June 11, 1968 B. T. HUEY 3,387,413

CONVERTIBLE BUILDING CONSTRUCTION

Filed Feb. 3, 1966 3 Sheets-Sheet 1

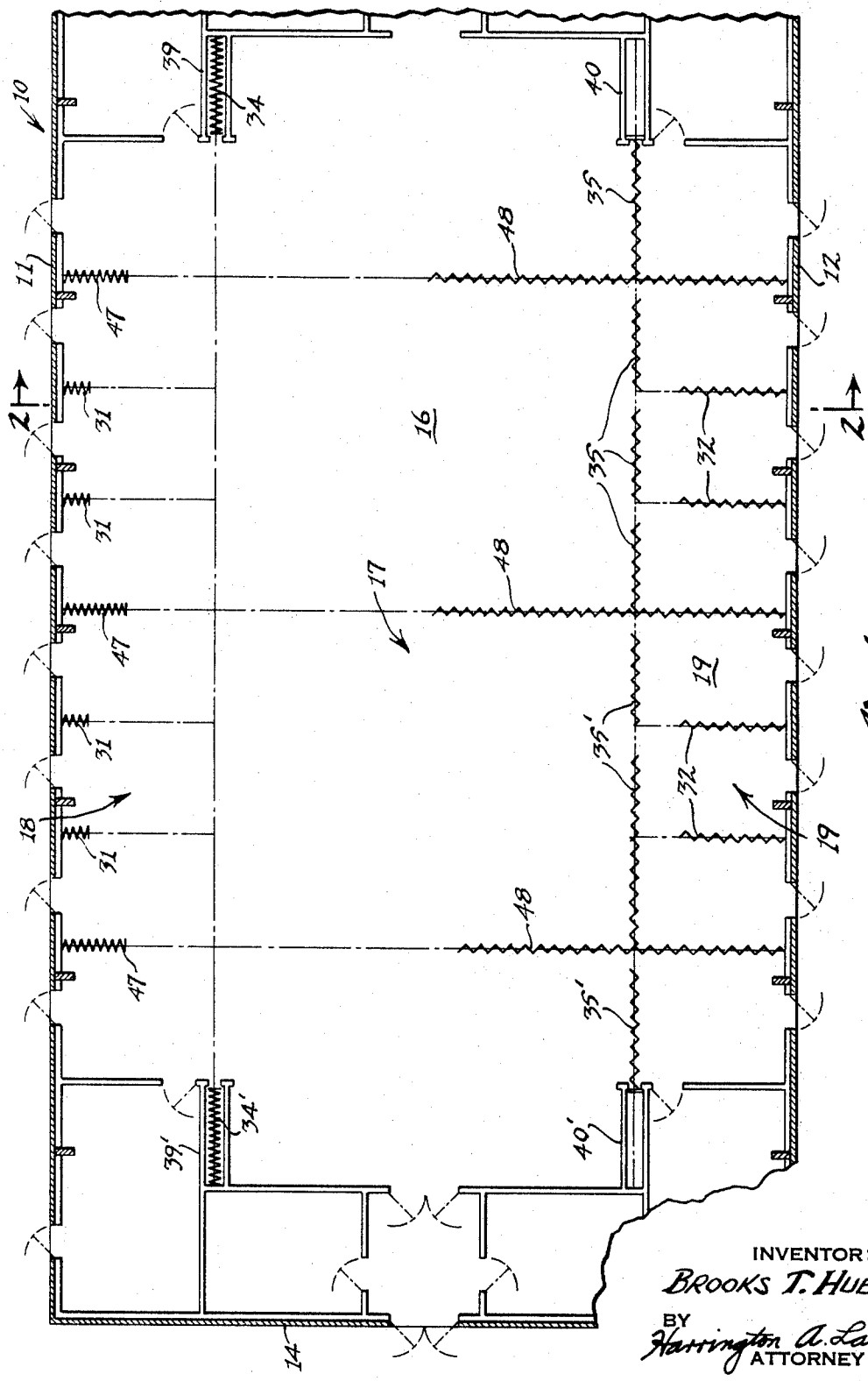


Fig. 1

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Fig. 2

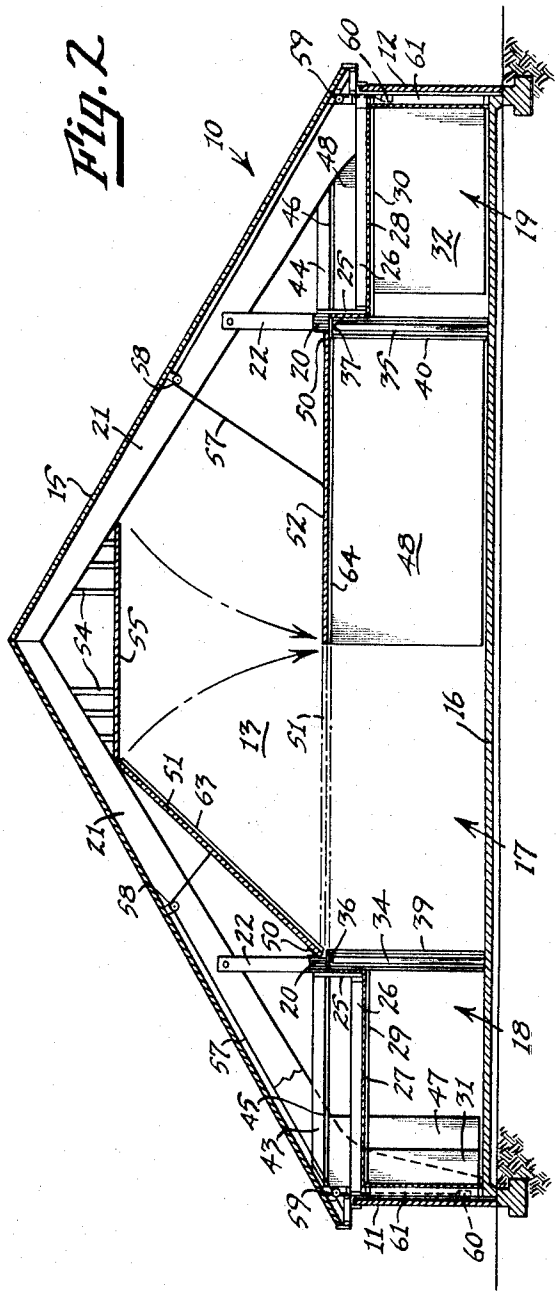
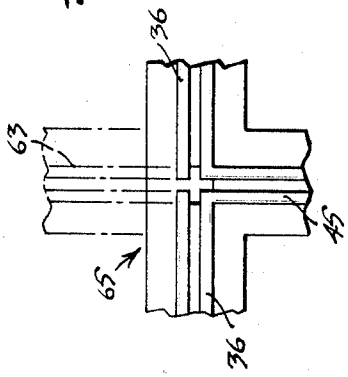


