES 4 and 11;

FIGURE 11 is a horizontal sectional view through a corner of the house in the region of the door and jalousie appearing in FIGURES 9 and 10, this view being taken as indicated by the line **11—11** applied to FIGURE 3;

FIGURE 12 is a horizontal sectional view similar to FIGURE 11 but showing another outside corner of the house;

FIGURES 13 and 14 are vertical and horizontal sectional views at the lower end of a post, illustrating certain details of a mounting arrangement; and

FIGURES 15 to 20 inclusive are isometric views of the six structural shapes which are used for the basic structure of the house shown in FIGURES 1 to 14 inclusive, these figures illustrating the approximate relative sizes and lengths of the six shapes which are, respectively, the roof panel, rafter, cap rail, vertical post, vertical wall post, vertical wall panel, and base rail.

A second embodiment of roof supporting structure is illustrated in FIGURES 21 to 26 inclusive, these figures comprising views as follows:

FIGURE 21 is a vertical sectional view through a portion of the roof in a plane parallel to and intermediate to the rafters;

FIGURE 22 is a fragmentary enlarged sectional view taken as indicated by the section line **22—22** on FIGURE 21;

FIGURE 23 is a view similar to FIGURE 22 but taken as indicated by the line **23—23** on FIGURE 21;

FIGURE 24 is an isometric view of certain details of the roof supporting structure of this second embodiment;

FIGURE 25 is a view of a portion of a form of a cap rail of this second embodiment; and

FIGURE 26 is an isometric view of a filler piece used in this second embodiment, which filler piece may comprise a piece or section of a cap rail such as shown in FIGURE 17.

In considering the drawings, attention is first directed to FIGURES 1, 2 and 3 which illustrate a house constructed in accordance with the present invention from the structural shapes provided according to the invention as illustrated in FIGURES 15 to 20 inclusive.

As above mentioned the structural shapes and the type of construction and assembly contemplated according to the invention adapt themselves readily to houses of a variety of floor plans, a typical plan being illustrated in FIGURE 4, the house of this same plan being shown in the perspective and elevational views of FIGURES 1 to 3.

In general, as seen in FIGURES 1 to 4, the house is preferably built upon a base comprising a concrete or cement slab B, preferably having an enlarged area such as shown at P comprising in effect a porch area in the region of the front door D.

Outside walls are indicated at O and partitions or inside walls at I. The roof structure is trimmed with a fascia indicated at F in FIGURES 1, 2 and 3.

Before describing the structure of the house itself and the manner of assembly of the structural shapes employed, reference is now made to FIGURES 15 to 20 and to the following brief description of the individual structural shapes thereshown.

Beginning with FIGURE 18, there is shown one of the vertical posts which are incorporated in each wall whether an outside wall or a partition wall. The post comprises a member **27** of square cross section, with an interior hollow **28** extended throughout the length thereof, and each side of which has a pair of spaced vertical grooves **29—29**, the vertical grooves being spaced equal distances from the edges of that side of the post and symmetrically arranged with respect to the central axis of the post. These grooves are of width adapted to engage the edges of the vertical wall panels, one of which is shown at **30** in FIGURE 19. This panel comprises a plain flat piece or board of length approximating that of the post **27**, both being of appropriate length to make up the full vertical height of the walls of the house.

In FIGURE 20 there is shown a base rail **31** comprising a channel member which is placed on the concrete or other base B (see FIGURE 5) on which the house is to be built and which is positioned with the channel presented upwardly. The channel flanges **32—32** are spaced from each other appropriately to interfit with the square lower ends of the posts **27** incorporated in the walls.

In FIGURE 17 there is illustrated a cap rail **33** comprising a member of H-shaped cross section, having lower flanges **34—34** which are relatively shallow or narrow but which are spaced from each other by a distance providing for interfitting of the upper ends of the posts **27**. The cap rail **33** further has wider flanges **35—35** preferably spaced the same distance as flanges **34—34** and projecting upwardly for cooperation in the support and positioning of rafters in the manner more fully described herebelow.

