

[54] **BUILDING CONSTRUCTION**
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[51] Int. Cl. **E04b 1/344**
[58] Field of Search **52/71, 69, 70, 238, 143, 52/122, 393, 403, 27, 28, 29, 39**

[56] **References Cited**

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[57] **ABSTRACT**
A building construction and method for transforming a large open space into a plurality of smaller spaces. Foldable wall panels are initially supported upon retractable wheels to facilitate unfolding and movement of the wall panel to a predetermined position forming an enclosure. Insulating material having an improved cross-sectional configuration is situated at panel joints and at the top and bottom of the panels. An acoustical and hermetic insulation is formed when an elevated ceiling unit is lowered so as to rest upon the wall panels. The weight of the ceiling unit simultaneously (a) displaces the wall panel vertically downward over the retractable wheels to secure the position of the wall panels and (b) compresses the insulating material at both the top and bottom of the wall panel.

6 Claims, 7 Drawing Figures

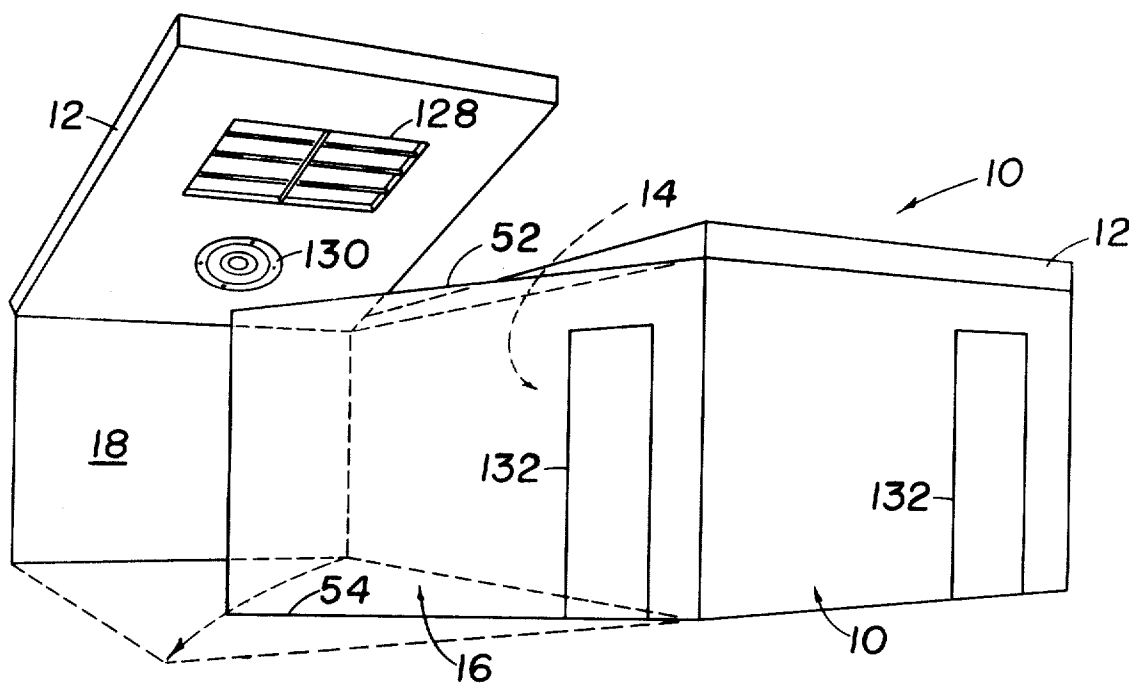


FIG. 1

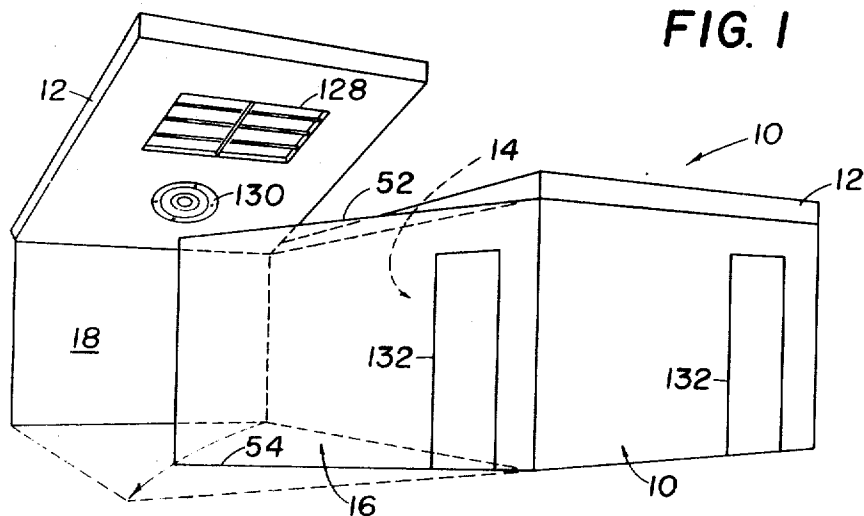


FIG. 3

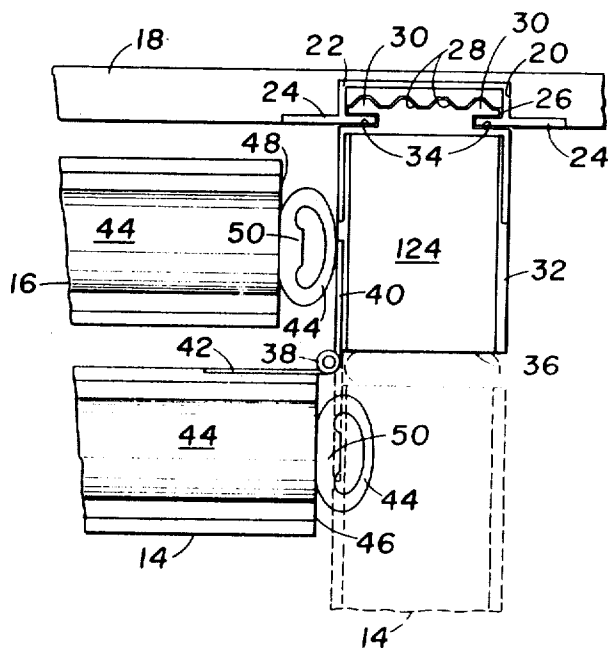
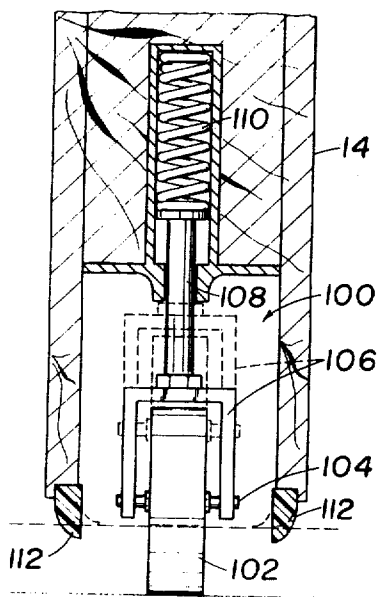


