

[54] MODULAR NOISE ABATEMENT
ENCLOSURE AND JOINT SEAL[76] Inventor: **Gordon J. Pollock**, 24451
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248/56; 248/68 CB
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- [58] Field of Search 52/589, 299, 283, 395,
52/403, 463, 474, 27, 241, 262, 483, 363,
270, 486, 487, 126, 393, 281, 122; 49/310,
480; 248/68 CB, 56

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ABSTRACT

A free-standing modular space enclosure for achieving desired levels of noise abatement, particularly in manufacturing facilities, by acoustically isolating separate units of noise-producing industrial machinery and apparatus, while at the same time providing ready access to any part or portion of the isolated equipment or machinery by removal of any adjacent detachable panel of the noise enclosure. Such access is desirable and necessary for repair, maintenance, regulation and inspection of the machinery or apparatus so isolated. The enclosure comprises a four-sided structure, the walls of which are assembled from a plurality of modular panels which are acoustically isolated from each other and from the skeletal framework although detachably sealed at their common joints or areas of engagement with each other. In addition to the side walls, the enclosure is provided with a roof also assembled from a plurality of modular panels and acoustically isolated from the wall panels and from the skeletal framework although engaged therewith. Any of the standard modular panels may be replaced, if desired, with special panels having specified features or characteristics such as, doors, windows, feed-through systems, service boxes, and the like.