Fig. 5



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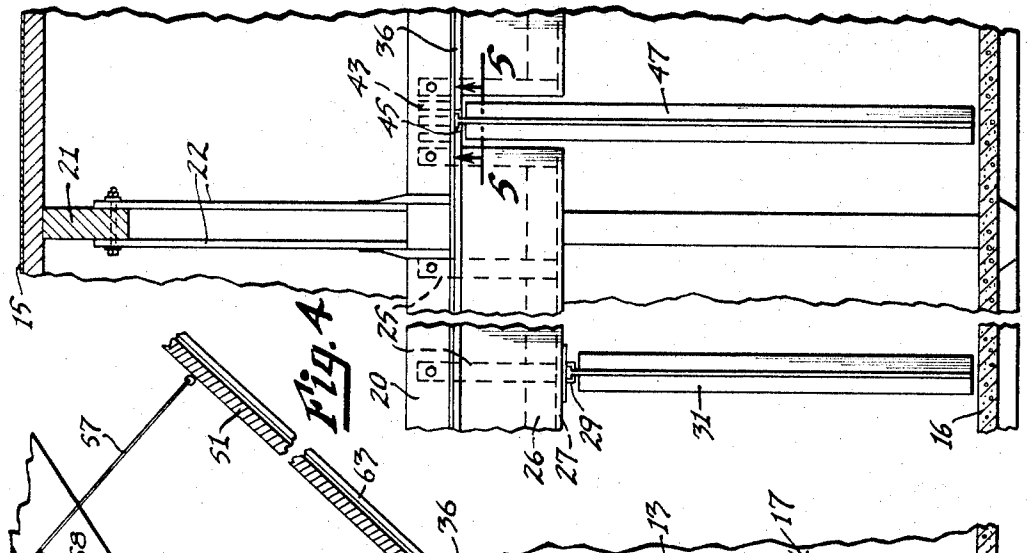


