

March 8, 1960

G. F. HAUF

2,927,665

PREFABRICATED SEALED BUILDING CONSTRUCTION

Filed Feb. 7, 1955

8 Sheets-Sheet 1

Fig. 1

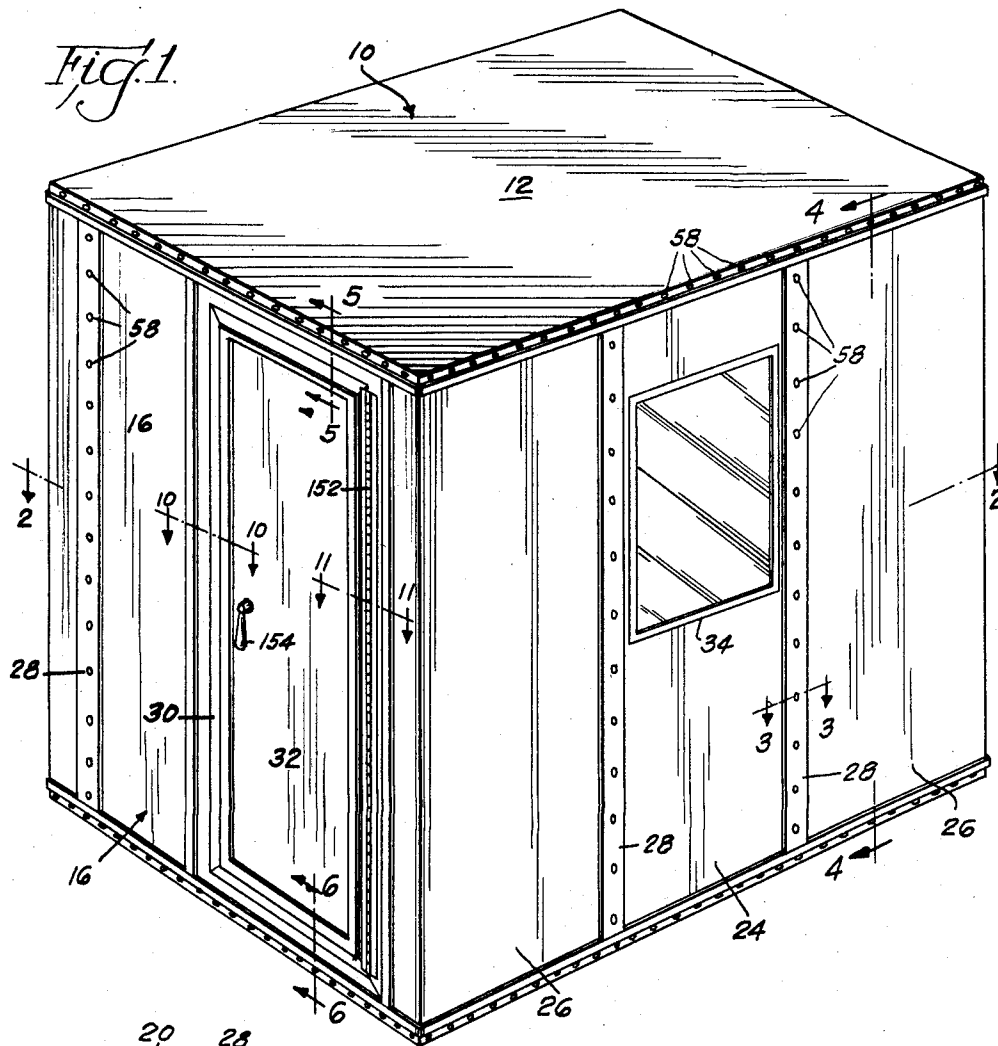
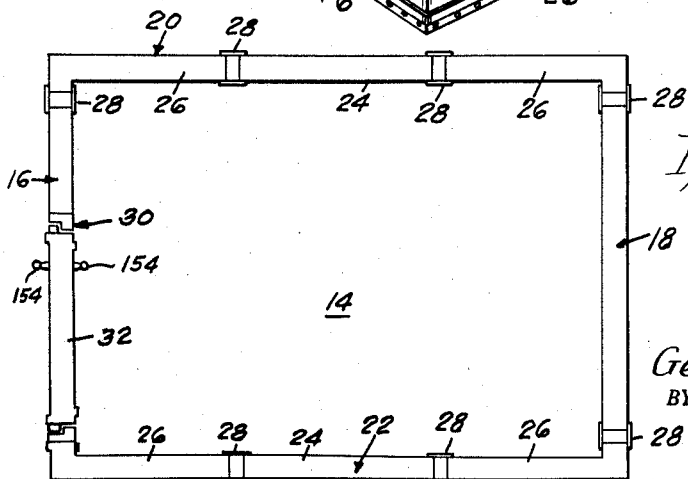