25 Claims, 27 Drawing Figures

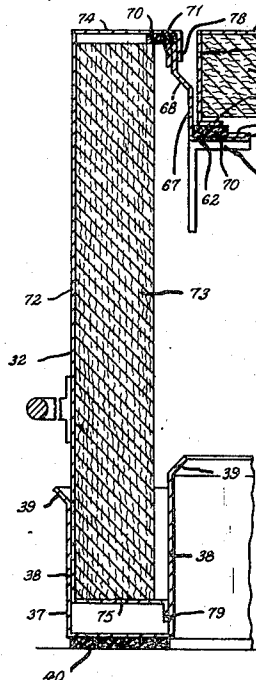


Fig- 1

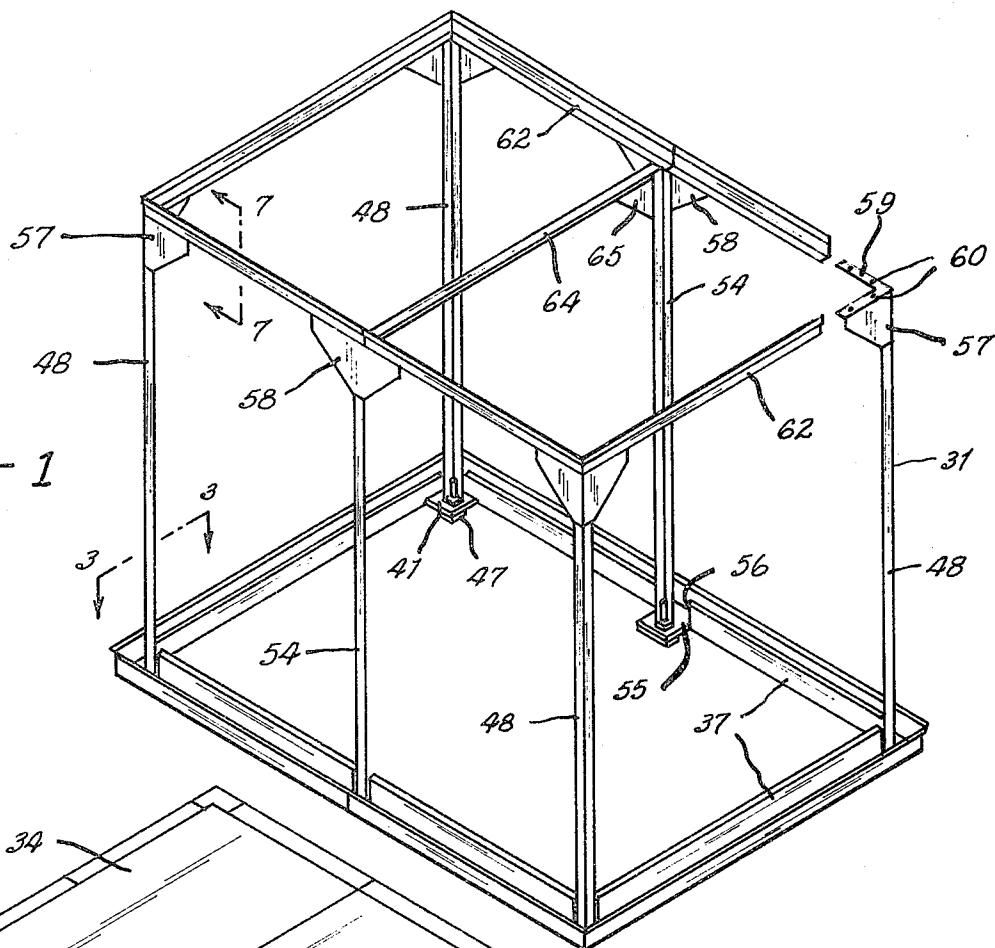
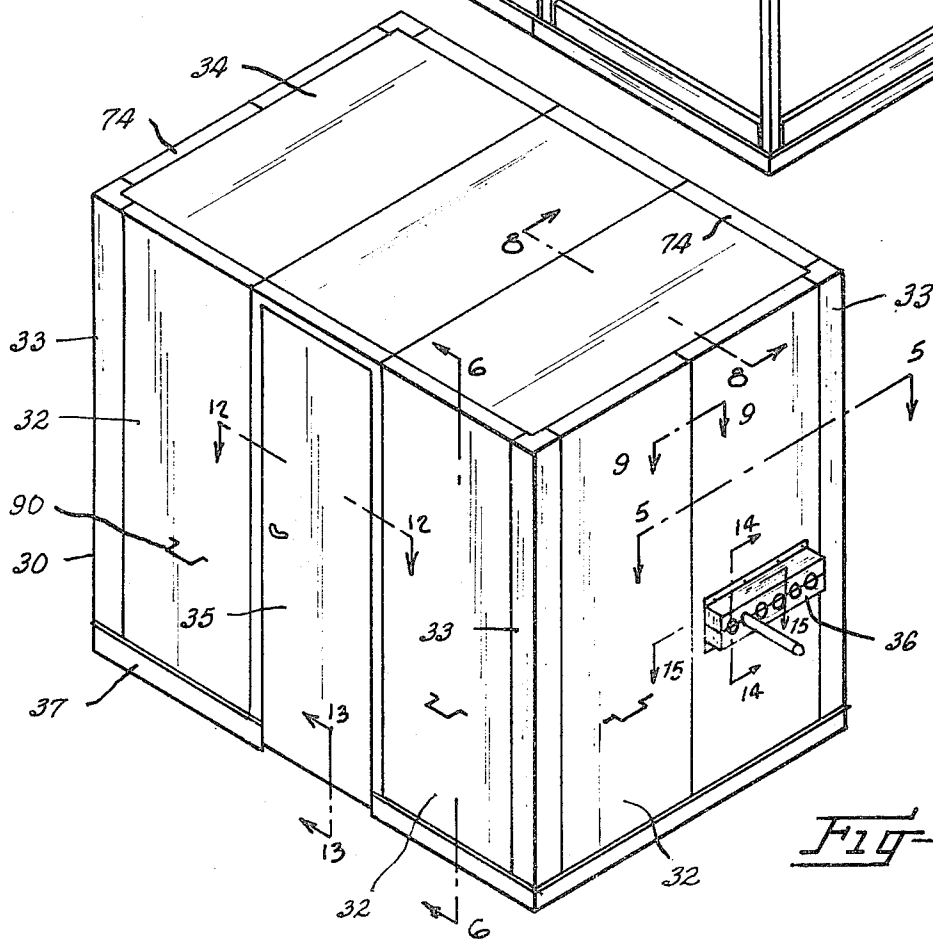
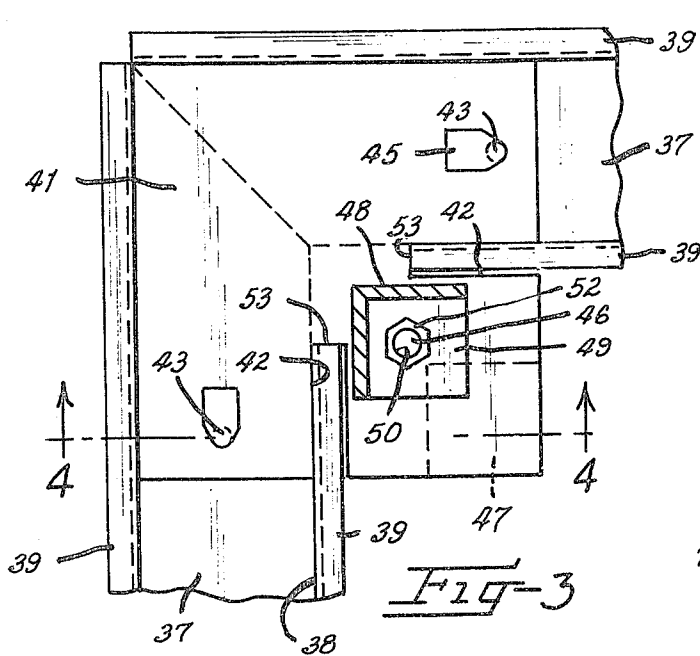
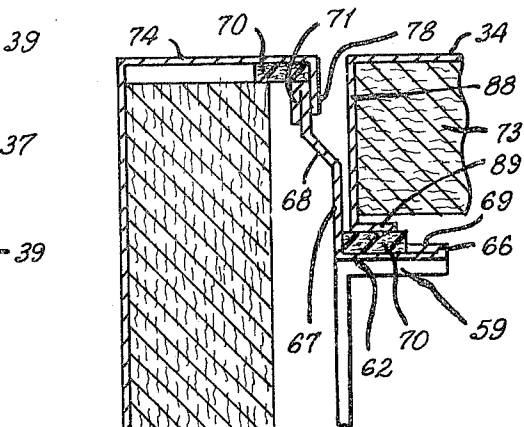
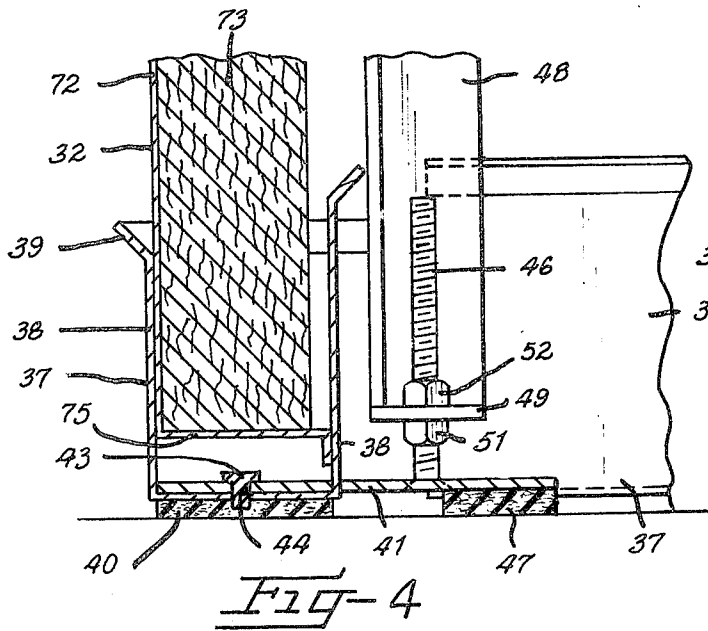