In FIGURE 16 a rafter **36** is illustrated, this rafter comprising a member having an interior hollow indicated at **37** and further having a pair of upwardly projecting flanges **38—38** for a purpose described herebelow. The rafter **36** is desirably of the same width as the post **27** which will thus permit it to be received between

the upwardly extended flanges 35—35 of the cap rail 33, in certain positions of the roof, as will be explained herebelow. The channel provided by the flanges 38—38 of the rafter 36 provides a groove for cooperating with the flanges 39—39 of the roof panel indicated at 40 in FIGURE 15 this panel comprising a flat channel shaped piece with the channel flanges 39 projecting downwardly so that they may be received between the flanges 38—38 of the rafter.

As hereinabove mentioned, all six pieces illustrated in FIGURES 15 to 20 inclusive are adapted to be extruded and are preferably formed of asbestos-cement composition.

In the preferred practice of the invention, the various pieces shown in FIGURES 15 to 20 inclusive are dimensioned as follows:

The vertical posts and panels 27 and 30 both have a length or vertical dimension corresponding to the height of the walls desired, for instance 7 feet 6¾ inches. The panels 30 are desirably of about 23/64 inch thickness and the grooves 29 in the posts 27 have a width of about ⅜ inch so as to accommodate the edges of the panels 30 with slight clearance.

Having in mind the presence of the grooves in each face of the posts 27, for instance grooves of about ⅜ inch depth so as to effectively interengage with the edges of the panels, and further having in mind the requirement that the posts have adequate strength to support the roof structure of the house, the post preferably measures 3½ inches across each side. Another factor which has been taken into account in the proportioning and dimensioning of the posts is the groove spacing (about 1⅝ inches from center-to-center) required in order that standard size electrical junction or outlet boxes measuring 1½ inches in depth from the mounting surface may be accommodated when mounted on one of the panels engaged in one of the grooves, without interfering with a panel received in the other groove.

The foregoing factors which have been taken into account in establishing the post width of 3½ inches are also taken into account in connection with the width of the panels 30 when employing the desired 16 inch center-to-center spacing of the posts. Thus, with this 16 inch "module" and with the posts of dimensions as above described, the boards are preferably of 13¼ inches width.

The dimensions of the post as above referred to also are used in establishing the width of the channel between the flanges 32—32 of the base rail 31, this channel width preferably being 3⅝ inches, in order to accommodate the ends of the post with slight clearance. The same is true of the spacing of the flanges 34—34 of the cap rail 33. The rafter 36 is advantageously made of the same width as the posts (3½ inches) and the channel spacing between flanges 35—35 of the cap rail is also desirably 3⅝ inches so as to accommodate the width of the rafter.

The length of the base rails 31 and the cap rails 33 is not critical but in a preferred embodiment this length is 8 feet or 12 feet which represent multiples of the 16 inch module referred to.

The width of the roof panel in this embodiment is 15½ inches, so that slight clearance remains between the edges of the roof boards when assembling rafters mounted on the 16 inch centers which is contemplated for both the vertical posts 27 and the rafters 36.

From the foregoing it will be seen that the posts and the dimensions thereof constitute the "keystone" of the system being taken into account in connection with at least certain dimensions of all of the other five basic pieces.

It is to be understood that a module larger than 16 inches may be employed, for instance 24 inches, but the 16 inch module has greater flexibility and will accommodate a wider variety of other pieces of equipment of standard sizes, as will more fully appear hereinafter.

In the following description of the mode of construction of the house according to the present invention, reference will be made to the general sequence of constructional operations to be followed.

In the casting of the base B, anchor bolts are preferably included, several of such bolts appearing in FIGURES 5 and 6 at 41. These anchors need not be provided for every post in each wall, but advantageously are provided for every third or fourth post in each wall. Base rails 31 are then appropriately drilled to pass the bolts 41 and are positioned on the base B with the flanges 32 projecting upwardly, a sill seal 42, such as asphalt coated roofing paper, being interposed between each base rail and the base B.