Fig. 2



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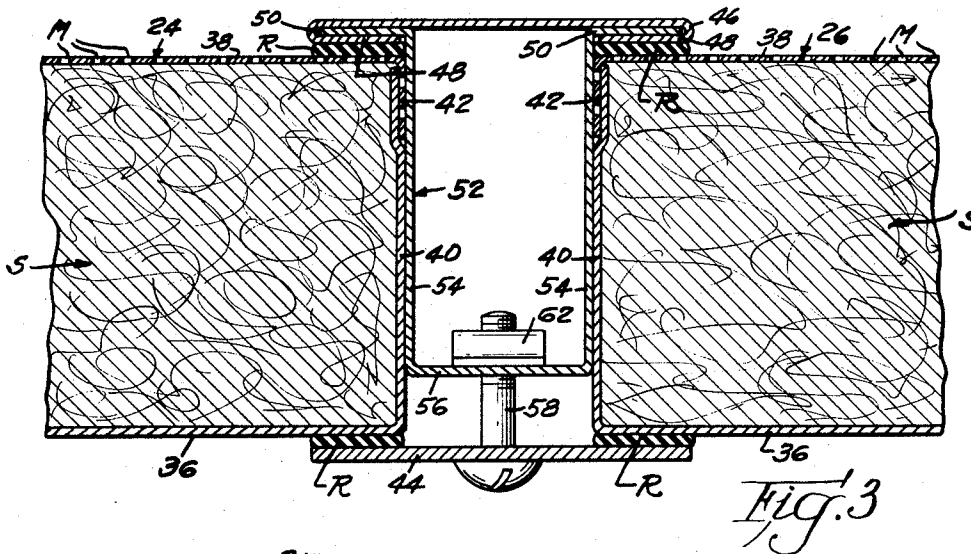
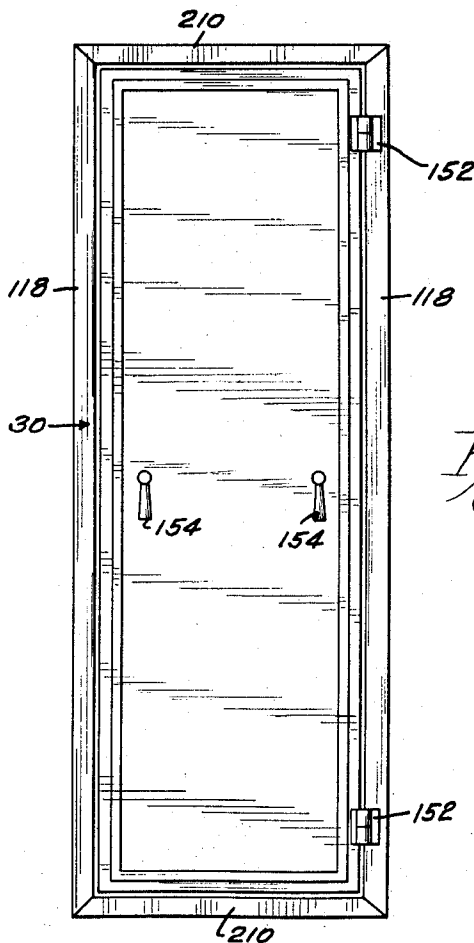
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8 Sheets-Sheet 2



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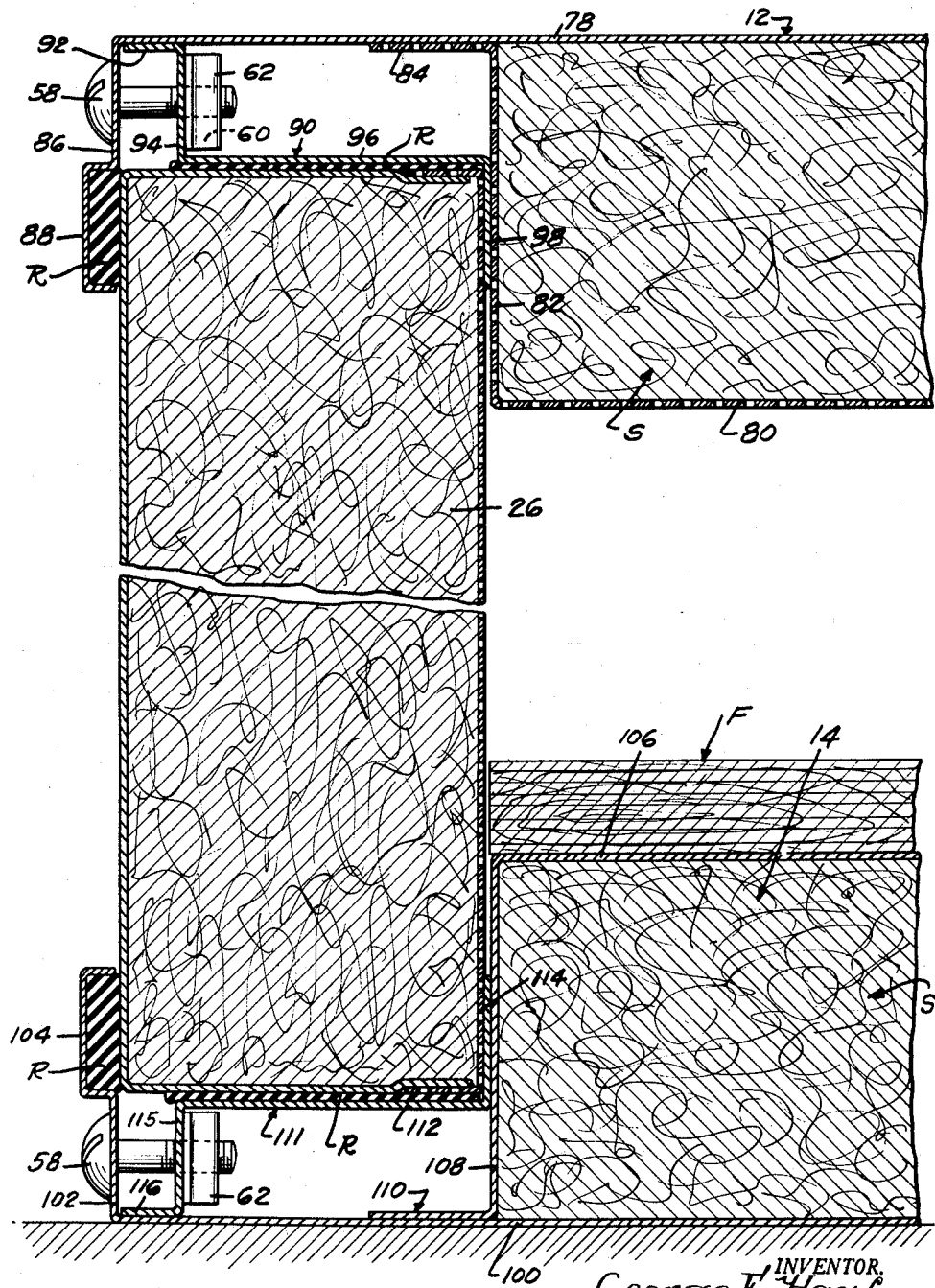