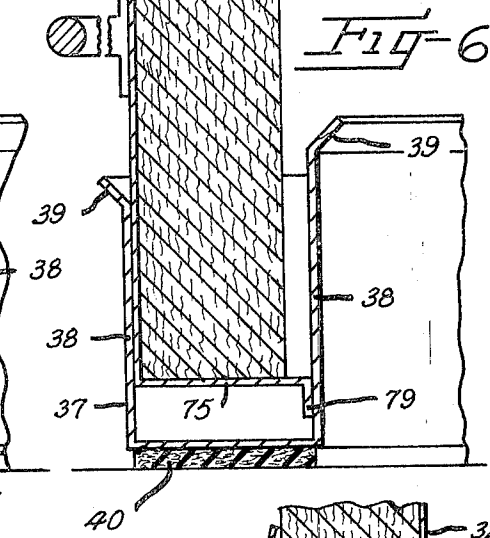
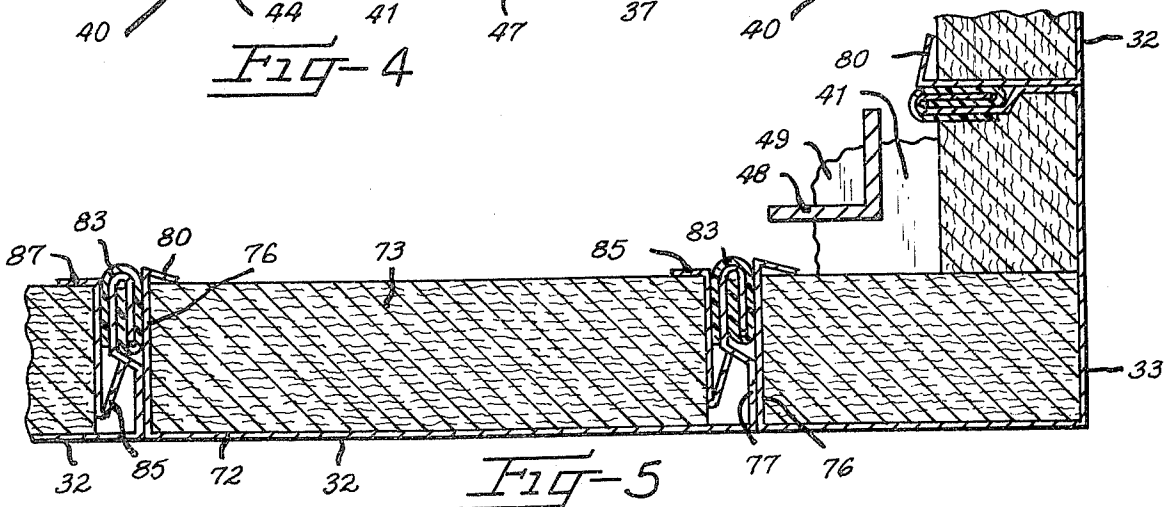
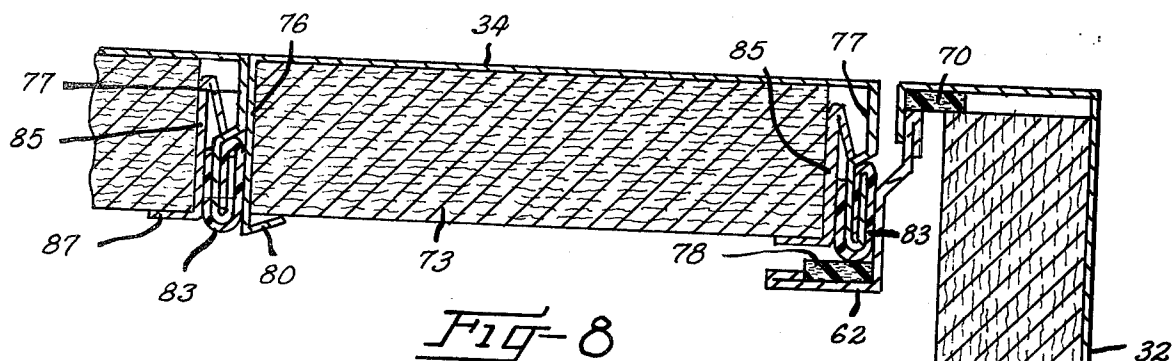
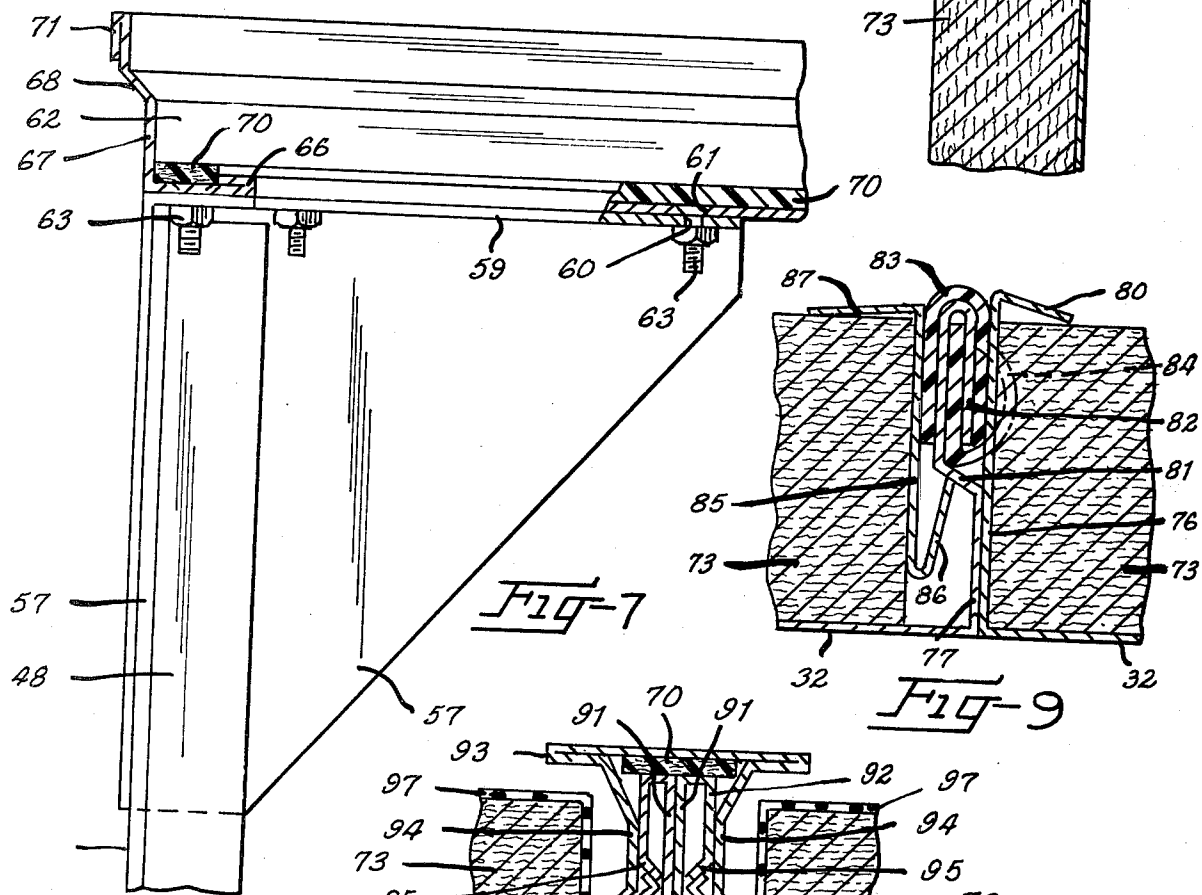
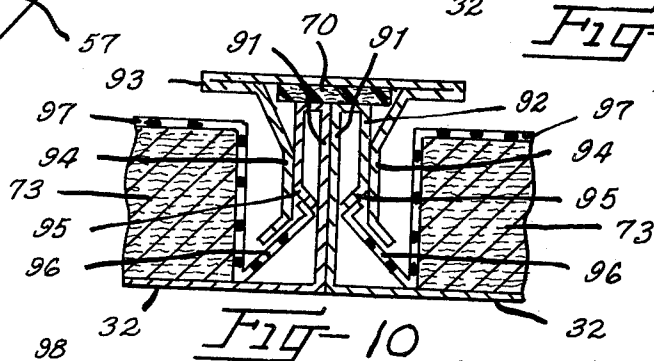
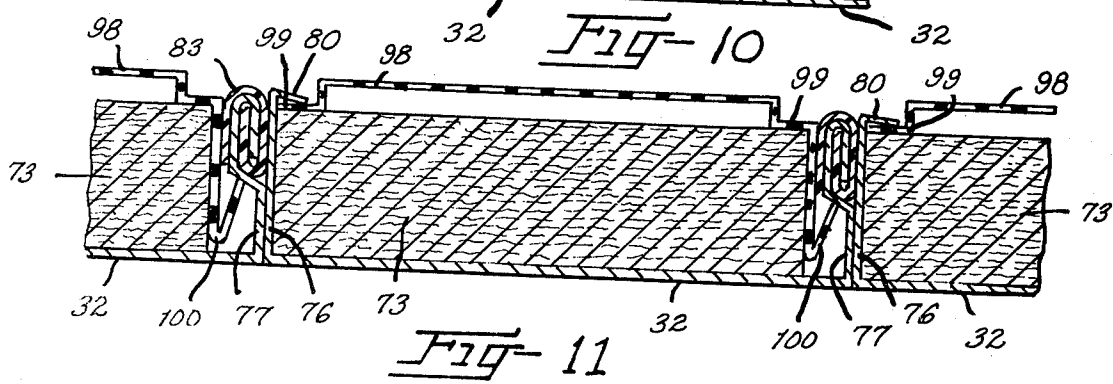