FIG. 7



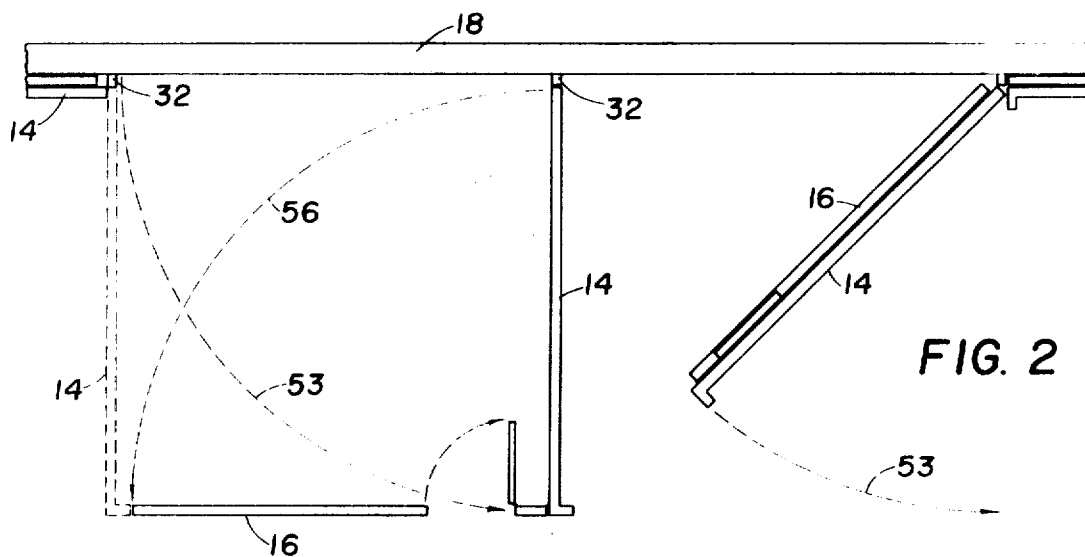


FIG. 2

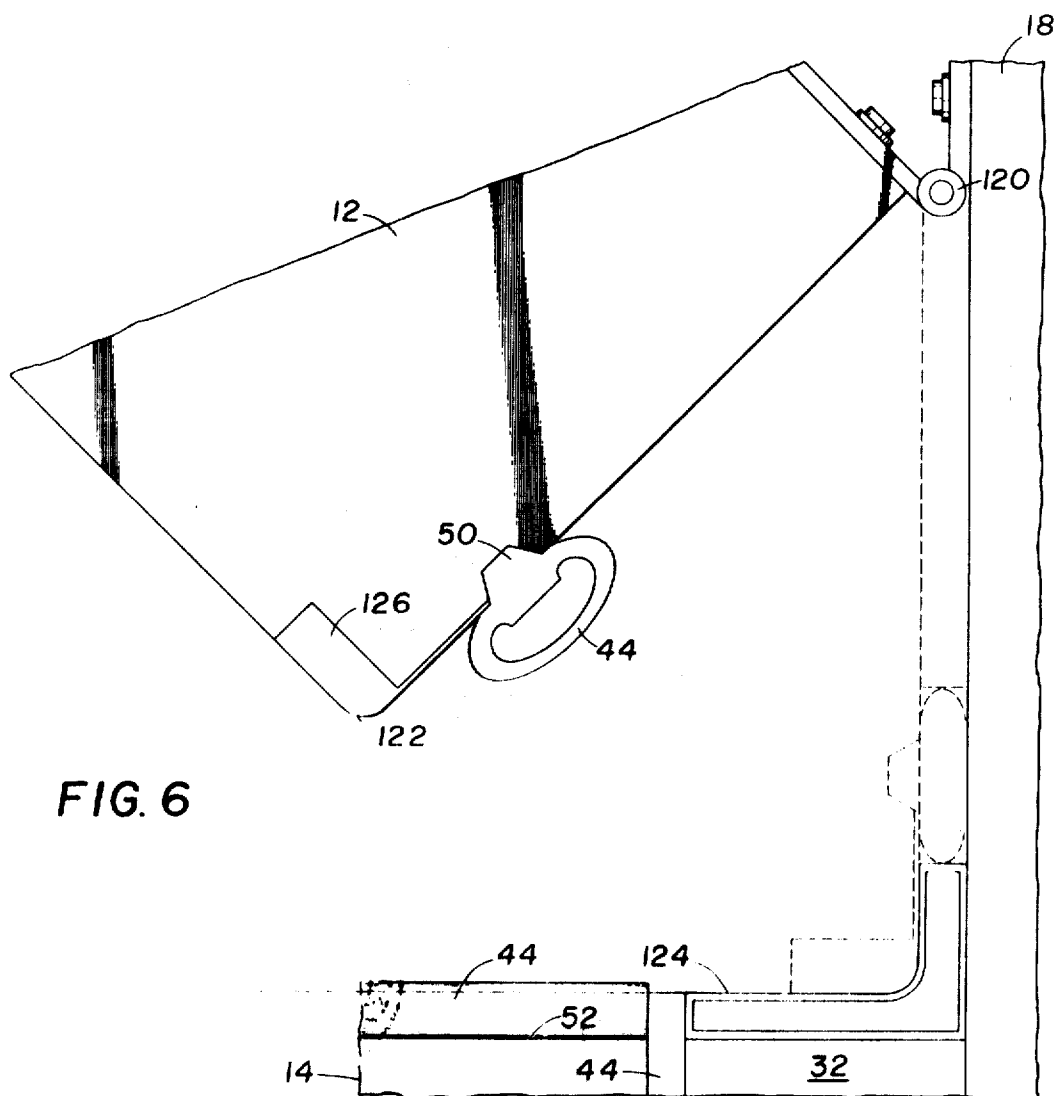


FIG. 6

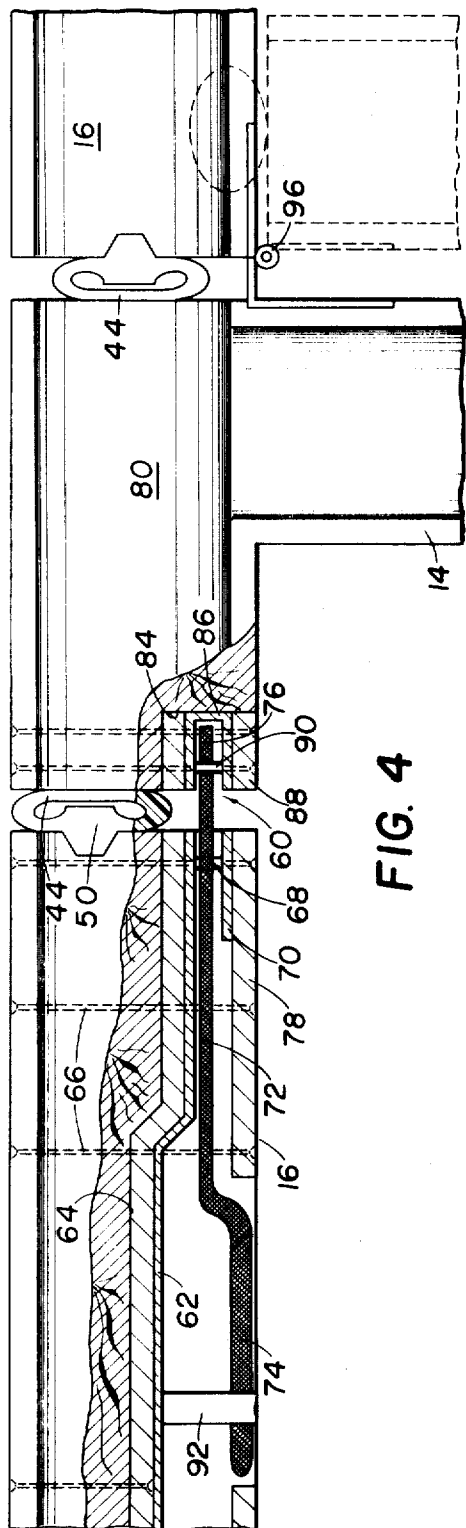


FIG. 4

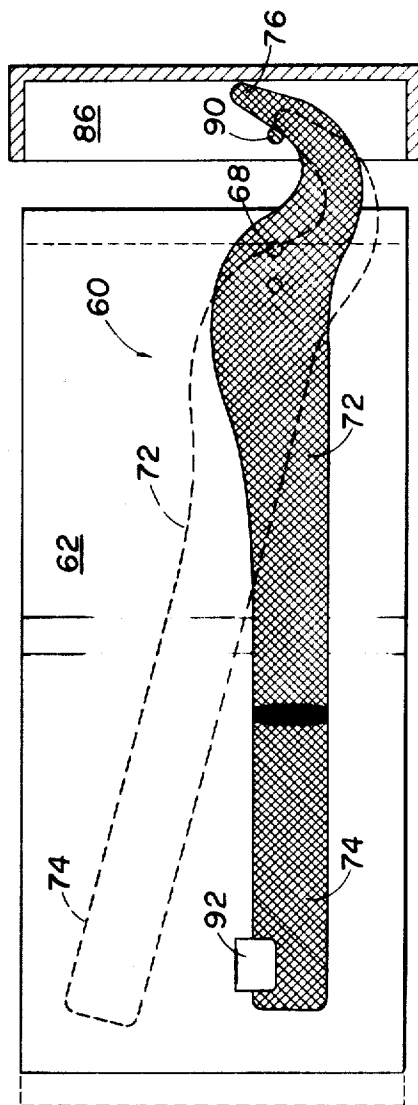


FIG. 5

BUILDING CONSTRUCTION**BACKGROUND****1. Field of the Invention**

This invention relates to building construction and more particularly to structure and method for transforming a large space into smaller spaces.