Fig. 4

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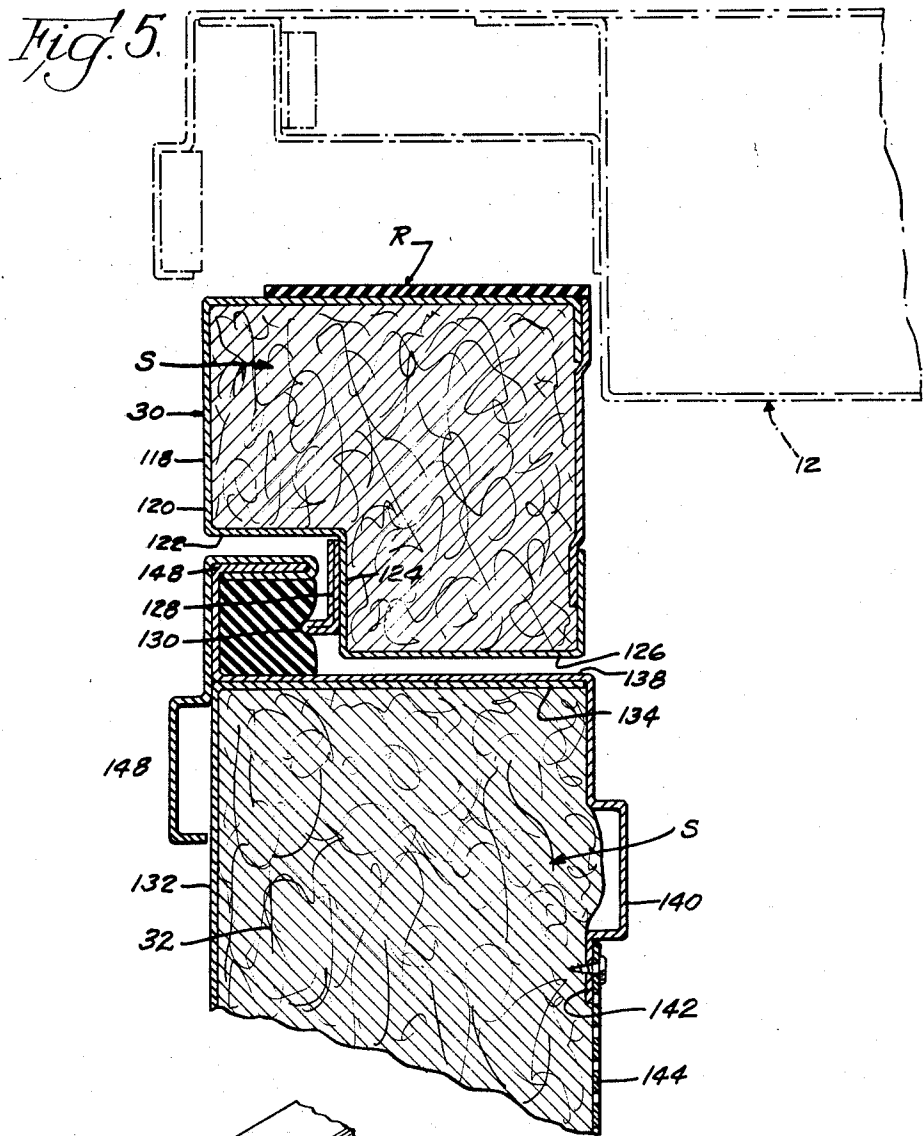
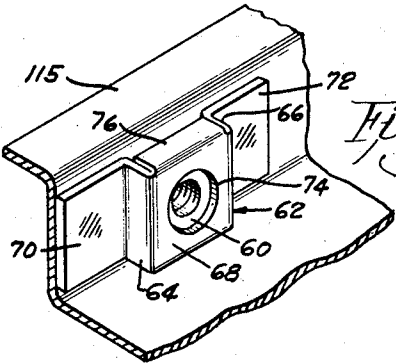
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PREFABRICATED SEALED BUILDING CONSTRUCTION

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8 Sheets-Sheet 4



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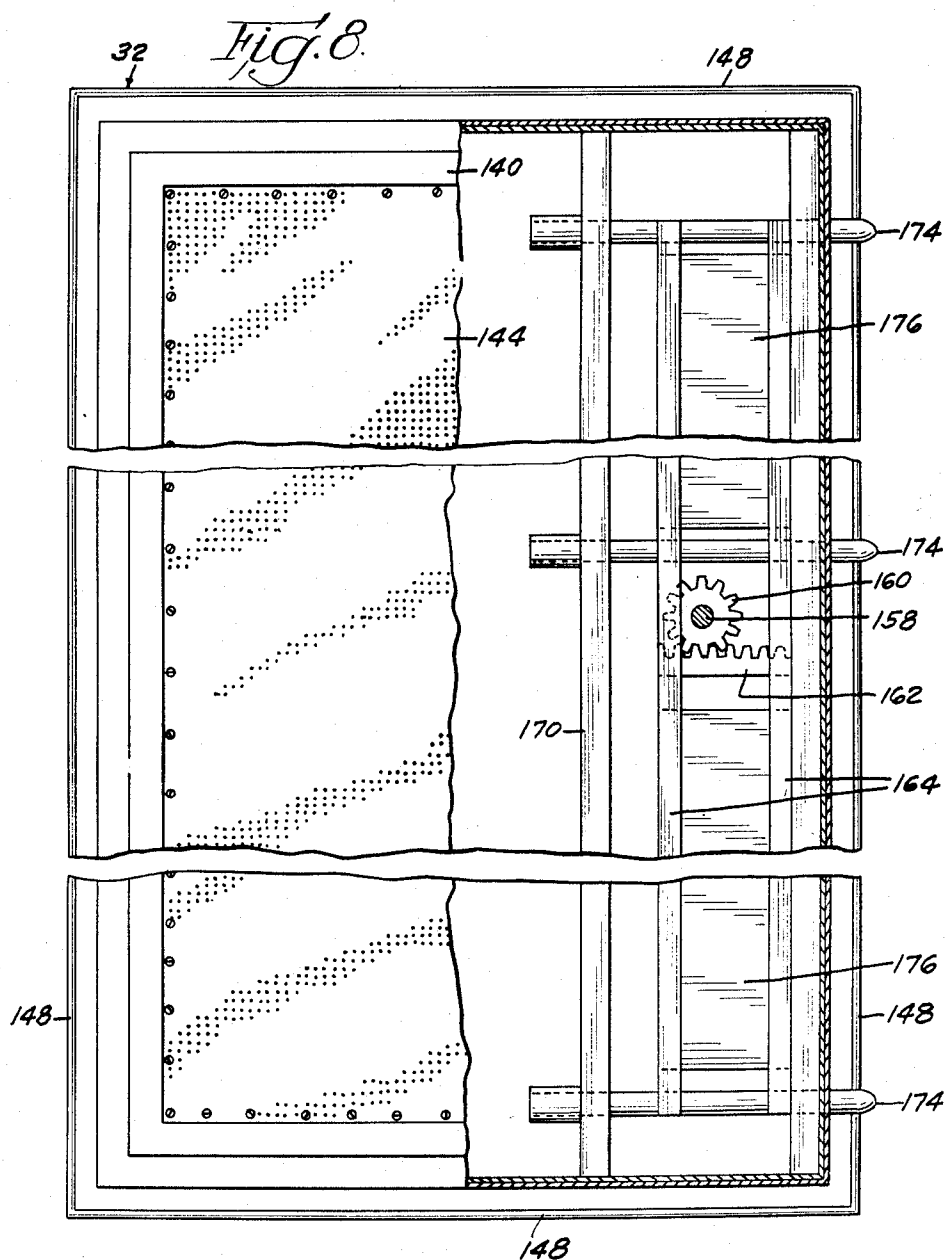
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PREFABRICATED SEALED BUILDING CONSTRUCTION