A series of vertical posts 27 alternating with vertical panels 30 is then positioned in each partition and each outside wall at the 16 inch center-to-center spacing, with the vertical edges of the panels received in the grooves 29 in the adjacent sides of the posts, for instance in the manner shown in FIGURES 5 and 12. At intervals along each wall, a post (for instance the center post appearing in FIGURE 6) is fastened to one of the bolts 41 by means of an angle piece 43 and a bolt 44 passed through apertures drilled in the post itself. This anchoring thus effects fastening not only of the post but also of the base rail 31.

The upper ends of the posts included in each partition are also preferably tied together by means of the tie made up of a plurality of rods 45 which may conveniently be made of length substantially representing a module dimension. At one end of such a wall, for instance at the corner post shown in the lower left corner of FIGURE 12, an anchor bolt 46 is inserted through an aperture in the post from the interior hollow thereof and this anchor bolt is connected by means of a nut 47 with one of the rods 45, additional rods 45 being connected with the first one by additional nuts 48 as the sections of the wall are successively built up (see FIGURE 12). Upon tightening of the nuts such as indicated at 48, the posts and the intervening wall panels 30 are drawn together and held in their proper relation with the edges of the panels engaged in the grooves in the posts.

During assembly of these tie rod parts, anchor bolts 49 are desirably mounted on the rods 45 at spaced intervals which may be equal to several times the post spacing, these bolts being provided for the purpose of fastening a cap rail in position at the top of the posts, in the manner which will be clear from the following description referring to FIGURES 5, 6 and 7. Several such cap rails appear in these figures at 33 and it will appear that the cap rails are positioned with their flanges 34—34 projecting downwardly to interfit with the upper ends of the posts 27. The cap rails are drilled at appropriate intervals to receive the anchor bolts 49 and nuts are applied thereto to fasten the cap rails in position.

Attention is now called to the fact that FIGURE 5 illustrates the left and right hand outside walls of FIGURE 4 and also the central partition wall running through the middle of the building and serving as a support for the ridge of the roof. The cap rail positioned at the top of this central or ridge supporting partition (see also FIGURE 8) has its upper flanges 35—35 notched out in order to provide a socket to receive and support the inner ends of rafters 36. Additional notches such as indicated at 50 in FIGURE 8 are provided at 16 inch intervals in both directions from the central notch, in order to receive and support the inner ends of additional rafters 36, the depth of the notches 50 progressively increasing as the side walls of the house are approached, so that the rafters assume a slightly inclined position from the ridge to the edge of the roof, as clearly appears in FIGURES 5 and 8.

The inner adjacent ends of the rafters 36 are also drilled to pass the rods 51, and after assembly of these parts, the upwardly open channel provided between the flanges 35—35 is filled with concrete so that the rods 51 become

embedded therein, thus providing a cementitious bond or anchor for the rafters with relation to the ridge cap rail. Similarly, at the side walls of the house, rods **52** are passed through the rafters and are embedded in the concrete within the cap rails in those regions.

In the end walls of the house, the roof supporting rafters **36** (see FIGURES 9 and 10) are received within the upwardly presented channels formed between the flanges **35—35** of the cap rails **33**. Thus, rafters **36** are supported by cap rails in different relation thereto depending upon the wall with which the cap rail is associated. Along the side walls of the house, and also along the central or ridge supporting partition, the rafters extend perpendicular to the cap rails, but at the end walls of the house, the rafters are parallel to and received within the upwardly presented channels of the cap rails.

Upon assembly of the roof supports as described above, the roof panels themselves are applied, various of such panels being indicated at **40** in FIGURES 5 to 8. It will be seen that the flanges **39** of the roof panels fit into the channel provided between the flanges **39** of the rafters **36**, the dimensions being such as to provide clearance between the edges of adjacent panels so as to pass the fastening bolts **53**. These bolts conveniently take the form of expansion bolts introduced into apertures drilled in the uppermost web of the hollow rafters **36**, appropriate washers **54** being introduced under the heads of the bolts **53** in order to provide for engagement with a substantial area of the roof panels **40**. A waterproof fabric or plastic cover strip C (see FIGURE 5) may be adhesively applied over the ridge of the roof.

By the fastening bolts **53**, the roof panels are secured to the rafters, and from the description above it will be noted that the rafters are secured to the cap rails which, in turn, are secured to the posts. Finally, the posts are anchored to the base, so that all parts of the structure are tightly held together.