2. The Prior Art

It has long been desirable to achieve maximum utility of space by providing structure for selectively dividing a large space into smaller spaces or rooms. Conventionally, movable wall partitions or dividers have been used for this purpose. See, for example, U.S. Pat. Nos. 3,107,400; 3,295,257; 3,331,426.

Numerous problems have traditionally been associated with conventional wall partitions which have made widespread use either impractical or undesirable. For example, most wall partitions are incapable of being situated so as to provide an acoustically and hermetically insulated space. Where attempts have been made to form insulated spaces, the structure involved has been undesirably complex.

While numerous efforts have been made in the prior art to provide additional rooms (see U.S. Pat. No. 2,395,691) a building construction and method which combines the features of versatility, rapid and facile assembly and the formation of acoustically and hermetically insulated sub-spaces has not heretofore been known.

BRIEF DESCRIPTION AND OBJECTS OF THE INVENTION

The present invention, including structure and method, provides an assembly of interior wall panels which are easily displaced from a folded position to an unfolded, enclosure-forming position. An elevated ceiling unit is lowered upon the unfolded wall panels so as to form acoustic and hermetic insulation at the top and bottom panel joints, the weight of the ceiling simultaneously downwardly displacing the wall panels to secure the wall panels in the unfolded position.

It is, therefore, a primary object of the present invention to provide improved structure for dividing a large space into smaller spaces.

It is another primary object of the present invention to provide an improved method for dividing a space into smaller spaces.

These and other objects and features of the present invention will become more fully apparent from the following description and appended claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic perspective view of one presently preferred building construction embodiment of the invention shown in the partially unfolded position.

FIG. 2 is a schematic plan view of the folding sequence of adjacent wall panels of the embodiment of FIG. 1.

FIG. 3 is a top plan view of the wall panels of FIGS. 1 and 2 particularly illustrating the attachment thereof to a fixed support wall.

FIG. 4 is a top plan view of side-by-side wall panels and means for securing same together, portions being broken away to reveal interior construction.

FIG. 5 is a fragmentary side elevational view of the wall securement structure, alternative positions of the structure being illustrated in broken lines.

FIG. 6 is a side elevational view of the ceiling unit of FIG. 1 shown in the elevated position above a corresponding unfolded wall panel.

FIG. 7 is a cross-sectional view of retractable wheels carried within the wall panels of FIG. 1 for facilitating selective lateral movement thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Attention is now directed to the preferred embodiment of the invention more particularly set forth in the figures, like parts having like numerals throughout.

THE STRUCTURE

The preferred embodiment of the building construction of the present invention, generally designated 10, is shown best in FIG. 1. Generally speaking, the building construction comprises a plurality of side-by-side distinct enclosures each of which may be substantially identical to the next. It should be appreciated, however, that a single enclosure within the space may be made pursuant to the teachings of this invention.

Each enclosure comprises a ceiling unit generally designated 12 which is arcuately displaceable from the generally horizontal position shown to the right of FIG. 1 to an elevated position shown to the left of FIG. 1 in a manner which will be hereinafter more fully described. Each enclosure also comprises at least one side panel generally designated 14 and a front panel 16. The front and side panels are foldable as shown in FIGS. 1 and 2 into a position parallel with a rigid support wall 18 as shown in FIGS. 2 and 3.

With continued reference to FIG. 3, a generally vertically oriented annular channel 20 is formed in the support wall 18, the channel 20 having a length extending along the vertical dimension of support wall 18, the length being at least slightly greater than the vertical dimension of the side panels 14 and 16. An insert 22, preferably formed of metal, is nested within the channel 20 and is provided with outwardly projecting flanges 24 which face the interior side of the support wall 18. If desired, the insert 22 may be fixed to the wall 18 with screws or bolts passing through the flanges 24 into the wall structure. The insert 22 interiorly defines a track 26, the back face of which presents a plurality of side-by-side grooves 28. The purpose for grooves 28 will be hereinafter more fully described.