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8 Sheets-Sheet 6



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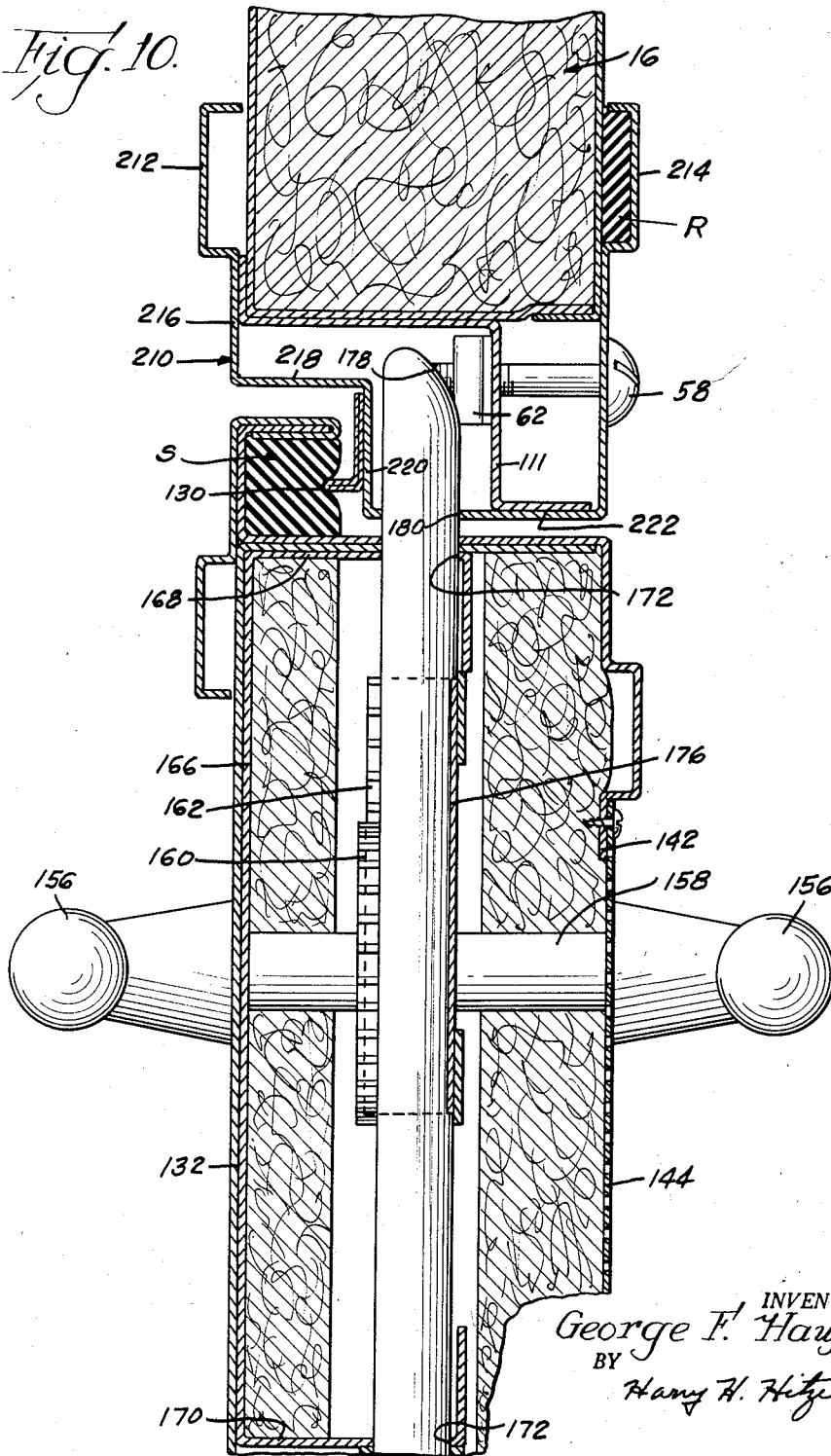
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PREFABRICATED SEALED BUILDING CONSTRUCTION