The arrangement of the rafters with the interior hollow **37** is advantageous for purposes of drainage. Thus, in the event of leakage of water from the channel in which the flanges **39** of the roof panels are received around the bolts **53** into the interior hollow **37**, the interior hollow **37** becomes in effect a duct to direct the leakage water laterally beyond the side walls of the house, where it may be discharged through apertures such as indicated in FIGURE 5 at **55**. These apertures may be formed by notching out the lower end wall of the rafter **36** just inside of the fascia boards **56** which are desirably fastened to the ends of the rafters. These fascia boards may be cut from the boards or panels **30** shown in FIGURE 19, and desirably are cut or trimmed to width such as to conceal the inclined roof, when the building is viewed in elevation, for instance as in FIGURES 1, 2 and 3. In addition to the notches **55** in the lower wall of the hollow rafters, the upper wall thereof is desirably also notched as indicated at **55***a* in FIGURE 5 to facilitate drainage from the channel at the top of the rafters. From inspection of FIGURES 9 and 11, it will be seen that pairs of posts **27***a*–**27***b* and **27***c*–**27***d* are positioned together and interlocked by means of key strips **57**, thereby providing a door jamb of increased strength as compared with that available with only a single post. A wooden trim member **58** is then preferably provided at each side of the door opening, these pieces also being fastened to the adjacent post by means of key strips **59**. The door D may then be hung in the doorway, and it will be noted that when the parts are assembled in this manner, the posts **27***a* and **27***c* may be spaced a distance representing a multiple of the 16 inch module, namely 48 inches, while at the same time making provision for utilization of a door of standard width, in the assembly illustrated this width being 34 inches. Similarly (see FIGURES 10 and 11) a jalousie **60** of standard 28 inch width may be introduced between the post **27***c* and the next post **27***e*, while retaining the spacing between the posts **27***c* and **27***e* at a multiple of the 16 inch module, namely at a space of 32 inches.

Spaces above and below a jalousie, and also above a doorway may be closed by panel boards such as indicated at **61** in FIGURES 9 and 10, which may be cut from boards **30**.

In the case of employment of jalousies of relatively small vertical height, for instance those indicated at **62** in FIGURE 2, the remainder of the wall in this region may be completed by including posts at 16 inch on-center spacing, but cutting off the posts and also the intervening wall panel boards at the appropriate height.

In connection with the structure above described, it will be noted that the same posts **27** are employed in all post positions, including those at corners of the house, whether outside or inside corners and also at points of junction between an outside wall and an inside partition and still further at door jambs. In instances where the posts appear at corners or at junction points, anchor means may be provided for the tie rods **45**, for instance bolts **46** mentioned above in connection with FIGURE 12, which as shown in that figure, may be inserted through the interior hollow of a corner or junction post so as to exetnd through different sides of the post and thus cooperate with tie rods for different walls which are joined at that post.

It will also be understood that with respect to any of the walls, either outside walls or partition walls, the wall panel boards **30** may be used in multiple so as to provide a double wall construction or, alternatively only a single wall of the boards may be employed. In some cases it may be desirable to employ double walls for the outside walls of the house, but only single walls for the interior partition and these variants may all readily be adapted, while employing the same posts and other parts of the structure.

In cases where double walls are used, various of the fastening devices, such as the tie rods **45** and the anchor pieces **43** and **49** are all concealed within the interior space between the two panels. This interpanel space also provides for the introduction of electrical connections, as well as for piping, so that in many instances it is preferred to employ the double panel construction, as compared with single panel construction. Nevertheless in certain partitions only a single wall or panel need be used, thereby further reducing constructional costs.

Still further in the event of employment of double walls, insulation of various kinds may be introduced in the interpanel space. As an example mineral fiber insulation or insulation in flake or granular form may be introduced. Moreover for some purposes it is advantageous to introduce dry sand into the inter-panel space. This strengthens the general construction and also has the effect of substantially eliminating vibration of panel boards in the post grooves. All or occasional inter-panel spaces in any wall may even be filled with cementitious material, thereby greatly increasing the strength and stability of the entire structure.