Fig. 4

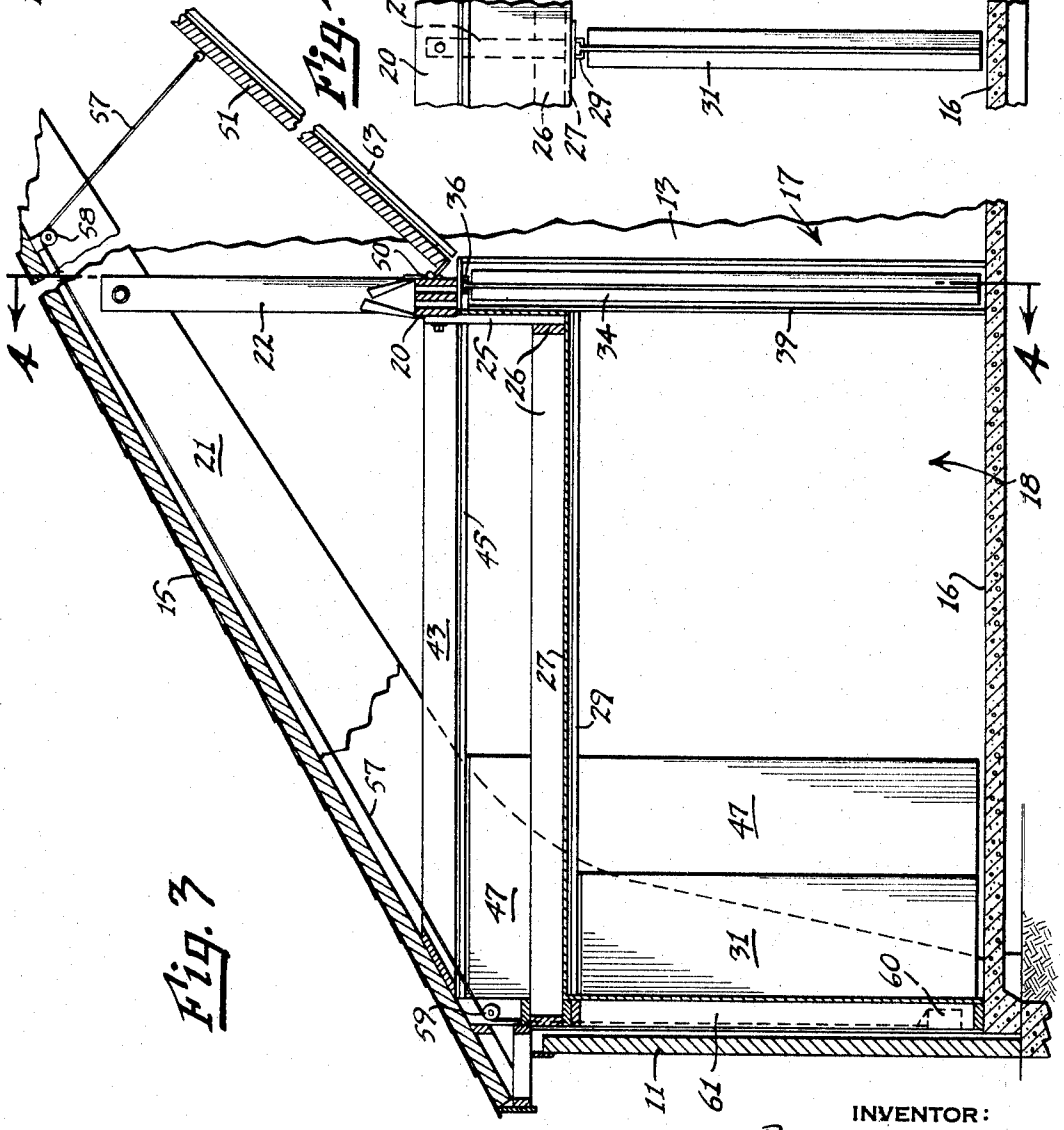


Fig. 3

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CONVERTIBLE BUILDING CONSTRUCTION

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3 Claims. (Cl. 52—69)

ABSTRACT OF THE DISCLOSURE

A convertible building construction including a floor, frame, outside walls, an upper ceiling and a pair of longitudinal beams spaced inwardly of the outside walls having track means supporting longitudinal foldable doors; a pair of lower ceiling panels hinged to the longitudinal beams for swinging movement between a lower ceiling plane and an upper position engaging the upper ceiling, and transverse track means and transverse foldable partition walls extending between each outside wall and the inside edge of each corresponding lower ceiling panel.

This invention relates to a building construction, and more particularly to a building adapted for the assembly of large groups of people and for conversion to different uses.

Heretofore, large assembly areas in hotels, restaurants and educational buildings have been sub-divided into smaller areas by the extension of foldable partition walls movably suspended on overhead tracks, and re-converted to the larger assembly areas by folding or collapsing the doors.

In the U.S. Reames Patent 3,083,418, issued Apr. 2, 1963, the idea of enlarging overhead space by the movement of ceiling panels, as well as the horizontal expansion and contraction of room space by movement of foldable partition walls, was advanced. However, in the Reames patent, the ceiling for the central assembly area remains fixed, whereas only the ceilings for the side room areas are movable to integrate the side room areas and the central assembly area and to restore the low-ceiling side room areas.

It is an object of this invention to provide a convertible building in which the ceiling construction of the main assembly area is convertible between a high ceiling and a low ceiling.