Into each of the grooves 28 is nested an outwardly projecting guide 30 forming an integral part of partition 32. The mating relation between guides 30 and grooves 28 restricts side to side relative movement of the partition 32 and the support wall 18 but simultaneously accommodates vertical displacement of the partition 32 (i.e., into the plane of the drawing in FIG. 3). The engagement of the guides 30 and grooves 28 is maintained by flanges 24, the inside edges of which project into opposed ways 34 extending along the length of partition 32 adjacent the terminal end thereof. Accordingly, the partition 32 is allowed to "float" exclusively in the vertical direction.

At least one hinge 38 has one leg 40 attached to the exposed end 36 of the partition 32. The opposite hinge leg 42 is mounted upon the inside surface of the side wall panel 14 so that the side wall panel 14 may be al-

ternately displaced between the illustrated folded position to the unfolded position shown in broken lines. It should also be observed that the partition 32 projects away from wall 18 to allow sufficient space for the front wall panel 16 to be interposed between the side wall panel 14 and the structural wall 18 in the folded condition.

As shown best in FIGS. 3 and 4, each vertical joint of the building construction 10 is provided with a tubular insulator 44. While any suitable insulator providing an acoustic and hermetic seal may be used, the illustrated insulator 44 is presently preferred. The tubular insulator is mounted upon one of the surfaces forming the joint, i.e. along the vertical edge 46 of the side wall panel 14 and also along the vertical edge 48 of the front wall panel 16. The insulators 44 are formed of a suitable resilient flexible material such as rubber or neoprene and have a generally tubular configuration.

An inwardly projecting rib 50 traverses the length of the hollow of the tubular insulator 44. Significantly, the rib 50 prevents total collapse of the tubular insulator 44 when the insulator is compressed by the wall panels 14 and 16 in the unfolded position. Accordingly, even when collapsed, the insulator 44 provides dead air space along its length which has the effect of providing surprisingly effective acoustical insulation in addition to hermetic insulation. It has also been found highly desirable to mount the tubular insulators 44 along both the top surfaces 52 (FIGS. 1 and 6) and the bottom surfaces 54 (FIG. 1) of the wall panels 14 and 16.

As shown in FIG. 2, the wall panels 14 and 16 are unfolded by first arcuately displacing the wall panels in the direction of arrow 53 until the side wall panel 14 is essentially normal with respect to support wall 18. Thereafter, the front wall panel 16 is arcuately displaced along the path defined by arrow 56 to a position essentially parallel with support wall 18. In this position, the front wall panel 16 is desirably secured to an adjacent side wall panel 14 as shown best in FIG. 4.

To insure secure attachment of the side wall panel 14 and adjacent front wall panel 16, an attachment assembly generally designated 60 is provided. The attachment assembly comprises a plate 62 preferably formed of decorative metal and situated within a contoured recess 64 formed in the inside surface of the front wall panel 16. The bracket may be secured in any desirable way such as with pins 66. A cylindrical bearing 68 is mounted between the plate 62 and support member 70, the cylindrical bearing acting as a fulcrum for lever 72. Lever 72 has an offset handle 74 and a hooked leading end 76. A substantial portion of the length of the lever 72 is obscured from view by a decorative face plate 78.

The adjacent side wall panel 14, referred to above, has a generally L-shaped depending end having short leg 80. The short leg 80 has a notch 84 into which a metal insert 86 is mounted. The metal insert is generally U-shaped in cross-sectional configuration (see also FIG. 5). The metal insert 86 is normally obscured from view by a decorative face plate 88.

A cylindrical bearing 90 is mounted in the insert 86 so as to be parallel with the bearing 68. The method for securing side wall panel 14 to the adjacent front wall panel 16 is best understood by reference to FIG. 5. When the front wall panel 16 is unfolded and brought into proximity with the previously unfolded side wall panel 14, the lever 72 is lifted into the broken line position of FIG. 5 to allow the hooked end 76 to pass be-

neath the bearing 90. Thereafter, the handle 74 is displaced downwardly as shown in FIG. 5 causing the bearing 90 to move along the surface of the hooked end 76 to the full line position of FIG. 5. Simultaneously with downward displacement of the lever 72, the bearing 90 will be drawn toward the bearing 68 thereby urging wall panels 14 and 16 together and collapsing tubular insulator 44 (see FIG. 4). A retainer 92, mounted upon the plate 62, is used to retain the lever 72 in the full line position of FIG. 5.