Fig- 2







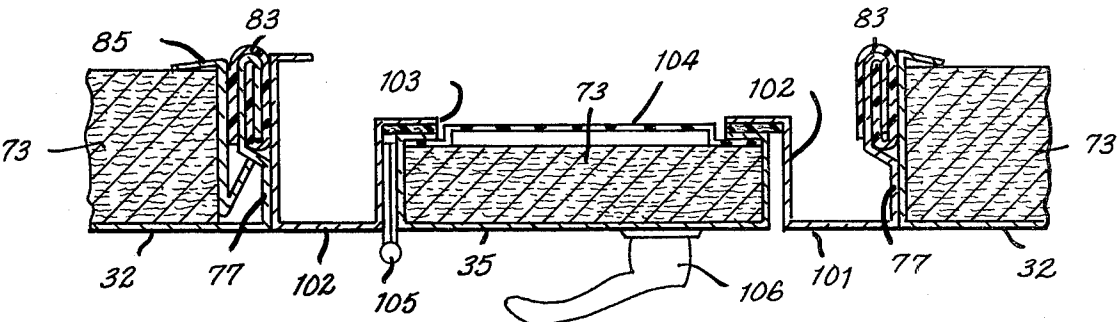


Fig- 12

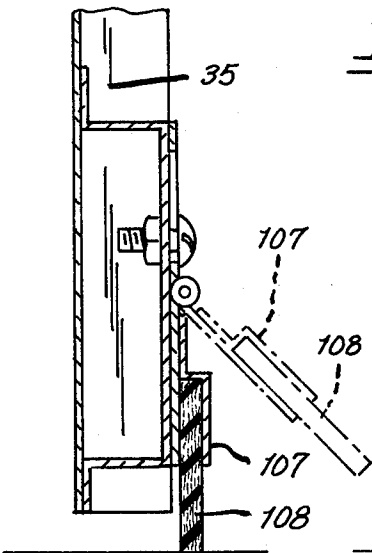


Fig- 13

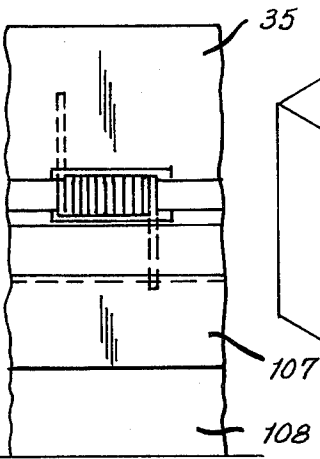


Fig-13a

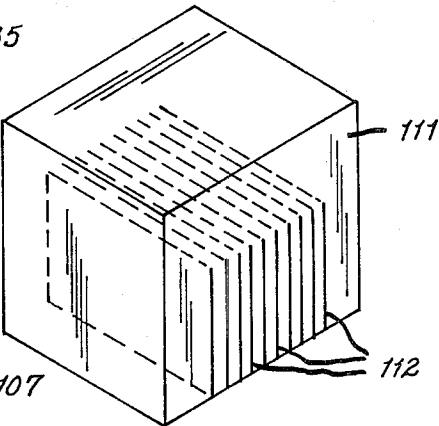


Fig- 16

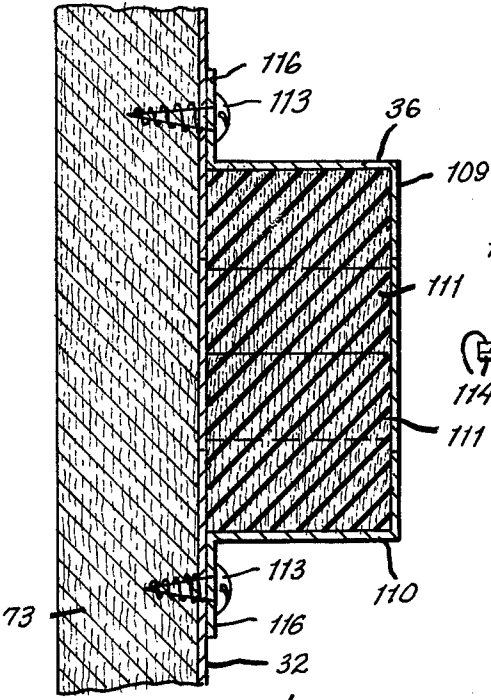


Fig- 14

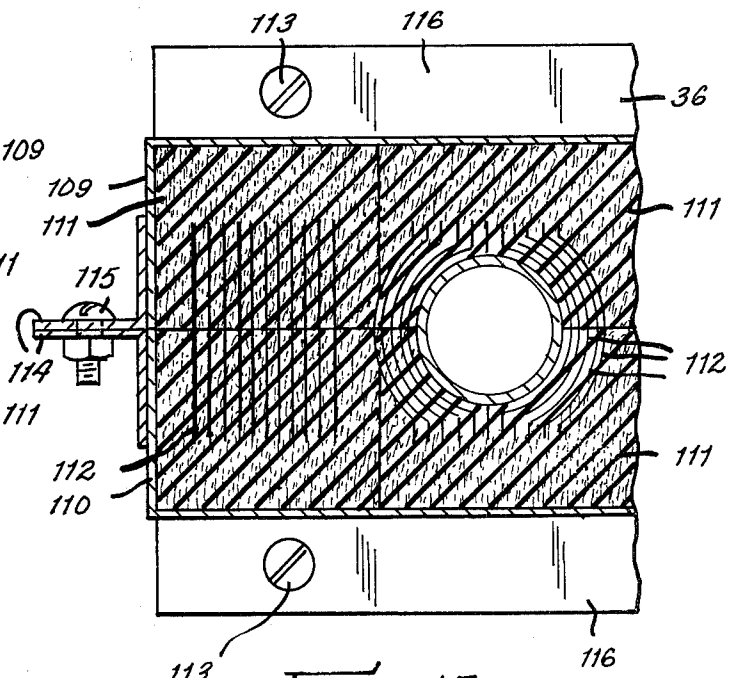
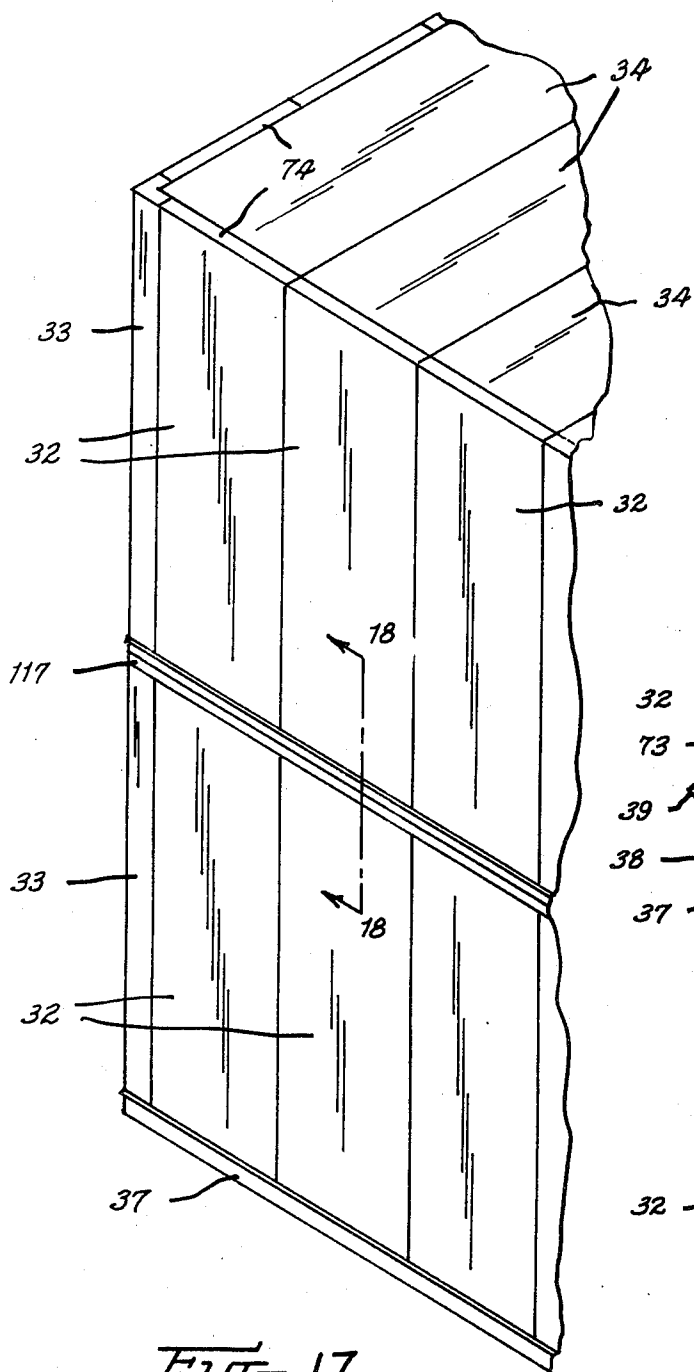
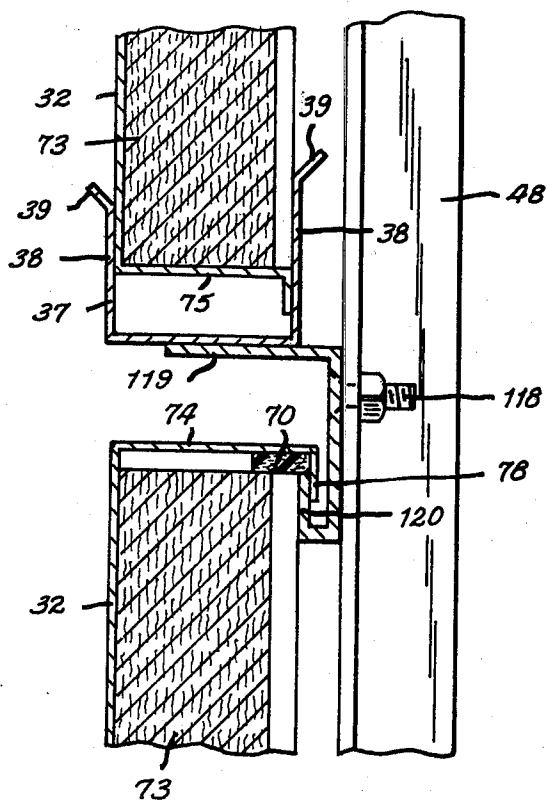