Another object of this invention is to provide a building construction having a ceiling convertible between high and low positions and foldable walls for sub-dividing a large assembly area into smaller areas when the ceiling has been converted to its low position.

Another object of this invention is to provide in a building construction a main assembly area having a ceiling convertible between high and low positions, and side rooms having fixed low ceilings.

Another object of this invention is to provide a convertible building construction having a central longitudinal assembly area with a ceiling convertible between high and low positions, and room areas on opposite sides of the assembly area having fixed ceilings, side partition walls adapted to be moved longitudinally for separating the central and side areas, and transversely extending partition walls for sub-dividing the side room areas and the central assembly area.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the drawings, wherein:

FIG. 1 is a schematic plan view of a building made in accordance with this invention, with the outer walls shown in section;

FIG. 2 is a section taken along the line 2—2 of FIG. 1 showing the entire transverse elevation of the building;

FIG. 3 is an enlarged fragmentary sectional transverse elevation of the left portion of the building shown in FIG. 2;

FIG. 4 is a section taken along the line 4—4 of FIG. 3; and

FIG. 5 is a bottom plan view of the intersecting tracks taken along the line 5—5 of FIG. 4.

Referring now more particularly to the drawings, the invention may be incorporated in a large building **10**, such as a large assembly building used for both recreational and educational purposes by a church. The building **10** includes side walls **11** and **12**, end walls **13** and **14** and a roof **15**, which may be sloping or not, as desired. The building **10** made in accordance with this invention is divisible into three main longitudinal areas; namely, the assembly area **17** and the two side room areas **18** and **19**, disposed on opposite sides of the assembly area **17**.