In order to release the lever 72 from the retainer 92, the lever is merely displaced downwardly and then lifted slightly out of the plane of the drawing as shown in FIG. 5 so that the handle portion 74 can be moved to the broken line position without interference from the retainer 92.

With continued reference to FIG. 4, it is observed that side wall panel 14 is connected by hinge 96 to another front wall panel 16.

Displacement of the wall panels 14 and 16 from the folded position to the unfolded position as shown in FIG. 2 is significantly facilitated by suspending wall panels 14 and 16 upon a plurality of roller assemblies 100, one of which is best illustrated in FIG. 7. Each roller assembly 100 comprises a conventional castor 102 rotatably carried upon an axle 104 held by a generally U-shaped bracket 106. The bracket is rigidly mounted upon a plunger 108 which is biased into the extended full-line position by a spring 110. The resistance in the spring 110 is selected to be sufficient to lift the weight of the wall panels 14 and 16. Accordingly, the wall panels are easily displaced from place to place upon the roller assemblies 100.

However, when the wall panels 14 and 16 are forced downwardly, e.g., when the weight of the ceiling unit 12 is allowed to rest upon the wall panel 14, the resistance of spring 110 is overcome such that the wall panel 14 is downwardly displaced against the bias of spring 110 to the broken line position. In the broken line position, the wall panel is secured in place. In this specification displaceable wheels means castors or glides which recess into the wall panels as the panels are downwardly displaced under the weight of the ceiling unit 12.

Insulators 44, as previously described, are situated both above and beneath the wall panels 14 and 16. Nevertheless, in order to facilitate use of the castors 102, a portion of the insulator 44 (not shown in FIG. 7) must be removed from the bottom of the wall panels. Acoustical and hermetic insulation is improved at the locations of the castors 102 through the use of a flexible seal 112 mounted to the wall panel and situated on both sides of the castor. When the wall panel is displaced downwardly with the weight of the ceiling unit 12, the insulators 112 are compressed against the floor surface to form a seal.

While movement of the wall panels is preferably accommodated with castors, clearly any suitable device including glides and the like could be used to reduce friction between the moving wall panels and the floor.

The structure and operation of the ceiling unit 12 can best be understood by reference to FIG. 6. The ceiling unit 12 is connected by a rotatable hinge 120 to the support wall 18. The hinge permits the ceiling unit 12 to be arcuately displaced between a horizontal position and a position acutely angular with respect to the horizontal. Any suitable conventional means can be used

for displacing the ceiling unit upwardly, including, for example, a cable and winch assembly. In the elevated position, ceiling unit 12 does not influence the position of the wall panels 14 and 16. Accordingly, as shown in FIG. 6, wall panel 14 is in an upward position elevated by spring 110 acting upon castors 102 (FIG. 7). Also, the resilient tubular insulator 44 is in the fully expanded position.

When the ceiling unit 12 is lowered, the inside corner 122 will engage the rigid upper surface 124 of partition 32. If desired, to prevent excessive wear, the edge 122 may be provided with a strike plate 126 to minimize or obviate any damage that may occur to the ceiling panel 12 through repeated engagement with the upper surface 124.

When the ceiling unit 12 is lowered to the broken line position of FIG. 6, the partition 32, side wall panel 14 and front wall panel 16 will be downwardly displaced against the bias of spring 110 (FIG. 7) as permitted by the floating attachment of the partition 32 (see FIG. 3). Simultaneously, the weight of the ceiling unit 12 will collapse insulators 44 above and beneath the wall panels so as to form an acoustical and hermetic seal at the ceiling and floor, respectively.

The construction of the ceiling unit 12, as described, accommodates some significant advantages not otherwise available in building structures. For example, light fixtures 128 (FIG. 1) can be permanently installed in the ceiling unit 12. In addition, an air flow duct 130 can be permanently installed and connected to a flexible conduit for providing heat and air-conditioning to each individual enclosure as it is formed.