Fig- 15



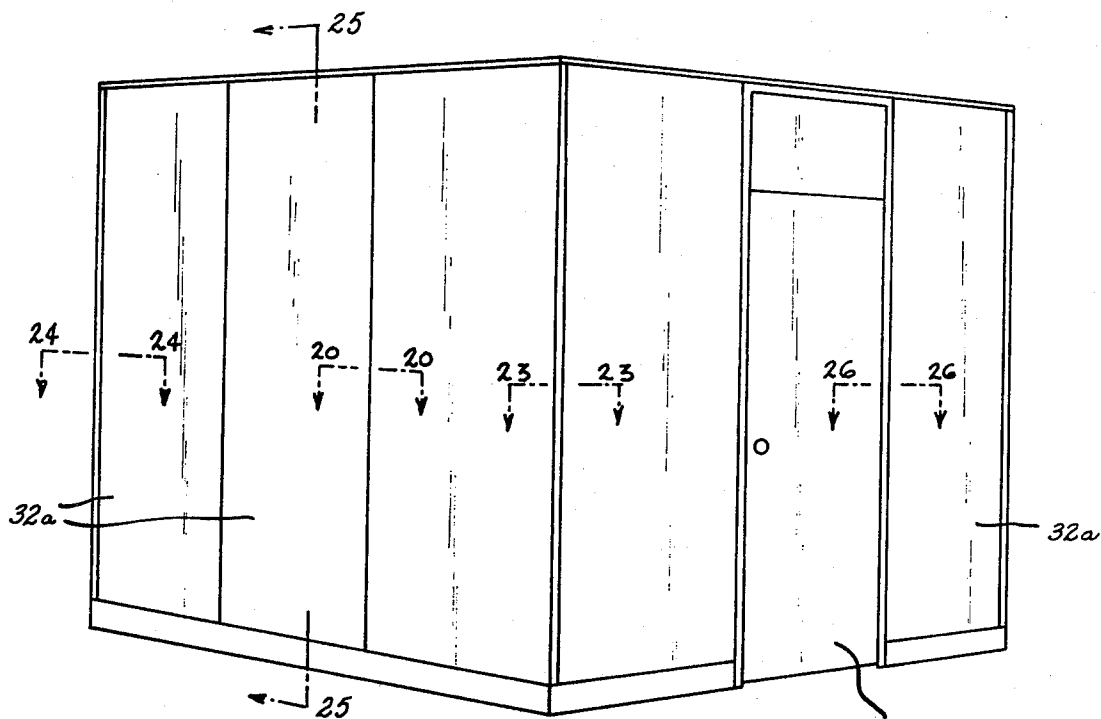


Fig- 19

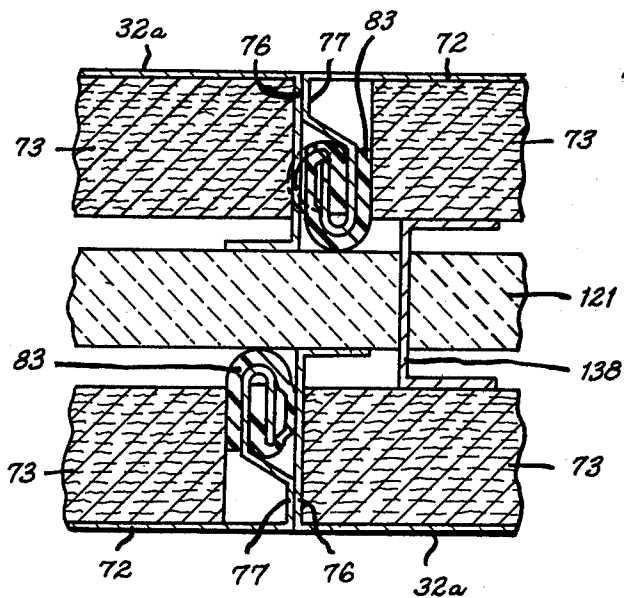


Fig- 20

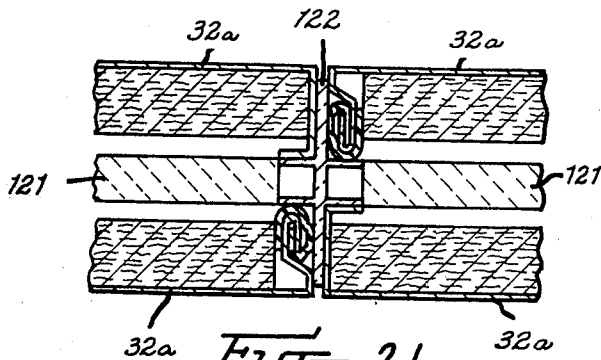


Fig- 21

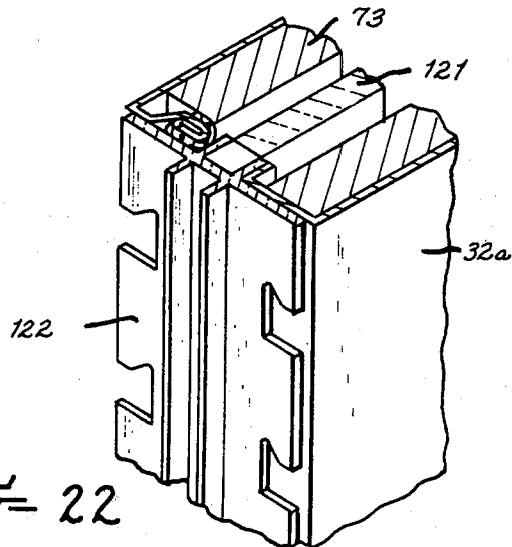


Fig- 22

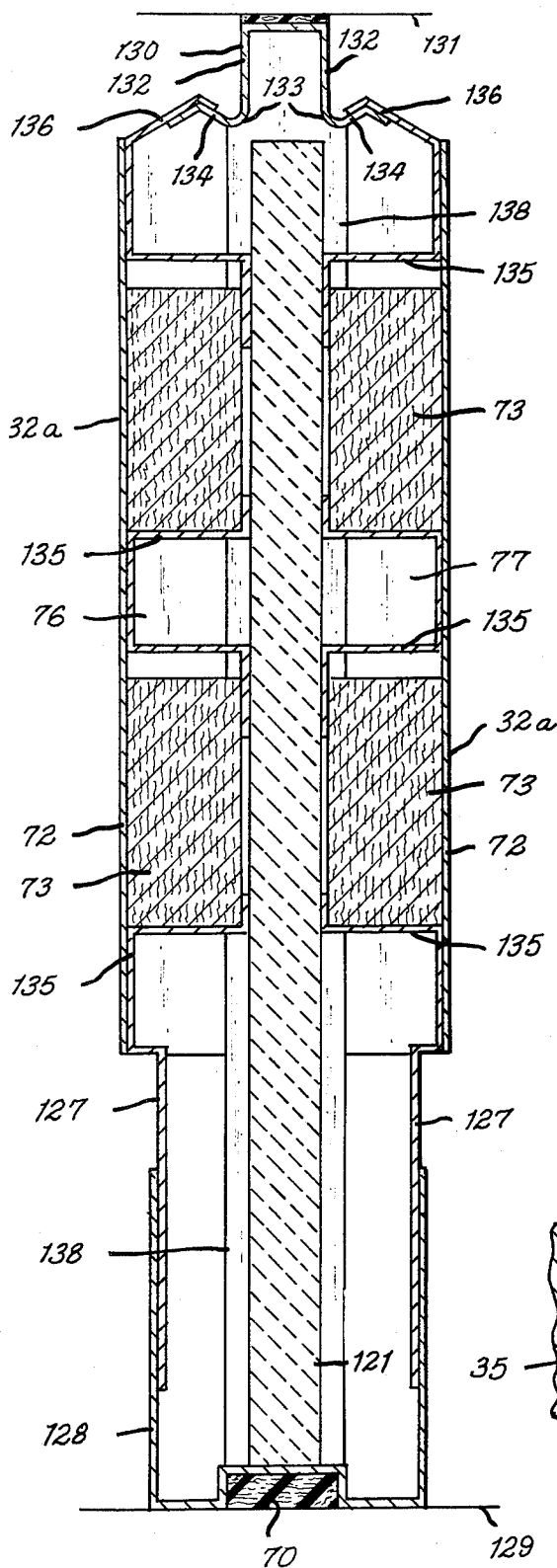


Fig- 25

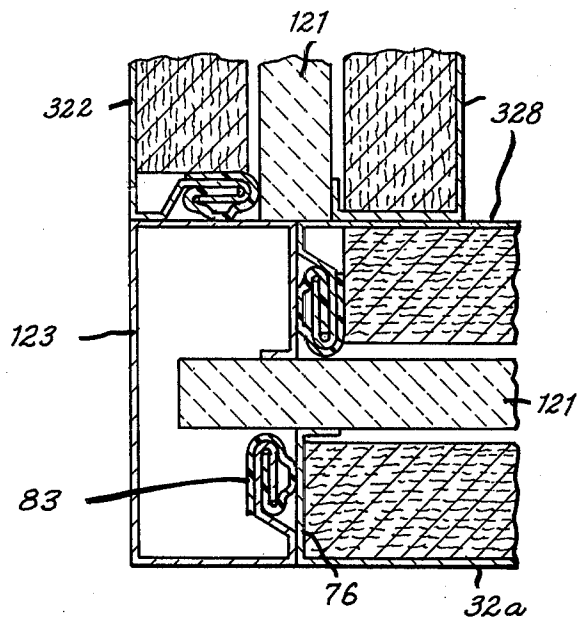


Fig- 23

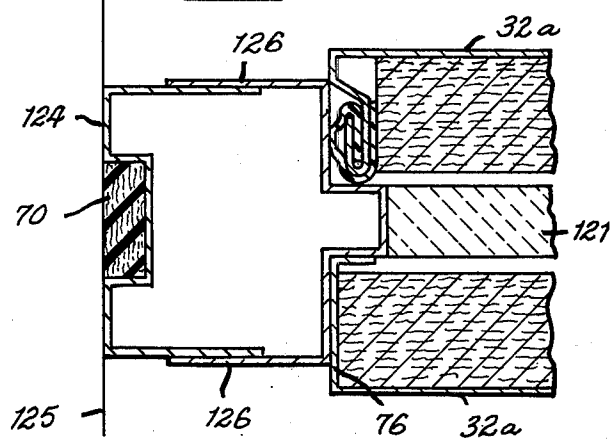


Fig- 24

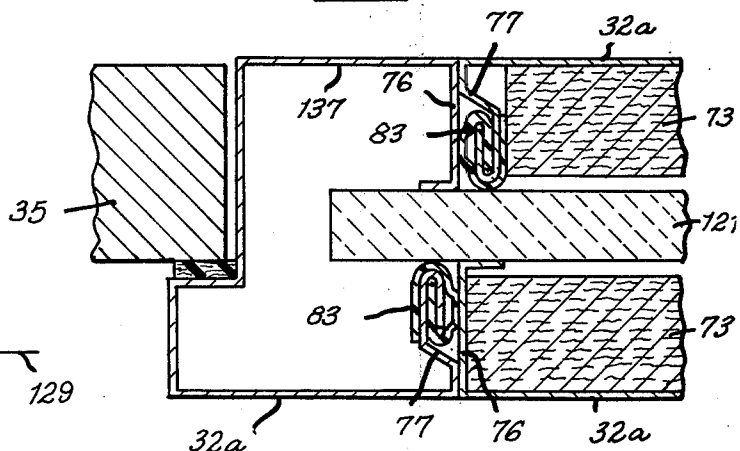


Fig- 26

MODULAR NOISE ABATEMENT ENCLOSURE AND JOINT SEAL

BACKGROUND OF THE INVENTION

With the heightened awareness of industry of the undesirable effects of high noise levels on worker efficiency and morale, as well as the increased legislative activity pertaining to industry noise abatement, there is increased emphasis on and need for compact, inexpensive, easily installed, portable and flexible noise-abating space enclosures for production machinery and equipment which exceeds tolerable noise levels. Because there is need for frequent access to such machinery and equipment for maintenance, repair and a variety of other reasons, the primary approach to noise-abating space enclosures for such machinery has emphasized a walk-around area within the space enclosure and a doorway in a substantially permanent wall structure of the space enclosure by means of which maintenance and repair personnel have access to the "room" defined by the enclosure and within which the machinery or equipment is positioned. By reason of the particular construction used for such noise-abating space enclosures and the access arrangement provided, such enclosures necessarily have to be large enough to provide a walk-around space for service and maintenance personnel and thus have to be considerably larger than would be required for noise-abating enclosure of the unit of machinery or equipment itself. When such space enclosures are assembled from modular panels, a critical area is the joint between adjacent panels which not only should provide an effective acoustical barrier in itself, but should also be designed to accommodate to irregularities in the assembly of the panels or possible thermal expansion and contraction. Additionally, these joints should be durable and should not themselves create a possible source of noise resulting from metal-to-metal contact. Despite costly and complicated design efforts, these critical problems still plague the prior art.

SUMMARY OF THE INVENTION

The invention contemplates a modular panel structure to provide a noise-abating space enclosure, in which the panels of the roof and side walls of the structure are not mechanically secured to each other, but are detachably engaged in an appropriate framework whereby each individual panel of the enclosure can be readily removed or lifted out of position independently of all the other panels so as to provide ready access to that portion of the enclosed machinery or equipment which is adjacent to the removed panel. Whatever service, maintenance, repair, regulation or inspection of the equipment is required, it can be accomplished directly through the opening provided by the removal of one or more individual panels. Such an arrangement eliminates the necessity of providing any interior walk-around space within the noise enclosure and permits the enclosure to be built extremely close to the outline of the equipment that it encloses, thus providing a much smaller, more compact and less costly enclosure than those of the prior art. The enclosure is free-standing and portable so that it can be moved quickly and easily if the particular machine or equipment has to be relocated on the plant floor and similarly, the enclosure is readily enlarged or reduced in size or modified

by the addition of special features whenever the equipment it encloses is replaced or modified.

The invention also contemplates an improved compressible joint seal between adjacent wall panels which will accommodate to irregularities in the panels or in the assembly thereof and which is so mounted and secured to the panel structure that it will not interfere with repeated removal of the detachable panels, but will not ordinarily be displaced from its operative sealing position when the panel is restored to its place in the enclosure.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an isometric view of the supporting framework or skeletal structure upon which the panels are mounted to provide a noise-abating space enclosure in accordance with the invention.

FIG. 2 is an isometric view with the panels in place on the frame of FIG. 1 to provide one form of enclosure.

FIG. 3 is a cross-sectional view, taken as indicated on line 3—3 of FIG. 1 and showing details of a corner post assembly. FIG. 4 is a cross-sectional view, taken as indicated on line 4—4 of FIG. 3, showing further details of the corner post assembly.

FIG. 5 is a cross-sectional view, taken as indicated on line 5—5 of FIG. 2 and showing details of the panel structure and joint.

FIG. 6 is a vertical cross-sectional view, taken as indicated on line 6—6 of FIG. 2 and showing details of the panel structure.

FIG. 7 is a cross-sectional view, taken as indicated on line 7—7 of FIG. 1 to show details of the form of securement of the support frame at its upper corner.

FIG. 8 is a cross-sectional view, taken as indicated on line 8—8 of FIG. 2 to show details of the roof wall structure.

FIG. 9 is an enlarged cross-sectional view, taken as indicated on line 9—9 of FIG. 2 to show details of the joint seal between the wall panels.

FIG. 10 is a view similar to FIG. 9, but showing a modified form of joint seal between panels.

FIG. 11 is a fragmentary cross-sectional view similar to FIG. 5, but showing a slightly modified form of panel insulation arrangement.

FIG. 12 is a horizontal cross-sectional view, taken as indicated on line 12—12 of FIG. 2 and showing details of a hinged door panel piece.

FIG. 13 is a fragmentary vertical cross-sectional view, taken as indicated on line 13—13 of FIG. 2 and showing details of a door seal which could be utilized with the door structure shown in FIGS. 2 and 12.

FIG. 13a is a fragmentary view in elevation of the door seal shown in FIG. 13.

FIG. 14 is a fragmentary cross-sectional view, taken as indicated on line 14—14 of FIG. 2 and showing details of a service box feature on one of the enclosure panels.

FIG. 15 is a fragmentary cross-sectional view, taken as indicated on line 15—15 of FIG. 2 and showing further details of the service box.

FIG. 16 is an isometric view of one of the rubber blocks employed in the service box.

FIG. 17 is a fragmentary isometric view of a structure employed to add a module of height to the space enclosure.

FIG. 18 is a fragmentary cross-sectional view, taken as indicated on line 18—18 of FIG. 17.

FIG. 19 is an isometric view of a space enclosure embodying the principles of my invention and adapted for use as partitions or walls for office enclosures.

FIG. 20 is a fragmentary cross-sectional view, taken as indicated on line 20—20 of FIG. 19.

FIG. 21 is a view similar to FIG. 20 but showing a modified form of panel joint.

FIG. 22 is a fragmentary isometric view of the joint shown in FIG. 21.

FIG. 23 is a horizontal cross-sectional view, taken as indicated on line 23—23 of FIG. 19 to show details of the corner joint assembly.

FIG. 24 is a fragmentary cross-sectional view, taken as indicated on line 24—24 of FIG. 19 to show details of the connection of the portable partition wall to the wall of the fixed building structure.

FIG. 25 is a vertical cross-sectional view, taken as indicated on line 25—25 of FIG. 19 to show the connection of the portable wall structure to the floor and ceiling of the fixed building structure.

FIG. 26 is a fragmentary cross-sectional view, taken as indicated on line 26—26 of FIG. 19 showing the joint between a wall panel and the door jamb.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to FIGS. 1-9 of the drawings, there is shown, as in FIGS. 1 and 2, a noise-abating enclosure, designated by reference numeral 30, which includes a free-standing support frame 31 on which are mounted side wall panels 32, corner panels 33 and roof wall panels 34. As will appear more fully hereinafter, some of the wall panels 32 or 34 are modified to provide special features or characteristics such as the hinged door 35 and the service box 36 shown in FIG. 2. However, for purposes of the present description, these modified panels need not be considered, as all the side wall panels could be standard panels 32 and all the roof wall panels could be standard panels 34, if no special features or accessories are required. In any event, the special panels or modified panels are of the same size as the standard panels which they replace and also have the same joint construction as the standard panels.