Extending longitudinally of the building **10** and along the lines of division between the areas **17**, **18** and **19** are a pair of longitudinal beams **20**, fixed to and suspended from the roof beams or rafters **21** by the dependent vertical beams **22**. Fixed to the inside of each longitudinal beam **20** are a plurality of longitudinally spaced depending frame arms **25** supporting the ceiling frames **26**, which support the ceilings **27** and **28** in fixed positions co-extensive with the side room areas **18** and **19**, respectively. The ceilings **27** and **28** are provided with spaced transversely extending overhead tracks **29** and **30**, respectively, for movably suporting folding partition walls **31** and **32**, respectively. The partition walls **31** and **32** are adapted to move transversely between folded or stored positions, such as the positions of the partition walls **31** disclosed in FIGS. 1, 2 and 3, and their extended positions as shown by the position of the partition wall **32** in FIGS. 1 and 2. Although the extent of the walls **32** in FIGS. 1 and 2 provides a door opening communicating the areas divided by each partition wall **32**, the walls **32** may extend the full width of the room area **19**.

Separating the side room areas **18** and **19** from the central assembly area **17** are longitudinal folding partition walls **34–34'** and **35–35'**, which are suspended on the overhead tracks **36** and **37**, respectively, fixed on the bottoms of the longitudinal beams **20**. The folded partition walls **34** and **35** are adapted to be stored in the storage compartments **39** and **40** at the end of the building adjacent the wall **13**, and unfolded to extend to the transverse center line of the building **10**. The folded walls **34'** and **35'** are adapted to be stored in the storage compartments **39'** and **40'** respectively, adjacent the opposite end wall **14**, and are also adapted to be extended to the transverse center line of the building to meet the corresponding extended longitudinal folding walls **34** and **35**, respectively.

Fixed to and extending transversely outwardly of the longitudinal beams **20** and spaced several feet above the fixed ceilings **27** and **28** are transverse track beams **43** and **44** supporting fixed transverse tracks **45** and **46**, respectively. The outer ends of the track beams **43** and **44** may be fixed in any manner to the roof **15**. Suspended from the fixed transverse tracks **45** and **46** for transverse movement are folding partition walls **47** and **48** which are of greater height and greater length than the folding partition walls **31** and **32**.

Pivoted to the inside of each of the longitudinal beams **20** by means of hinges **50** are a pair of lower ceiling panels **51** and **52**, which are preferably of equal width and adapted to extend the entire length of the assembly area **17**. Of course the ceiling panels **51** and **52** may be divided longitudinally into sections to facilitate handling, particularly over long assembly areas. Moreover, the lower ceiling panels **51** and **52** are pivoted about hinges **50** at equal elevations so that they will extend in a common,

horizontal lower-ceiling plane with their inner edges meeting, as disclosed by the dashed-line position of lower ceiling panel 51 and the solid-line position of lower panel 52 in FIG. 2.

Rigidly fixed beneath the roof 15 by means of ceiling framing elements 54 is an upper ceiling section 55 (FIG. 2). The fixed ceiling section 55 is also adapted to extend the full length of the assembly area 17. The width of the fixed ceiling section 55 is sufficient, and so related with the positions and sizes of the lower ceiling panels 51 and 52, that, when the ceiling panels 51 and 52 are pivoted upwardly, the inner free edges of the ceiling panels 51 and 52 will abut against the lower surface of the ceiling section 55, and, as shown in FIG. 2, will mate with the side edges of the ceiling section 55. Each ceiling panel 51 and 52 is adapted to be raised or lowered by a cable 57, fixed at one end to the upper surface of each ceiling panel 51 and 52, and then travelling over pulleys 58 and 59, fixed to roof 15, to extend downwardly within the side walls 11 and 12, and terminating in a weight 60 concealed in a weight closet 61. Although it is not disclosed, the actual raising and lowering of ceiling panels 51 and 52 may be effected by manually moving the cable 57 or the weight 60 up and down, or by mechanical means such as a winch connected to the cable 57 or the pulley 59.