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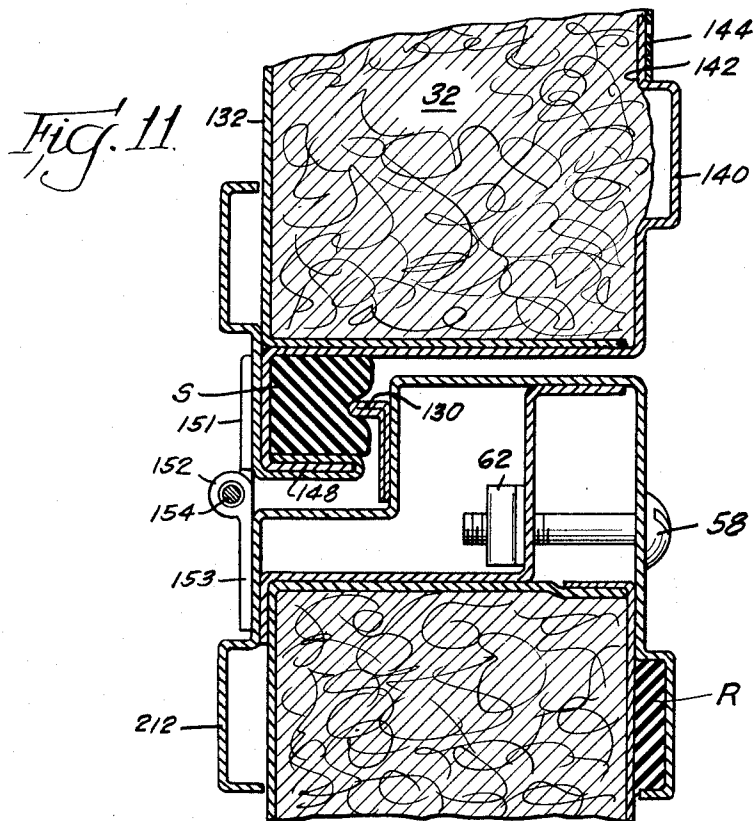
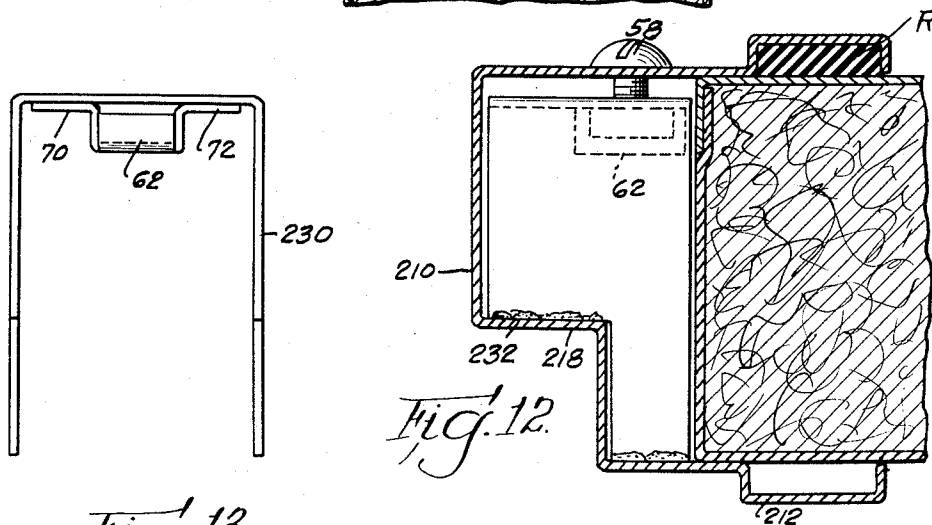
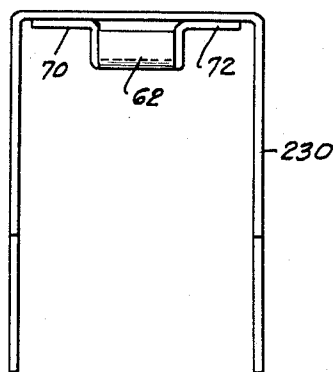
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PREFABRICATED SEALED BUILDING CONSTRUCTION

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8 Sheets-Sheet 8



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PREFABRICATED SEALED BUILDING CONSTRUCTION

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Application February 7, 1955, Serial No. 486,567

4 Claims. (Cl. 189—2)

My invention relates to improvements in prefabricated building construction.

My invention relates more particularly to the construction of sealed buildings which may be assembled and built where desired from certain standard prefabricated sections and joints which form the walls of a room or building with the necessary insulating qualities.

Prefabricated sections and joints have been used in the past for the construction of ovens and other buildings for the baking of finishes, products or chemicals, or in low temperature heat treating where heat insulating structure is required, and also to structures utilized in the smoking and treatment of hams, bacon, sausages and the like where a structure must have tightly sealed joints. One such structure is shown in a previously issued United States Patent No. 2,300,743 to George F. Hauf and James J. Egan.

In recent years there has been a demand for totally enclosed rooms, especially designed, constructed and mounted to eliminate external noise and vibration. Specifically, such rooms are used for audiometric testing of the hearing qualities of persons and are placed in factories, shops and doctors' offices for this purpose. Since various buildings or offices in which they are placed are of various sizes with different locations of doors and windows, the totally enclosed and sealed room structure must be such that sections, doors and windows of the same are interchangeable and may be assembled to suit the particular location selected for its site. Also, in any assembly the wall joints, including floor and ceiling and the window and door openings, must have a ceiling quality which will exclude and prevent entrance of sound, air, water or other fluid.

With these and other purposes in mind, the principal object of the invention is to provide a room structure made up of prefabricated sections and panels and parts adapted to be assembled at the place of use, which structure is easily assembled in such a way that the joints between aligned wall sections or panels and the joints between the wall and floor and ceiling or roof sections are hermetically and structurally tight and have the highest of insulating qualities.

Another object of the invention is to so construct the prefabricated wall panels, joints, doors and windows in such manner that all of the parts are flat and can be easily packaged, handled and shipped.

Another object of the invention is to provide a room structure comprising wall panels, roof and floor sections adapted to be joined together and joint structures for such purpose that not only provide hermetically tight joints, but also provide strong walls which are structurally rigid and will withstand exceptionally hard and continuous usage.

A further object of the invention is to provide joint structures for the wall panels, roof, floor and the door frame and door which present a neat and attractive appearance when assembled.

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A further object of the invention is to provide an improved construction of door and door frame which is effective upon closing the door to hermetically seal the entire periphery of the door opening, yet the means for opening and closing the door either from within or without will be sufficiently easy to operate so that children and weak and ill persons can easily manipulate the door opening and closing means.

A further object of the invention is to provide in connection with the door operating means, door locking bolts having camming surfaces thereon for pressing the door inwardly along both vertical or longitudinal sides to secure the desired hermetic seal in the door frame structure.