THE METHOD

The method of assembling a plurality of enclosures within a larger space can be easily understood by reference to FIGS. 1 and 2. As shown in FIG. 2, the wall panels 14 and 16, normally situated in the folded position parallel to support wall 18, are arcuately displaced about the axis of hinge 38 (FIG. 3) in the direction of arrow 53. When the side wall panel 14 is essentially normal to the support wall 18, the front wall panel 16 is arcuately displaced about the axis of hinge 96 (FIG. 4) along the path depicted by arrow 56 to the full unfolded position parallel to the support wall 18. Displacement of the wall panels 14 and 16 is easy and unencumbered as the wall panels 14 and 16 are supported in an elevated position upon castors 102 (FIG. 7).

In the unfolded position, the front wall panel 16 is secured to an adjacent side wall panel 14 or, where desired, a permanent fixed wall. Securement is accomplished through any desirable attaching means such as that illustrated and described in connection with FIG. 4. As pointed out, each of the vertical joints of the wall panels forms an acoustical and hermetic seal as a result of partial collapse of tubular insulators 44 during the unfolding process.

When completely unfolded, the ceiling unit 12 is lowered arcuately about the axis of hinge 120 (FIG. 6) so that the weight of the ceiling unit is brought to rest upon the unfolded wall panels 14 and 16. The weight of the ceiling unit causes both wall panels 14 and 16 and partition 32 to be downwardly displaced against the bias of spring 110 (FIG. 7) into floor engagement. Simultaneously, acoustic and hermetic seals are formed on both the top and bottom surfaces of the wall panels. As described in connection with FIG. 3, vertical dis-

placement of the partition 32 is made possible exclusively in the vertical direction as a result of the slidable attachment of the partition 32 within the bracket 26. Where desired, each front wall member 16 may be provided with a doorway 132 thereby making each enclosure independently accessible. Moreover, each enclosure is provided with independent lighting, air-conditioning and heating.

Each enclosure may thereafter be collapsed or folded by reversing the described method, the wall panels being folded neatly against the support wall 18 and each ceiling unit being elevated to an aesthetically pleasing position and providing light and air-conditioning to the larger space.

In accordance with the structure and method of this invention, it is apparent that a large space can be quickly and easily converted into a plurality of smaller enclosures each of which is acoustically and hermetically sealed from the next and each of which is provided with its own lighting, heating and air-conditioning facility.

The invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiment is to be considered in all respects only as illustrative and not restrictive and the scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

1. A building structure comprising in combination:

a generally vertically oriented folding wall panel mounted upon a rigid support wall so as to provide limited movement of the wall panel in the vertical plane;

a ceiling unit suspended above the wall panel, the ceiling unit comprising means for selectively lowering at least part of the weight of the ceiling unit upon the unfolded wall panel; and

means interposed above and below the wall panel for forming a seal when the weight of the ceiling unit is brought to rest upon the wall panel.

2. A building structure as defined in claim 1 further comprising downwardly biased castors providing facile movement of the wall panel across a floor surface, the castors being selectively telescoped into the interior of the wall panel when the wall panel is downwardly displaced in response to the weight of the ceiling unit upon the wall panel.

3. A building structure as defined in claim 1 wherein said folding wall panel comprises at least two sections foldable into parallel relationship one with respect to the other and both with respect to a third wall and means interposed between each of the wall sections for forming a seal when the wall sections are fully unfolded.

4. A building structure as defined in claim 1 wherein said ceiling unit comprises a hinged mounting facilitating arcuate displacement between a generally horizontal position and an acute angle with respect to the horizontal, the ceiling unit further comprising rigid means for engaging the vertical wall panel and for displacing the vertical wall panel downwardly as the ceiling unit is lowered to the horizontal position.

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5. A building structure as defined in claim 4 wherein said ceiling unit comprises an air delivery opening and a light source which, when the ceiling unit is in the general horizontal orientation, deliver air and light.

6. A building structure as defined in claim 1 wherein

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said seal forming means comprises a generally flexible tube having an axially aligned inwardly directed projection which prevents total collapse of the tube when the tube is compressed under pressure.

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