The lower ceiling panel 51 is provided with a plurality of longitudinally spaced parallel transverse tracks 53 which are adapted to coincide with and form extensions of the transverse tracks 45 when the ceiling panel 51 is in its lower ceiling position disclosed by the dashed-lines in FIG. 2. In this position, the transverse partition walls 47 may be expanded inwardly to the center of the assembly area 17, which would be the inner or free end of the ceiling panel 51. In a similar manner, transverse ceiling tracks 64 are fixed on the lower surface of the lower ceiling panel 52 for receiving the transverse folding partition walls 48 in their expanded positions, as disclosed in FIG. 2. When expanded, both partition walls 47 and 48 in the same transverse plane will meet to form a partition extending completely across the building 10 from side wall 11 to side wall 12. When the ceiling panels 51 and 52 are elevated, the transverse partition walls 47 and 48 are retracted into their collapsed stored positions as disclosed by the position of the wall 47 in FIGS. 1–4. Also, either wall 47 or 48 may be partially expanded to completely span the width of the corresponding side room area 18 or 19 in order to further sub-divide the room areas.

Since the height of the longitudinal partition walls 34–34', 35–35', and the transverse walls 47 and 48 are equal, the longitudinal tracks 36 and 37 are crossed by the transverse tracks 45 and 46, respectively. These intersections 65 will have constructions similar to that shown in FIG. 5. Moreover, in order to permit the longitudinal partition walls 34–34' and 35–35' to extend their full lengths, and still permit the full expansion of the transverse partition walls 47 and 48, the longitudinal partition walls are separated into sections, as shown by the partition walls 35 and 35' in FIG. 1. The longitudinal walls 34–34' and 35–35' also have smaller sections to provide doorways between each room formed by the transverse partition walls 31, 32, 47 and 48, and the interior of the assembly area 17. These longitudinal wall sections may be detachably secured to each other by any convenient means outside the scope of this invention.

The various operations of the invention will now be described by assuming initial positions in which both lower panels 51 and 52 are raised engaging the fixed ceiling section 55, and all partition walls 31, 32, 34–34', 35–35', 47 and 48 are folded or stored. In the initial positions, the assembly area 17 is provided with a high ceiling and all the side room areas 18 and 19 are horizontally integrated with the assembly area 17 to obtain the maximum undivided space, which might be used for recreational or athletic activities, such as a dance, a lecture, play, basketball game, or any activity where maximum space is required for the assemblage of the largest number of people.

Where it is desired to combine a substantially large assembly area and collateral areas for small groups, such as classrooms or workships, the longitudinal partition walls 35–35' and 34–34' may be unfolded and extended their full lengths to sub-divide the building 10 into the central assembly area 17, and the side room areas 18 and 19. The room areas 18 and 19 may then be further sub-divided into rooms by one or more of the room partition walls 31 and 32 and also by extending the transverse partition walls 47 and 48 only as far as the longitudinal partition walls 34–34' and 35–35'. As shown in FIG. 1, all of the sub-divided rooms are approximately of equal size, but any two of these adjacent rooms may be combined to form a larger classroom by merely folding or storing one wall, such as 31. In this example, the assembly area 17 may either be provided with the high ceiling where both lower ceiling panels 51 and 52 are raised, or it may be provided with a low ceiling where ceiling panels 51 and 52 are lowered to their common plane, as disclosed by the dashed-line position of panel 51 and the solid-line position of panel 52 in FIG. 2. It will be readily observed that where the additional upper ceiling space is not required, the lower ceiling position will afford substantial economy in heating and cooling, since only the air in the assembly area 17 below the lower ceiling position need be conditioned. Moreover, all the space between the lowered ceiling panels 51 and 52 and the roof 15 functions as an insulating medium for either heating or cooling.