Other objects and advantages will be more apparent from the following description wherein reference is had to the accompanying drawings, upon which—

Fig. 1 is a front perspective view of a room embodying a preferred form of the invention;

Fig. 2 is a diagrammatic plan sectional view of the room shown in Fig. 1;

Fig. 3 is a plan sectional view of one of the joints and vertical wall panels taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view taken through one of the wall panels, the roof and the floor, showing the hermetical and structural connection between the side walls and the floor and roof;

Fig. 5 is a fragmentary vertical sectional view through the top of the door and the door frame, taken on the line 5—5 of Fig. 1;

Fig. 6 is a similar vertical sectional view through the bottom of the door and the lower door frame, taken generally on the line 6—6 of Fig. 1;

Fig. 7 is a transverse sectional view through the floor of the room, showing the structural supports placed at intervals for the flooring on the floor section;

Fig. 8 is a view of one of the doors employed, the view being taken from the inside of the room, with parts broken away to show the latch and bolt mechanism and the view also being foreshortened;

Fig. 9 is a front elevational view of a modified type of door in the door frame;

Fig. 10 is a plan sectional view through the door and door frame showing one of the bolt and latch members, the view being taken on the line 10—10 of Fig. 1;

Fig. 11 is a fragmentary plan sectional view through the door, door hinge and wall panel, the view being taken generally on the line 11—11 of Fig. 1;

Fig. 12 is a fragmentary plan sectional view of a modified type of door frame showing fastening clips therein;

Fig. 13 is a front view of one of the fastening clips; and

Fig. 14 is a preferred form of nut-holding cap and nut which I employ to fasten the joints.

In the embodiment of the invention which I have chosen to illustrate and describe the same, I show a room 10 which may generally consist of a roof section 12, a floor section 14, a front wall 16, a back wall 18, and side walls 20 and 22. As best shown in the diagrammatic illustration in Fig. 2, the side walls may be formed from a series of vertical wall panels 24 and 26, the panels 26 having corner portions to be connected by the special joints 28 used throughout to the front and back walls 16 and 18. A door frame 30 is mounted in the front wall 16 to receive the special door 32 that is employed. A window frame 34 may be mounted in one of the side panels 24, the construction of the same being such that the frame and window will be hermetically sealed and insulated.

Referring now to Fig. 3, the structure of the wall panels as well as the hermetic seal between the joint and

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the wall panels is disclosed. The wall panels 26 and 24 are preferably hollow sheet metal which has the outer wall 36 and an inner wall 38, the periphery of each wall panel having the side wall 40 which is overlapped by a small ledge 42 of the inner wall 38 and suitably welded together. The space between the inner and outer walls may be filled with any suitable or desired sound deadening or other insulating material S. For audiometric testing, which is one use for rooms of this type, the inner wall 38 may have minute openings M throughout its entire surface, as is well known in the acoustic or sound deadening art.

The joint which I prefer to use for joining wall sections or panels in substantially the same plane, may comprise a flat plate member 44 which will run throughout the height of the wall panels 24 and 26. I provide a parallel plate 46 on the inner surface of the panels 24 and 26, the inner plate being provided with reversely bent flanges 48 for receiving between the flanges and the plate the legs 50 of fastening channel members 52, each of the channel members 52 having leg portions 54 connected by a base 56 which has suitable openings for screw members 58. The bolts 60 for receiving the end of a screw 58 are preferably held in a housing 62 (see Fig. 14), which is formed from a single piece of sheet metal having side portions 64 and 66 that are angularly disposed with respect to the central portion 68 thereof, flanges 70 and 72 extending laterally from the sides so that they can be spot-welded to the base 56 of the channel member 52. A central opening 74 permits the end of the screw member to extend through the forward wall 68 of the housing. The top and bottom of the housing also have side wall portions 76 so that when a nut is placed in the housing and the housing is spot-welded to the channel member, the nut is permanently retained and held against turning when the screw member is fastened.

A sealing strip of rubber or other suitable material R is provided between the outside surface of each wall section and the outer plate 44, and a similar strip is also provided between the inner surface of the wall sections and the inner plate 46. With this construction, when the screw members 58 are tightened the joints between the wall sections will not only be structurally rigid, but will also be effectively and permanently hermetically sealed.

In Fig. 4 I have shown the manner in which the roof and the floor of the room may be both structurally connected and hermetically sealed to the wall panels. The roof 12 may be formed with a sheet metal outer wall 78 and a parallel spaced inner sheet metal wall 80, the inner wall having a transverse flange 82 and a fastening ledge 84 which is welded or otherwise secured to the inner surface of the outer wall 78. The space between the inner and outer walls may be filled with insulating or sound deadening material S, similar to that employed in the side panels 24 and 26. The transverse flange 82 of the inner wall is preferably spaced a distance equal to the width of the side panels from the intumed flange 86 of the outer wall 78. The flange 86 is formed at its edge with a channel 88 to receive sealing material R such as rubber.

About the entire periphery of the roof I provide a generally Z-shaped fastening strip 90 which is formed with a ledge 92, a transverse wall 94 parallel to the flange 86, a leg 96 extending backwards from the flange 86 to the wall 82, and having a flange 98 parallel with the wall 82. The fastening strip is secured to the roof 12 in this position by suitable welding at the ledges 92 and 98. Each of the fastening strips 90 has a nut housing 62 fastened thereto, each of the housings containing a nut 60 to receive a fastening screw 58.

In assembly, the roof 12 which is rectangular in shape, may be of the size of the room to be built and the upper ends of the wall panels 24 and 26 will extend within the channel 88 and against the fastening strip 90, a layer of sealing material R being placed along the top of the same. As the screw member 58 is then fastened in the nut 60,

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the top of the wall sections will be fastened within the downwardly depending flange 86 of the roof structure, and by compression of the sealing material R, both a hermetic seal and a structurally sound connection will be made between the side panels and the roof.