For purposes of flexibility in the size of the enclosure, for ease and convenience of assembly and installation, and for purposes of minimizing manufacturing cost, the side wall panels 32 and the roof wall panels 34 are made to a uniform width, for example 24 inches, and are made in stock lengths in one or two foot increments up to a convenient maximum length of, for example, 10 feet. It will be understood that all the panels 32 in the structure would be of a uniform length or height and that all the panels 34 would similarly be of a uniform length.

The frame 31 includes a plurality of horizontally disposed channel elements 37 which are arranged in a coplanar quadrangular relationship at ground or floor level and are connected with each other in a manner to be described. In FIG. 1, six of such elements 37 are shown, there being one provided on each of the end walls and two provided on the front wall and on the rear wall of the enclosure. It will be understood that the number of such elements that are used or required will depend upon the length of the elements used and the

size of the enclosure which is to be assembled. As best seen in FIGS. 4 and 6, the channel elements 37 are substantially U-shaped in cross-section and the terminal portion of the legs 38 of the channel element are bent or flared upwardly as at 39 to provide an enlarged throat or guideway for slidable insertion of the panel 32 into the channel element. The exterior surface of the web of channel element 37 has adhesively secured thereto any suitable form of vibration damping or cushioning material in the form of a continuous gasket or pad 40 which engages the floor surface and serves to insulate or isolate the enclosure from direct contact with the floor and thereby minimizes vibration and sound transmissions between the floor and the enclosure.

As best seen in FIGS. 3 and 4, a corner plate 41 is placed into overlying relationship to adjacent channel elements at their corner junctures. Each corner plate is provided with a pair of notches or recesses 42 which extend in a direction normal to each other and are of a size sufficient to permit the corner plate to slide down into the channel element 37 over the interior leg 38 of the channel element. The corner plate 41 is provided with a pair of spaced downwardly projecting pins 43 which are so located as to enter and traverse matched openings 44 which are provided for that purpose in the web of the channel element 37. This mechanical interlock between the corner portions of the channel elements 37 and the respective corner plates 41 maintains the channel elements in the desired right angle relationship to each other at the corner and prevents them from shifting horizontally relatively to each other. The pin 43 may conveniently be provided with a flattened lip portion 45 which is spot welded or otherwise permanently secured to the web of the channel 37.

The corner plate 41 also is provided with an upwardly projecting threaded stud 46, which is welded or otherwise permanently affixed to the corner plate in a position which is inwardly of the inner legs 38 of the channel elements at the respective corners. The under surface of an inward portion of the corner plate 41 is provided with a sound absorbing gasket or pad 47 which is the same or similar to the previously described pad 40 and is intended for the same purpose. A vertically extending corner post 48, which may conveniently be in the form of angle iron or the like, has a seat element or plate 49 permanently affixed to the lower end thereof and provided with an aperture or opening 50 which permits the stud 46 to traverse the seat plate 49 when the corner post is slidably mounted thereon. The seat plate rests upon an underlying nut 51 which threadably engages the stud. By rotating the nut 51 in one direction or the other, the vertical position of each of the corner posts 48 may be adjusted within limits so that the enclosure 30 will be level despite sloping portions or irregularities that may exist in the floor surface on which the enclosure is set. When the leveling procedure has been completed by manipulation of the nuts 51 at each of the corners of the structure, a lock nut 52 may be utilized if desired to bear against the upper surface of the seat plate 49. It will be noted that for purposes of the corner plate arrangement above described, a portion of each of the inner legs 38 of the channel elements is cut away, as at 53, to accommodate to the recesses 42.

If the enclosure is reasonably short in length, the four corner posts 48 will provide sufficient vertical support

for the panels of the enclosure. If the enclosure is somewhat longer, it may be desirable to provide additional vertical supports, such as the intermediate vertical support posts 54 which can be identical in structure to the corner posts 48. Depending upon the length of the enclosure, any desired number of such intermediate support posts 54 may be utilized to prevent any sag in the enclosure and to provide the necessary rigidity to the support frame 31.

When intermediate support posts 54 are used, a floor plate 55 having the upwardly projecting threaded stud 46 is utilized to adjustably support the lower end of the support post 54 in the same manner as previously described with reference to the corner post 48 and the corner plate 41. It is not necessary to provide the floor plate 55 with recesses to accommodate the interior legs 38 of the channels 37, as was the case with the corner plate 41, although such recesses may be provided on the floor plate 55 if desired. However, it is necessary to cut away portions of the channel legs 38, as at 56, to provide clearance for setting the floor plate 55 into the desired overlying relationship to the web of the channel element. The floor plate 55 may also be provided with the downwardly projecting ends 43 to traverse the underlying channel element in the same manner as previously described with reference to the corner plate. The floor plate 55 also provided with an isolating pad 47 on the underside thereof in the same manner as previously described with reference to corner plate 41. It will be noted that the frame as thus described is free-standing and portable, as it has no securement to the floor.

As best seen in FIGS. 1 and 7, the upper end of each of the corner posts 48 has a flanged corner gusset 57 affixed thereto as by welding or the like. Similarly, the upper end of each of the intermediate support posts 54 also have a flanged gusset 58 affixed to the upper ends thereof. The inwardly directed horizontally extending flanges 59 of the gussets are provided with spaced apertures 60 which match corresponding openings 61 provided in the top rails 62 of the frame. Suitable fasteners 63, such as illustrated bolts, traverse the openings 60 and 61 and are secured by nuts to rigidly connect the top rails 62 to the respective posts 48 and 54. The top rails 62 are leveled to a horizontal plane by means of the vertical adjustment of the posts, as previously described. When it is necessary to use the intermediate support posts 54, it is also advisable to provide a corresponding upper cross brace 64 which has gussets 65 affixed to the ends thereof by means of which the cross brace can be bolted or otherwise connected to the opposed intermediate posts 54 just below the adjacent top rail.

The top rail has a cross-section substantially in the form of a right angle which provides an inwardly directed horizontally extending ledge portion 66 and an upwardly directed support leg 67 which is bent as at 68 to provide an offset. The end of the support ledge 66 is provided with a reverse bend 69 to form a recess on the ledge for accommodating a cushioning or gasket strip 70 for the purpose of noise isolation. The end of the support leg 67 is provided with a reverse bend 71 to provide broad surface engagement with a similar noise isolating strip 70 which is accommodated in the upper portion of the side wall panels 32. It will be noted that the top rails 62 are disposed in a plane which is inwardly of the vertical support posts whereas the channel elements 37 are disposed in a plane outwardly of

the vertical support posts, so that the top rails are offset inwardly from the channel elements.

The structure of the side wall panels 32 and the roof wall panels 34 is substantially identical. Except for their configuration and size, the corner panels 33 are also structurally the same as the other panels. Each of the panels includes a heavy structural skin or face portion 72 of sheet metal or the like which is bent inwardly on all four sides thereof to provide a form of open faced box or receptacle of sufficient depth to receive the required thickness of noise-insulating mats 73. In the side wall panels 32, there are two opposed horizontally extending flanges 74 and 75 and two vertically extending opposed flanges 76 and 77. As best seen in FIG. 6, the upper flange 74 is provided with a downwardly extending lip 78 which hooks behind the leg 67 of the top rail 62 when the side panel is in place. The lower flange 75 is also provided with a downwardly directed lip 79 which provides a bearing surface or guide surface for the lower end of the panel when it is moved downwardly into the channel element 37. Each side wall panel is thereby held in place by being suspended by the upper flange 74 from the top rail and having its bottom flange 75 slidably received and retained within the channel element 37. The channel element has sufficient depth so as to accommodate and retain the bottom of the side panel within the entire range of vertical adjustment permitted by the manipulation of the nut 51 on the threaded stud 46 of the corner plate 41 and floor plate 55.

As best seen in FIG. 5, the vertically extending flange 76 is provided with an inwardly directed lip 80 which functions as a retainer for the insulation mat 73. The opposite vertical flange 77 is provided with an inwardly directed offset bend as at 81 and is bent to provide an open flat fold 82 to receive and retain a continuous vinyl gasket 83. As shown in FIG. 9, the gasket 83 has a bulbous formed portion 84, shown in phantom outline, which compresses or is deformed to accommodate to any variation which might occur in the sealing joint between adjacent abutting panels. The gasket 83 is installed by inserting one edge of the gasket into the open space provided by the flat fold 82 and then wrapping the rest of the gasket around the outside of the flat fold so that it seals against the flange 76 of the adjacent side wall panel 32 or the adjacent corner panel 33, as well as fitting snugly and sealing against a resilient insulation retainer clip 85 on the opposite side of the flat fold.

The insulation retainer clip 85 is provided at one edge thereof with a reverse bend forming an inwardly directed hook 86 which is yieldably displaced as the clip is pressed into place between the gasket 83 and the edge of the insulation mat 73 and then returns to its original configuration to hook under and be retained by the offset 81 of the flange 77. The opposite edge of the clip 85 is bent to form a retaining lip 87 for holding the mat 73 in place in the same manner as the lip 80 of the flange 76. Once the hook 86 is engaged, it cannot be removed without destroying it, and the sealing gasket 83 is thereby permanently held in place. All the panels are uniformly made with the gasketed flange 77 on the same side of the panel which, in this instance, is illustrated as being the right side. In this manner, the gasketed flange 77 of one of the side panels is always in sealing abutment with the vertically extending flange 76 of the adjacent panel. As shown in FIG. 5, this same flange structure is also utilized on the corner panels 33.

By reference to FIG. 8, it will be noted that the same flange structure is also utilized for the abutting edges of the roof wall panels 34. As shown in FIG. 6, the shorter edges or sides of the roof panel are provided with flanges 88 having an inwardly directed lip 89 which serves as a retainer for the insulation mat 73.