Another manner of utilizing the post **27** is illustrated in FIGURES 13 and 14, this being appropriate to a situation where an interior partition terminates without joining another wall. In such a case, an expansion bolt **63** may be used to fasten a disc **64** to the base B, the disc **64** being of size adapted to fit into the interior hollow **28** of a post **27**. The post fastening device illustrated in FIGURES 13 and 14 may also be employed for the lower ends of roof supporting posts which are not incorporated in walls, for instance the posts shown in FIGURE 1 at the left hand side of the figure, which are employed for the support of a roof overhang over the porch P.

The structure provided in accordance with the foregoing is highly flexible and adaptable to different conditions and to different house plans and provides the basic structure of such houses by the employment of only six basic shapes, with a minimum of trimming and fitting.

FIGURES 21 to 26 inclusive illustrate a modified ar-

rangement providing for the support of the roof. In accordance with this modified arrangement the same wall posts are employed as in the arrangement previously described, namely the posts **27** having grooves on all four sides adapted to cooperate with the edges of wall panels **30***a* which are the same as the panels **30** previously described, except that they are made slightly longer than the posts, so as to project upwardly a short distance above the upper ends of the posts, as is clearly visible in FIGURES 22 and 23.

Exactly the same roof panels **40** are employed in the arrangement of FIGURES 21 to 26, as are also exactly the same rafters **36**. However the rafters are differently supported on the upper ends of the posts. The difference here involved is largely a matter of employment of different cap rails. Two different shapes of cap rails are used in this embodiment, namely the cap rails **65** and **66** which are shown in the isometric views of FIGURES 24 and 25 and which also appear in transverse section in FIGURE 21. The chief difference between the rails **65** and **66** is in the vertical dimension thereof, the rail **65** being thicker than the rail **66** and being adapted to support the rafters above the ridge supporting wall of the house (appearing toward the left in FIGURE 21). Thus the rafters **36** are positioned at right angles to the cap rail **65** and rest thereon at the ridge of the roof.

On the other hand the rail **66** is adapted to be supported on an outside wall of the house paralleling the ridge supporting wall, as seen at the right in FIGURE 21, and the difference in thickness of the cap rails **65** and **66** provides the desired pitch for the roof, instead of providing such pitch by notching out cap rails to different degrees as was described in connection with the cap rails **33** of the first embodiment.

Each of the cap rails **65** and **66** also is provided with downwardly projecting flanges **67**—**67** and **68**—**68** forming a channel for receiving the upper ends of the posts **27**, in a manner similar to that described above in connection with the cap rails **33** of the first embodiment. The cap rails **65** and **66** also have a downwardly open central channel **69** which, when the cap rails are placed upon the posts communicate with the upper edges of the spaces between the wall panels **30***a*. In order to avoid cracks between the wall boards **30***a* and the cap rails **65** and **66**, the channel **69** is made of width sufficient to embrace the pair of panels **30***a*, and the upward extension of the panels **30***a* above the upper ends of the posts results in projecting of the upper ends of the panels into the channel **69**, so that no open crack will remain in this region. The channel **69**, however, extends across the top ends of the post **27** and thus may be used as a duct for electrical wiring or even for piping of small diameter. When employing this duct for electrical wiring, the wiring may then be extended downwardly between the panels **30***a* at any desired point in the wall, for instance to a junction or outlet box located near the floor level.

The cap rail **65** also has an interior hollow indicated at **70** which lightens the structure.

Between the rafters **36**, filler pieces such as shown at **71** in FIGURES 24 and 26 are desirably employed, these filler pieces also being supported on the cap rails. Actually the filler pieces **71** may comprise a section of the piece **33** in FIGURE 17 and used in the first embodiment as a cap rail. Grooves **72** are provided in the upper surface of the cap rails **65** and **66** in order to receive the downwardly projecting flanges **73** of the filler pieces **71**. The upper flanges **74** of the filler pieces **71** serve to block off the inter-rafter spaces. In the event of employment of a partition intermediate the ridge supporting partition and the outside wall shown at the left and right of FIGURE 21, for instance the partition wall shown in FIGURE 21 between the center of the figure and the left side, the filler pieces **71** may be supported upon a cap rail **66** of the same type as used at the outside wall. In this event the flanges **74** of the filler pieces **71** will not reach all the way to the roof panels **40** but will block off at least most of the space between the rafters in the region of that partition.