In the lower portion of Fig. 4 I have shown the manner in which the floor 14 and the side panels may be fastened together. The floor, similar to the roof, may have an outer or bottom sheet metal wall 100 which has an upturned outer flange 102 that has a channel 104 at its upper edge, the channel to receive the sealing member R. The upper wall 106 of the floor 14 may be a sheet metal panel with a downwardly turned flange 108 and a transverse flange 110 which is welded at suitable spots to the upper surface of the bottom wall 100. The space between the walls 100 and 106 is filled with suitable sound deadening or insulating material S. A suitable floor covering such as plywood or other material F may be placed upon the top of the floor 14.

To receive the lower end of the wall panels 24 and 26 and structurally support the same, I provide a generally Z-shaped supporting shelf 111 which has an upper surface 112, a flange 114 fastened to the side of the floor 108, the wall 112 terminating at its forward end in a downwardly extending flange 115, and a lateral flange 116 that is fastened throughout its length to the top of the wall 100 of the floor 14. Suitable nut housings 62 are fastened to the flange 115 throughout its entire periphery, the same holding nuts 60 to receive the screw members 58. A sealing strip R is placed on the supporting shelf 111, and when the screw members are fastened tightly the bottom edges of the wall panels are structurally secured to the floor and are also hermetically sealed by reason of the sealing strip R both at the bottom of the wall panels and along their outer edge.

In order to support the plywood floor layer F with sufficient strength upon the sound-proof floor, I provide sheet metal channel members 101 placed upon the lower wall 100 of the floor with outwardly bent flanges 103 fastened to the underside of the top wall 106 of the floor. These channel shaped support members may be fastened as desired throughout the length of the floor, depending upon the load to be carried and the proportions of the room.

In Figs. 5 and 6 I have shown a vertical cross-section of the manner in which a door and door frame may be mounted in my improved structure, the showing of Figs. 5 and 6 being directed solely to the mounting of the horizontal portions of the door frame between the floor 14 and the roof 12. The vertical portions of the door frame are shown in detail in Figs. 10 and 11.

The horizontal and vertical portions of the door frame are welded together at their meeting edges in a manner which will be hereinafter described. The door frame 30 thus comprises a generally rectangularly shaped frame of a suitable size to receive the door 32. The horizontal panels may be constructed of sheet metal in the form of a tubular member 118 being filled with insulating material S. Each of the members 118 may have a front wall 120 that terminates in an inwardly directed flange 122, the flange 122 terminating in a transversely bent flange 124 which extends to the inner wall 126 of the door frame. An angle shaped strip 128 is welded or otherwise suitably fastened on the surface of the flange 124 along the entire length of the horizontal portions 128, the strip having an outwardly directed lip portion 130 for a purpose which will be hereinafter described.

The vertical portions of the door frame may be in the shape of a generally open-ended channel 210 having the channel shaped ledges 212 and 214 embracing the edge of a front panel 16. Each of the vertical members 210 also has a front wall 216 that terminates in an inwardly directed flange 218, the flange 218 terminating in a transversely bent flange 220 which extends to the inner wall 222 of the member. Both the vertical and hori-

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zontal frame members are provided with similar fastening strips 211 for attachment to the side panels of the room and to the floor and roof respectively, the fastening being done in a manner previously described herein in connection with the fastening of the other panels, each fastening including the provision of the sealing strip R in the peripheral ledge 212.

The door 32 which I prefer to employ, is preferably made of sheet metal and comprises an outer wall 132 rectangular in shape, the wall having an inwardly turned flange 134 about its entire periphery. I provide a sheet metal frame 136 which has an opening to receive the inwardly turned flange 134 of the door panel 132 within a surrounding wall 138, the sheet metal frame also having an inner wall portion 140 about its periphery. The inner wall portion 140 has a ledge 142 to which a rectangular sheet metal panel 144 may be fastened, the door thus formed being provided between the outer wall 132 and the panel 144 with the latch mechanism for locking the same and sound deadening material S.

The peripheral flange 138 of the frame has a transversely extending ledge 146 that extends away from the same and terminates in a ledge 148 parallel to the ledge 138. A reinforcing flange 150 extends about the periphery of the door, the flange 150 being fastened over the inwardly turned flange 148 of the metal frame 136. Within the space between the walls 138 and 149 I provide a sealing material S which when the door is closed, will be compressed by the lip 130 of the door frame, thus providing an effective peripheral hermetic seal about the entire door.

The door 32 may be fastened in the door frame by a continuous hinge member 152 consisting of alternate plates 151 and 153 fastened to the door and to the door frame respectively, the hinge member being mounted upon a continuous pin 154, both the hinge and the pin extending the length of the door. The pin and hinge connection are preferably of the type called a free floating hinge so that the hermetic seal about the door may be more easily accomplished.

The door is provided with operating handles 156 upon both the inside and the outside of the door, both handles being connected to a rod 158 which carries a gear 160. The gear is adapted to mesh with a rack 162 which is fastened at its sides to a pair of vertically disposed sheet metal strips 164 that extend to a point adjacent the top and the bottom of the inside of the door. A reinforcing channel 166 is mounted against the outside wall 132 of the door, the channel having the legs 168 and 170 provided with guide openings 172 for the door latching bolts 174. The bolts 174 are welded or otherwise secured to the vertical strips 164, the strips being further reinforced by being connected between plate members 176 placed above and below the rack and gear 162 and 158 respectively.

As best shown in Fig. 10, the engaging ends of the bolt members are formed with a cammed or curved surface 178, so that as they engage the opening 180 in the side door frame, the edge of the door will be moved inwardly toward the frame, pressing the lip 130 into the sealing strip R. In this manner the door is pivoted about the hinge pin 154 and pressed inwardly so that the lip 130 compresses the seal R to effect a thoroughly tight hermetic seal.

In Figs. 12 and 13 I have shown a modified form of construction of the door frame. The door frame members 210, instead of being provided with a continuous fastening strip 211 having fastening bolts spotted at desired intervals, are provided with fastening clips 230 which may be generally U-shaped as shown in Fig. 13 and provided with the step portions 232 to set upon the flange 218 and be welded into position.

In Fig. 9 I have also shown a modified form of the door 32 in which two sets of door opening and closing handles 154 are provided and two sets of latching bolts

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174 are also provided. With the free floating hinge such as described, the locking bolts are capable of fastening both vertical edges of the door securely into hermetic sealing position due to the cammed surfaces on the hinged bolts. With the door frame which has been provided it will of course be understood that either type of door may be provided and will fit into the door frame, the choice being entirely dependent upon the purposes for which the room is to be used.