After the framework shown in FIG. 1 has been assembled and leveled, the panels are installed without the use of any tools or fasteners. The corner panels 33 are set in place first and then the side wall panels are set in place. Both these panels are installed by inserting the bottom of the panel slidably into the channel element 37 for a sufficient distance to provide temporary engagement. The upper flange 74 of the panel is then hooked over the leg 67 of the top support rails 62 and the panel is then pushed downwardly or permitted to drop further into the channel element 37 until the portion 68 engages the sponge neoprene gasket strip 70. After the sides of the enclosure have been mounted, then the roof wall panels 34 are placed in position by resting the flanges 88 on the sponge neoprene gasket strip 70 which is provided on the ledge portion 66 of the top support rail. During assembly, the flexible joints provided by the arrangement of the vinyl gasket 83 will accommodate to irregularities in the abutment of adjacent panels resulting from manufacturing defects or dimensional variations, so that an excellent noise seal is effected.

A lift handle 90 is conveniently provided on each of the side wall panels 32 for the purpose of quickly and easily obtaining access to the interior of the enclosure whenever such access is necessary. A side panel 32 which is two feet wide and seven or eight feet in height will weigh approximately 50-55 pounds. An adult person can grasp the lifting handle 90 and easily raise any panel 32 sufficiently to lift its upper flange 74 out of its hooked engagement with the support leg 67 and then remove the panel from its engagement with the channel element. After access to the enclosed piece of machinery or equipment has been obtained and the necessary repair or maintenance mission has been accomplished, the lift handle 90 aids in easily returning the panel to position on the enclosure in the manner previously described. It will be understood that such lifting handles 90 could also be provided on one or more of the roof wall panels 34 if the enclosed machinery or equipment routinely will require access from overhead.

There are occasions when the noise insulation mats 73 may become damaged or oil-soaked and require replacement. When this occurs, the particular panel involved is detached from the enclosure and the insulation mat is removed, either by deforming it sufficiently so it will slip out of the panel, or by deforming the retainer clip 85 sufficiently to remove it and thereby permit the mat to be lifted out. A new insulation mat is then installed by placing one edge of the mat under the lip 80 and inserting a new retainer strip 85.

The form of joint seal that I have described above is the preferred form. However, other forms of joint seals or joint constructions could be utilized with an enclosure embodying the features of my invention. In FIG. 10, I have shown an example of a modified form of joint seal. In this form, the opposed vertical flanges 91 of the panels are symmetrically identical and are rebent to provide a thickened or enlarged portion 92. A resilient T-bar 93 is secured at appropriate places to the frame 31 and has outwardly directed spaced spring arms 94

which yieldably accommodate the abutting portions 92 of the panel flanges and frictionally retain the panels in connected sealed relationship. A cushioning pad 70 is adhesively secured to the inner face of the T-bar to reduce noise transmissions. If desired, the reverse bend portions of the flanges 91 can be further bent convergently, as at 95 to provide seating surfaces for the flanged edges 96 of a perforated steel back plate 97 which can be used to overlie the insulation mat 73 to protect it from damage or injury under adverse operating conditions.

In FIG. 11, there is shown a slightly modified form of perforated steel back plate 98 and the manner in which it can be secured to the panel structure for the same purpose as was previously recited with respect to the perforated steel back plate 97. The back plate 98 is shown as having a flange or edge 99 which is parallel to and offset from the main body of the back plate. This edge is slid underneath the lip 80 of the vertical panel flange 76. The opposite edge 99 on the back plate is extended to provide an integral retainer clip 100 which serves the same function as the retainer clip 85 previously described and is installed in the same manner into locking engagement with the flange 77 of the panel.

In FIG. 2 of the drawings, I have shown one of the standard side wall panels 32 modified to provide a hinged door 35. The details of this hinged door structure are shown in FIGS. 12, 13 and 13a of the drawings. As best seen in FIG. 12, the vertical flanges of the modified door panel 101 are the same as previously described with reference to the side wall panels 32. The upper flange 74 and the lower flange 75 of the panel 101 may also be identical to that previously described with reference to the standard panel 32 and the mounting thereof in the enclosure would be as previously described. The body of the panel 101 is formed and recessed to provide the door jambs 102 and the opening 103. The door 35 itself is formed in any suitable manner from sheet metal or the like and has mounted on the interior face thereof an insulation mat 73 and a protective perforated steel back plate 104. A suitable hinge 105 is secured to one of the door jambs and to one edge of the door. An operating and locking handle 106 is provided for opening and closing movement of the door. The door would then be operated in a conventional manner and the modified door panel 101 would be mounted on or detached from the frame 31 in the same manner as previously described with reference to the standard panels 32.

Under certain conditions, it is not permissible for the door 35 to have any sort of threshold, as it is necessary that ingress and egress through the door should not involve any change in elevation above floor level. Under such circumstances, the channel element 37 which would normally extend below the bottom edge of the door 35 and which would receive and retain the lower flange 75 of the modified panel, has to be eliminated together with the coextensive portion of the flange 75 of the panel. However, those portions of the flange 75 which extend to either side of the door opening are still retained on the panel and are received in the corresponding portions of the channel element 37. Inasmuch as this arrangement destroys the previously described seal between the panel and the frame and the floor at the bottom of the door opening, I have shown an alternative sealing arrangement for the door 35 in FIGS. 13 and 13a of the drawing. To maintain a noise abatement

seal at the bottom of the closed door 35 under those circumstances where the door is required to extend substantially to floor level, I have provided a spring-loaded hinged plate 107 which is secured to the interior surface of the door 35 adjacent to the bottom edge thereof and which is normally urged to the upward phantom line position shown in FIG. 13. The plate 107 has a sealing gasket 108 affixed thereto in floor engaging position. The plate 107 may be substantially as wide as the door opening 103, but the width of the gasket 108 may be slightly greater so that the ends of the gasket will abut the door jamb when the door is in its fully closed position. Alternatively, a projection or lug may be provided on the door jamb to engage the plate 107 when the door is in its fully closed position. In either event, when the door is opened, the spring-loaded plate will be freed from restraint and will swing from the solid line position shown in FIG. 13 to the phantom line position, thus permitting the door to be open without any appreciable wear on the gasket, as would result if the gasket were permitted to scrape the floor during the door opening. When the door is closed, the plate remains in its upward, non-floor engaging position until abutment of the gasket or the plate occurs which causes the plate assembly to swing downward and return to its solid line sealing position.

In FIG. 2, I have also shown one of the standard side wall panels 32 modified to provide a service box accessory 36. Such a service box is utilized to permit cables and pipes to traverse the panel without diminishing the noise abatement characteristics of the enclosure. In FIGS. 14, 15 and 16 of the drawings, I have shown details of the service box arrangement. The service box consists of an upper half 109 and a lower half 110, each half providing a container for an equal quantity of individual sponge rubber blocks 111, one of which is shown in perspective in FIG. 16. One face of each of the blocks is provided with a plurality of closely spaced cuts or slits 112. The rubber blocks 111 which are placed in the lower half 110 are so disposed that these slit faces will abut the corresponding slit faces of the rubber blocks which are in the upper half 109 of the service box. As many sets or pairs of upper and lower blocks are used as are necessary for the number of individual cables or pipes which will extend through the service box. Appropriate openings are provided in the face of the panel 32 for the passage of the cables and pipes. The lower half 110 of the service box is then mounted in proper position on the exterior of the panel 32 by means of the fasteners 113. The pipes and cables are then laid in place on the rubber blocks of the lower half of the service box. The upper half 109 and its rubber blocks are then placed over the lower half and is drawn into abutment therewith by means of the projecting ears 114 and fasteners 115. The upper half of the service box can then be secured to the panel 32 by means of the fasteners 113 extending through the flanges 116 which are provided on each half of the service box. As the pairs of rubber blocks are drawn together around the service lines, the slitted portions are deformed and compressed and displaced to form a tight, conforming seal between each pair of blocks and the service line which traverses them. By this arrangement, noise leaks are minimized without interfering with the connection of service lines to the machinery or equipment within the enclosure.

When the height of the enclosure exceeds a certain magnitude, the size of the side wall panels 32 becomes so great as to make the panels unwieldy and too heavy for simple access removal and replacement. Such a condition also results in the side panels having a long unsupported vertical span which is undesirable both from the standpoint of structural rigidity and the standpoint of noise abatement. To overcome this problem, there is shown in FIGS. 17 and 18 of the drawings a modified form of structure which is utilized when the enclosure has to be of an abnormal height. In all basic respects the panels and the frame structure is identical to that previously described with reference to FIGS. 1-9 of the drawings. However, to permit the use of shorter and less cumbersome side wall panels 32 and corner panels 33, an intermediate horizontal support rail 117 is affixed to the vertical posts 48 and 54, as by fasteners 118. The upper horizontally extending leg 119 of the rail 117 provides an underlying support or channel elements 37 which are affixed to the leg 119 as by welding or other suitable means. These channel elements provide the retainer channel for the upper group of panels 32 and 33. The lower leg of the support rail 117 is formed into an upperly directed hook 120 which serves the same function as the support leg 67 of the top support rail 62 in supporting and engaging the upper flange 74 of the lower series of panels 32 and 33. In other respects, the frame 31 is as previously described and the panels 32 are mounted on the frame and detached therefrom in the same manner as previously discussed.

FIGS. 19 through 26 of the drawings represent adaptations of the principles of my invention, previously described, to wall partitions of modular arrangement which can be utilized as full or partial space enclosures in offices and similar commercial installations, particularly in floor-to-ceiling partitions.

FIG. 19 illustrates a representative floor-to-ceiling office enclosure assembled from a plurality of panels 32a which, except for slight modifications, are very similar in structure to the panels 32 previously described with reference to the noise abatement enclosure. As best seen in FIG. 20, the panels 32a include the metal face member or skin 72 having the vertical flanges 76 and 77 and include insulation mats 73. It will be noted that the joint seal between the panels utilizes the vinyl gasket 83 to provide a compressible butt joint comparable to that previously described. A plurality of the panels 32a are utilized and, as illustrated in FIG. 19, modified panels having special characteristics can also be utilized for the purpose of providing special features such as the hinged door 35. For purposes of the partition or office enclosure, a dual set of panels 32a is utilized, these panels being spaced horizontally from each other to provide both an exterior row of panels and an interior row of panels which give the enclosure a finished appearance interiorly thereof, which ordinarily is not necessary in connection with the noise abatement enclosure. A gypsum board filler 121 can be utilized in the median space between opposed panels 32a if additional sound proofing is desired.