The filler pieces, the rafters and the cap rails are desirably anchored or secured in position by means of anchor bolts **75**, some of which appear in FIGURES 21, 22 and 23. These anchor bolts have apertured eyes adapted to be threaded upon the tie rods **45** and extend upwardly through holes drilled in the cap rails and in the filler pieces. Above the filler pieces the anchor bolts cooperate with angle irons **76** which in turn are fastened to the rafters **36** by means of bolts **77**.

The roof supporting arrangements of the two embodiments described above each have certain advantages. On the one hand in the arrangement of FIGURES 1 to 20, the roof supporting arrangement requires a minimum number of different shapes and also eliminates any necessity for employment of filler pieces between the rafters. On the other hand the arrangement of FIGURES 21 to 26 is of advantage in providing a duct for electrical wiring above the upper ends of the posts and further in eliminating the employment of rods such as shown at **51** in FIGURE 8, as well as the concrete in filling the upwardly presented channel of the cap rail **33**.

I claim:

1. A building structure comprising a plurality of walls including walls lying in planes at right angles to each other and each wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls, each wall including a plurality of posts having equal center-to-center spacing from each other and each post being of square cross section, with an interior hollow extended throughout the length of the post and each post having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in each wall, each vertical panel of the walls being of thickness fitting the post grooves and of width sufficient to span the post-to-post spacing and to project into the post grooves, the walls lying in planes intersecting each other at a junction post common to both walls and each wall including vertical panels received in at least one of the pairs of opposed grooves, and post interconnecting ties extended through and between the posts of each wall, and anchor means for the adjacent ends of the tie for both walls, the anchor means for both ties being disposed within the interior hollow of the junction post.

2. A building structure according to claim **1** and further including a channel member extending along each wall at an end of the posts, the channel of the channel member being of width fitting the ends of the square posts and being positioned in engagement therewith.

3. A building structure according to claim **1** in which each wall includes pairs of vertical panels received in both pairs of opposed grooves in adjacent sides of the spaced posts thereof.

4. A building structure comprising a wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls and the wall including a plurality of spaced posts of square cross section, each post having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in the wall, each vertical panel of the wall being of thickness fitting the post grooves and of width sufficient

to span the post-to-post spacing and to project into the post grooves, the wall including pairs of vertical panels received in the pairs of opposed grooves in adjacent sides of the spaced posts, a post interconnecting tie extended through and between the posts adjacent the upper ends thereof and lying between the pairs of vertical panels, a roof including rafters supported on the upper ends of the posts of the wall and rafter tie-down means connected with the rafters and with the post interconnecting tie.

5. A building structure according to claim 4 in which the rafter tie-down means includes a cap rail interposed between the upper ends of the posts and the rafters and means for connecting the rafters to the cap rail and means for connecting the cap rail to the post interconnecting tie.

6. A building structure according to claim 4 in which the rafter tie-down means includes an upright link member connected with the rafter at its upper end and connected with the post interconnecting tie at its lower end.

7. A building sructure comprising outside and partition walls in spaced parallel relation and each including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls, there being a plurality of posts having equal center-to-center spacing from each other in both outside and partition walls and each post being of square cross section, each post having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in each wall, each vertical panel of the outside and partition walls being of thickness fitting the post grooves and of width sufficient to span the post-to-post spacing and to project into the post grooves, cap rails extended along and supported by the upper ends of the posts in the parallel outside and partition walls, each cap rail having a downwardly open channel of width fitting the upper ends of the posts, and roof rafters supported by the cap rails.