Where it is desired to sub-divide the assembly area 17, the lower ceiling panels 51 and 52 must be in the lowered position so that the tracks 63 and 64 will align with and effectively extend the tracks 45 and 46 for full expansion of the transverse partition walls 47 and 48. With the transverse partition walls 47 and 48 extended on the lowered ceiling panels 51 and 52, the relative positions of the longitudinal walls 34–34' and 35–35', and the room partition walls 31 and 32 are almost as numerous as the space needs of the occupants. For example, all partition walls may be extended to sub-divided the spaces into the maximum number of rooms. Also, the longitudinal partition walls 34–34' and 35–35' may be fully retracted into their respective storage compartments 39, 39', 40 and 40', and the transverse room walls 31 and 32 may be fully retracted to provide elongated assembly areas extending transversely of the building 10 between the transverse walls 47 and 48 and from side wall 11 to side wall 12. Between these two extreme space arrangements for the extended side walls 47 and 48, there may be any number of intermediate arrangements. For example, one such arrangement could be as shown in FIG. 1, but with the transverse walls 47 expanded. Thus, the longitudinal partition walls 34 and 34' and the room walls 31 are retracted so that small assembly areas extend between the transverse walls 47 and 48 from the side wall 11 to the longitudinal partition walls 35–35', with room area 19 sub-divided into small rooms by the transverse partition walls 32 and 48.

Here again, where the transverse partition walls 47 and 48 are extended, so that the lower ceiling panels 51 and 52 are necessarily in their lower ceiling position, there is considerable reduction in heat transfer to the outside environment, because only the room areas 18 and 19 beneath their ceilings 27 and 28 and the assembly area 17 beneath the lowered ceiling panels 51 and 52 need be heated or cooled, and all the spaces above the ceilings and beneath the roof 15 provided a thermal insulating air medium.

Consequently, the convertible building construction made in accordance with this invention provides numerous variations not only in lateral or horizontal space requirements, but also in vertical space requirements, to suit the space needs and functions of the occupants. Moreover, the building provides partitions and panels to suit the

needs required without wasting space and without heating or cooling unnecessary spaces.

It will be apparent to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof, and therefore the invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. A convertible building comprising:

(a) a floor,

(b) a building frame rigidly supported above said floor and including opposed side walls,

(c) an upper ceiling fixedly supported on said frame above said floor,

(d) a pair of parallel longitudinal beams fixed to said frame and spaced between said side walls above said floor and below said upper ceiling,

(e) longitudinal track means mounted along each of said longitudinal beams,

(f) a longitudinal folding partition wall suspended in each of said longitudinal track means for movement along said beams,

(g) a pair of lower ceiling panels having inner mating edges and outer edges,

(h) hinge means mounted on each of said longitudinal beams inside said corresponding longitudinal track means and connecting said outer edges to said corresponding beams for swinging movement about longitudinal pivotal axes,

(i) said hinge means being spaced apart a distance equal to the combined widths of said ceiling panels,

(j) means for swinging said ceiling panels about said hinge means between a lower ceiling plane in which said ceiling panels are coplanar and said inner edges meet, and a raised position in which said inner edges engage said upper ceiling,

(k) transverse outer track means mounted on said frame and extending from each beam outwardly toward said corresponding side wall,

(l) ceiling track means mounted on said ceiling panels transversely thereof and adapted to be coextensive with said outer track means when said panels are in said lower ceiling plane,

(m) a pair of transverse folding partition walls,

(n) means mounting each of said transverse partition walls to move in said corresponding outer track means and in said corresponding ceiling track means when said ceiling panels are in said lower ceiling plane.

2. The invention according to claim **1** further comprising room ceilings fixed on said frame between each longitudinal beam and its corresponding side wall.

3. The invention according to claim **2** further comprising room track means extending transversely of said room ceilings, and foldable room partition walls movably carried by said room track means.

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