As indicated in FIGS. 21 and 22, the joint between adjacent panels can be modified by the insertion of a notched shelf-support member 122 on which shelf-support brackets (not shown) can be secured if desired to provide for shelving either interiorly or exteriorly of the enclosure.

As shown in FIG. 23, a cap member 123 which is of general rectangular tubular construction and is provided with a vinyl gasket seal at one face thereof, is used at the corner intersection of the panel 32a to conceal the joint and provide a finished appearance to the structure. The cap member 123 can also be used to finish off the end of a partition wall when, for some reason, it does not terminate in abutment with the fixed building structure but terminates as a free-standing end. When the end of the partition wall terminates at and is to be connected to a wall of the fixed building structure, the arrangement shown in FIG. 24 is used. This consists of a channel member 124 which is affixed to the wall 125 of the building structure and telescopically and slidably engages an opposed vertically extending channel member 126 which is connected to the end of the partition wall or panel. This arrangement accommodates to variations in spacing between the end of the partition wall and the fixed wall, within limits, and also accommodates to any out of plumb condition of the fixed wall that may exist.

As shown in FIG. 25, the bottom edge of each panel 32a is extended to provide a channel-engaging leg 127 so that spaced legs 127 are slidably and telescopically received in a floor channel member 128 which merely rests upon the floor surface 129 and is provided with a floor-engaging sponge neoprene gasket strip 70 to isolate the sound or vibration transmittals between the floor and the enclosure. The legs 127 are sufficiently long so that adjustments can be made to accommodate to variations and irregularities in the floor-to-ceiling height while still maintaining an effective seal at the floor level. The channel member 128 is of sufficient width and height to serve as a baseboard compartment for the installation of electrical wiring and fittings.

A panel support member 130 is secured to the ceiling 131 of the fixed building structure, using a gasket strip 70 to isolate noise vibrations. The member 130 is provided with spaced arms 132 which are rebent as at 133 to provide upwardly directed support ledges 134 for the upper edges of the panels 32a. The back surface of each panel is stiffened or reinforced by a series of horizontally extending channel members 135 which are welded or otherwise fixedly secured to the back face of the skin 72 of the panel. The insulation mats 73 are disposed intermediate these reinforcing channels. The previously mentioned downwardly extending spaced legs 127 are extensions of the lowermost reinforcing channel member 135, whereas the uppermost of these reinforcing members has an upwardly and inwardly extending formed leg portion 136 which is adapted to overlie one of the ledges 134 so as to suspend each of the panels 32a from the ceiling support member 130. Thus, the dual set of panels 32a forming the partition wall is suspended from the ceiling support member 130 at its upper edge and is nested into the floor channel member 128 at its lower edge to provide a sealed wall partition structure which has superior light-proof and sound-proof characteristics. In order to minimize the direct load which would otherwise be imposed on the ceiling by the suspended panels, the support member 130 is utilized primarily to provide a seal, and a vertical strut 138 engages the member 130 in load-bearing engagement with the floor to take the panel load off the ceiling.

FIG. 26 illustrates the joint between the modified door containing panel 32a and the adjacent panel 32a.

It will be noted that the vertical edges of the door jamb 137 represent the previously described joint seal arrangement of the wall structure using dual sets of panels 32a. Accordingly, the door jamb 137 is so formed as to provide an identical joint structure through that which would exist between adjacent pairs of panels 32a.

It is to be understood that the forms of my invention herein shown and described, are to be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In a modular noise abatement enclosure, the combination of a free-standing open skeletal frame having a ground-engaging channel member with upstanding spaced legs, an upper support rail, posts interconnecting said channel member and support rail in coextensive vertically spaced relationship, height-adjusting means provided on said posts for positioning said upper support rail in a horizontal plane independently of the positional plane of said ground-engaging channel member, and a plurality of side wall panels detachably mounted in co-planar abutting relationship on each side of said frame to form a continuous enclosure, each of said panels having a sound-insulating interior face, each of said side wall panels having a lower edge slidably engaging the legs of said channel member in sealing engagement and having an upper edge detachably engaging said rail and suspended thereby to provide the sole vertical support for said panel and maintain said lower edge out of direct downward load-bearing engagement with said channel member, whereby any one of said panels can be bodily displaced and detached from said frame by relative upward movement thereof to provide interior access to a selected portion of the enclosure.

2. A combination as defined in claim 1, including a compressible seal affixed to a vertically-extending edge of each panel for sealing abutment with a vertically-extending edge of an adjacent panel.

3. A combination as defined in claim 2, wherein said vertically-extending edge of each panel comprises a flange having an inwardly directed offset bend terminating in a reverse open fold defining a seal-retaining recess, and said compressible seal is coextensive with said flange and has an edge portion retained in said recess, said seal extending outwardly and reversely from said recess around the exterior of said fold on opposite sides thereof to provide a substantially U-shaped seal contour having one leg of the U engageable with said vertically extending edge of an adjacent panel, and retainer means carried by each panel for securing the opposite leg of the U against displacement.

4. A combination as defined in claim 3, wherein said retainer means is a resilient clip having an inwardly-directed hook at one edge thereof, said hook being yieldably displaceable to pass between said opposite leg of the U and an edge portion of each said panel to extend into locking relationship with said offset bend portion of said flange, and said clip having another portion interposed in sealing engagement between said opposite leg of the U and a portion of each said panel, whereby said clip locks said seal against displacement from said flange.

5. A combination as defined in claim 4, wherein said sound-insulating face is a noise-insulating mat on the interior of said side wall panels, and means are provided on said resilient clip for retaining said mat on said panels.

6. A combination as defined in claim 1, wherein said upper support rail has an upwardly directed leg portion, and said upper edge of said side wall panels is provided with means for engaging said leg portion in response to relative downward movement of the panel.

7. A combination as defined in claim 1, wherein said channel member has a pair of spaced upwardly directed legs, each of said legs having outwardly flared terminal portions to provide guideways, and said lower edge of said side wall panels is provided with spaced portions defining guide surfaces slidably engageable with said spaced channel legs in response to relative downward movement of the panel.

8. A combination as defined in claim 7, wherein said upper support rail has an upwardly directed leg portion, and said upper edge of said side wall panels is provided with a downwardly directed lip for engaging said leg portion in response to said downward movement of the panel.

9. A combination as defined in claim 1, including roof wall panels carried by said frame for enclosing the roof side thereof.

10. A combination as defined in claim 9, wherein said upper support rail is provided with a ledge portion and underlying opposed edges of said roof wall panels in noise-sealing relationship thereto, and said roof wall panels are disposed in abutting co-planar relationship.

11. A combination as defined in claim 10, including a compressible seal affixed to an edge of each roof wall panel for sealing engagement with the abutting edge of an adjacent roof wall panel.

12. A combination as defined in claim 1, wherein said height adjusting means includes a threaded stud connected to said channel member and projecting upwardly into said post, and a post support element underlying said post and threadedly engaging said stud for vertical displacement thereon.

13. A combination as defined in claim 1, wherein at least one of said side wall panels is provided with means for access therethrough without bodily detachment thereof.

14. A combination as defined in claim 13, wherein said means for access is an opening in said side wall panel and a closure movably connected to said side wall panel for sealing engagement with said opening.

15. A combination as defined in claim 14, wherein the bottom portion of said closure is provided with a movably mounted spring-loaded ground-engaging seal which is normally urged out of ground-engaging position in response to opening movement of said closure and is yieldably restored to ground-engaging position in response to closed position of said closure.

16. A combination as defined in claim 13, wherein said means for access is an opening in said side wall panel and a utility service box connected to said side wall panel in overlying relationship to said opening and in resiliently yieldable sealing engagement with said opening.

17. A combination as defined in claim 16, wherein said utility service box comprises a separable housing

defining a hollow receptacle and having openings provided in said housing for traversal of utility lines there-through, and a compressible material retained in said receptacle and normally sealing the openings therein, said material being yieldably displaceable into contour sealing engagement with said utility lines in response to securement of the separable housing portions to each other.

18. A combination as defined in claim 1, including a rigid perforated backing plate retained on the interior of said side wall panels in overlying relationship to the exposed surface of said sound-insulating face.

19. A combination as defined in claim 1, wherein said frame includes a second support rail above said upper support rail, said posts interconnecting said channel member and said upper and second support rails in vertically spaced relationship, said upper support rail providing an upwardly directed second channel member, and a second plurality of side wall panels detachably mounted in coplanar relationship on each side of said frame above said first-named panels, said second side wall panels having a lower edge slidably engaging said second channel member in sealing engagement and having an upper edge removably engaging said second support rail and suspended thereby.

20. A combination as defined in claim 19, wherein said upper support rail has an upwardly directed leg portion, said upper edge of said first-named side wall panels is provided with means for engaging said leg portion in response to relative downward movement of the panel, said second channel member being disposed above said leg portion, said second support rail having a second upwardly directed leg portion, said second side wall panels having a lower edge slidably engaging said second channel member in sealing engagement and having an upper edge provided with means for removably engaging said second upwardly directed leg portion, whereby any one of said second side wall panels can be bodily detached from said frame by relative upward movement thereof independently of said first-named side wall panels.

21. A combination as defined in claim 1, including a second plurality of side wall panels spaced inwardly from said first-named side wall panels and disposed in parallel opposed relationship thereto, said second side wall panels having a lower edge slidably engaging said channel member in sealing engagement therewith and having an upper edge removably engaging said rail and suspended thereby.

22. A combination as defined in claim 21, including a compressible seal affixed to a vertically extending edge of each of said second panels for sealing engagement with an abutting edge of an adjacent panel.

23. A combination as defined in claim 22, including a shelf support member mounted between adjacent edges of said first-named and second side wall panels and having portions for retaining shelf brackets.

24. A combination as defined in claim 21, including a gypsum panel supported by and between said first-named and second side wall panels, and parallel thereto.

25. A combination as defined in claim 21, wherein said support rail is affixed to the ceiling of a fixed building structure.

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