From the above and foregoing description it can be seen that I have provided a sealed building or room structure which can be prefabricated at the factory, the roof, floor, side wall sections, joints and doors all capable of being packed for shipment in relatively easily handled packages. Further, the package may be assembled at the factory in accordance with the size of the room which has been ordered and the doors may be placed in any suitable or convenient side of the room, depending upon the structure and the surroundings of the building in which it is to be placed.

In the construction which has been disclosed the operating handles for opening the door are adapted to be swung through a radius of 90°, the final 45° movement of the handle being adapted to cam the door into hermetic sealing position. By reason of the length of the handle and the ratio of the gear and rack, the pull required either to open or close the door is sufficiently light so that small children or weak or ill persons can easily manipulate the closing and opening of the door.

I contemplate that changes and modifications may be made in the exact details shown and I do not wish to be limited in any particular; rather what I desire to secure and protect by Letters Patent of the United States is:

1. A fluid-tight room construction comprising a horizontally disposed rectangular roof unit, a horizontally disposed rectangular floor unit of the same size, rectangular side wall panels vertically disposed between said floor and said roof units, joints connecting said side wall panels together at their abutting edges, each of said joints comprising elongated vertically disposed plates and an elongated vertically disposed channel connecting the same, each roof section and floor section being identical and each having a peripheral trough about the edge of the same to receive the upper and lower ends of said wall panels, said troughs facing each other, each trough having an outer transverse edge flange, a U-shaped channel in each edge flange, a sealing strip in each channel, each trough also having a Z-bar therein with one vertical leg lying against the vertical edge of the roof and floor unit with the outer vertical edge spaced inwardly from and parallel to the outer trough edge flange, and a connecting horizontal leg spaced inwardly from the top and bottom surfaces of said roof and floor units with the ends of said side wall panels fastened between said horizontal legs, said sealing strip lying in said channel against the sides of the wall panels around their entire periphery adjacent the top and bottom ends of the same, and fastening means forming part of each roof and floor unit to structurally and hermetically lock the same over the wall panels, said fastening means comprising nut members held in non-rotating screw receiving suspension in each outer vertical edge of said Z-bar and fastening screws extending horizontally inwardly through the outer edge of said trough and received by said nut member.

2. A sealed room structure comprising a rectangularly shaped roof, a rectangularly shaped floor and rectangularly shaped vertical wall panels, each of said wall panels being similar in construction, joints hermetically and structurally connecting said wall panels together to form a rectangular enclosure, each of said wall panels and said roof and floor panels comprising flat hollow rectangular sheet metal members having insulating material therein, facing peripheral troughs around the edges of said roof and floor panels for telescopically receiving the upper and lower ends of said vertical wall panels, each

of said troughs having a peripheral supporting shelf therein, a vertical peripheral flange spaced from the outer edge of said trough, a hermetic sealing strip in said flange and fastening means holding said flange against the outer side of said wall panels, said fastening means including

nut members fixedly held in a vertical leg of said supporting shelf and screws positioned in said vertical peripheral flange engaging said nut members and adapted to tighten said flange and said sealing strip against the outer side of said wall panels.

3. A fluid-tight room construction consisting of prefabricated units including a rectangular roof unit, a rectangular floor unit and rectangular wall panels connected together to form a rectangular enclosure, each of said roof and floor units comprising spaced inner and outer sheet metal walls having sound deadening material therebetween, the outer wall of said roof unit and said floor unit each having an outer transverse peripheral flange spaced from the edge of the same to form a peripheral trough about the edge of the same, each of said wall panels comprising aligned insulated wall panels joined together by a pair of cover plates and having edge and side surfaces, the side surfaces of adjacent wall panels being aligned with each other with the edges spaced apart, each pair of cover plates including one disposed against and overlying a portion of the side surfaces of two aligned wall panels and a second cover plate overlying the opposite aligned surfaces of two of said wall panels, said second cover plate having a U-shaped channel disposed between the abutting edges of two wall panels, fastening means between said channel and said first mentioned cover plate, sealing means disposed between portions of both of said cover plates and both of the side walls of said aligned wall panels, a Z-shaped bar in each trough having one leg forming a horizontal shelf, the upper and lower edges of said enclosure resting in the trough against said shelf around the edges of the roof and floor units, a sealing strip in the outer flange of each of said troughs, and screw means extending inwardly from said outer flanges, fixedly held nuts in the Z-bars of the troughs in said floor and roof units engaged by said screws frictionally holding the upper and lower ends of said wall panels in said troughs.

4. A fluid-tight room construction consisting of prefabricated units including a rectangular roof unit, a rectangular floor unit and rectangular wall panels aligned and connected together to form a rectangular room having vertical wall panels and horizontal roof and floor

units, said wall panels fastened to said floor and said roof units, each of said roof and floor units comprising spaced inner and outer sheet metal walls having sound deadening material therebetween, the outer wall of each floor and roof unit having a transverse peripheral flange spaced from the side edges of the same to form a peripheral trough thereabout, said aligned wall panels joined together by a pair of cover plates, each wall panel having edge and side surfaces, the side surfaces of adjacent wall panels being aligned with each other with the edges spaced apart, each pair of cover plates including one disposed against and overlying a portion of the side surfaces of two aligned wall panels and a second cover plate overlying the opposite aligned surfaces of two of said wall sections, said second cover plate having a U-shaped channel disposed between the abutting edges of two wall panels, fastening means between said channel and said first mentioned cover plate, sealing means disposed between portions of both of said cover plates and both of the side walls of said aligned wall panels, the upper and lower edges of said enclosure resting in the peripheral troughs around the edges of the roof and floor units, a Z-shaped bar having one leg thereof forming a horizontal shelf in each trough, a sealing strip on said shelves engaged by the upper and lower end edges of said wall panels, and screw means in said floor and roof units frictionally holding the upper and lower ends of said wall panels in said troughs between the transverse peripheral flanges and the side edges of said floor and roof units, said screw means including nuts held against rotation in said Z-bars and screws engaging the same through the peripheral flanges of said trough.

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