8. A building structure comprising a plurality of walls including walls lying in planes at right angles to each other and each wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls, each post being of square cross section and having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in each wall, each vertical panel of the walls being of thickness fitting the post grooves and of width sufficient to span the post-to-post spacing and to project into the post grooves, the walls including vertical panels received in at least one of the pairs of opposed grooves between adjacent posts, rafters for supporting a roof, the rafters being of the same width as the posts of the walls, and elongated rafter supporting members extended along and mounted on walls at right angles to each other and each having a downwardly presented channel fitting the upper ends of the posts of the wall on which the member is mounted, each of the rafter supporting members further having an upwardly presented channel fitting the rafter width, there being a rafter supporting member mounted on one wall and having a rafter received in its upwardly presented channel, and there being a rafter supporting member mounted on a wall perpendicular to said one wall and having rafters extended transversely thereof and supported thereon.

9. A building structure comprising a wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the wall, there being a plurality of posts having equal center-to-center spacing from each other in the wall and each post being of square cross section and having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in the wall, each vertical panel of the wall being of thickness fitting the post grooves and of width sufficient to span the post-to-post space and to project into the post grooves, the wall including vertical panels, received in at least one of the pairs of opposed grooves between adjacent posts, a cap rail extended along the upper edge of the wall and interfitting with the upper ends of the square posts and supported thereon, a roof including spaced rafters extended at right angles to the cap rail and supported thereon at spaced intervals along the cap rail, and means fastening the rafters to the cap rail and the cap rail to the posts, the cap rail comprising cementitious material and has an upwardly open channel having notches at spaced intervals receiving the rafters, the rafters comprising cementitious material and the means for fastening the rafters to the cap rail comprising a mass of cementitious material infilling the upwardly open channel of the cap rail in the vicinity of and in bonding engagement with the rafters.

10. A building structure according to claim 9 and further including an anchor rod extended through the rafters within the notches in the cap rail, the anchor rod being embedded in the mass of cementitious material in the channel of the cap rail.

11. A building structure comprising roof bearing outside and partition walls in spaced parallel relation and further comprising an intermediate non-bearing partition wall parallel to said other walls, each wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls, there being a plurality of posts having equal center-to-center spacing from each other in each wall and each post being of square cross section and having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in each wall, each vertical panel of each wall being of thickness fitting the post grooves and of width sufficient to span the post-to-post spacing and to project into the post grooves, cap rails extended along and supported by the upper ends of the posts in the roof bearing parallel outside and partition walls, each cap rail having a downwardly open channel of width fitting the upper ends of the posts, roof rafters supported by the cap rails and filler pieces at the upper edges of each of said bearing and non-bearing walls, the filler pieces extending from rafter to rafter to substantially close the spaces therebetween.

12. A building structure comprising roof bearing outside and partition walls in spaced parallel relation, each wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls, there being a plurality of posts having equal center-to-center spacing from each other in both outside and partition walls and each post being of square cross section and having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in each wall, each vertical panel of the outside and partition walls being of thickness fitting the post grooves and of width sufficient to span the post-to-post spacing and to

project into the post grooves, cap rails extended along and supported by the upper ends of the posts in the parallel outside and partition walls, each cap rail having a downwardly open channel of width fitting the upper ends of the posts, roof rafters supported by the cap rails, and filler pieces at the upper edges of each of said walls, the filler pieces extending from rafter to rafter to substantially close the spaces therebetween.

13. A building structure comprising a plurality of walls including walls lying in planes at right angles to each other and each wall including vertical posts and vertical panels, the individual posts and the individual panels being of length sufficient to extend substantially throughout the height of the walls, each wall including a plurality of posts having equal center-to-center spacing from each other and each post being of square cross section, with an interior hollow extended throughout the length of the post, and each post further having a pair of spaced vertical grooves in each of its four sides with the grooves in each side spaced equal distances from the edges of that side and symmetrically arranged with respect to the central axis of the post to thereby provide pairs of opposed panel receiving grooves in the adjacent sides of spaced posts in each wall, each vertical panel of the walls being of thickness fitting the post grooves and of width sufficient to span the post-to-post spacing and to project into the post grooves, the walls lying in planes intersecting each other at a junction post common to both walls and at least one of the walls including vertical panels received in both of the pairs of opposed grooves in adjacent sides of the spaced posts thereof, a post interconnecting tie extended from post to post between said pairs of vertical panels, and anchor means for an end of the tie, the anchor means being disposed within the interior hollow of said junction post.

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