June 22, 1965 C. H. HURKAMP 3,189,949

FOLDABLE BUILDING STRUCTURE

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Fig. 1.

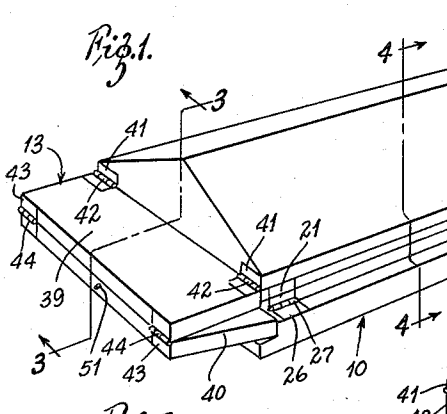


Fig. 2.

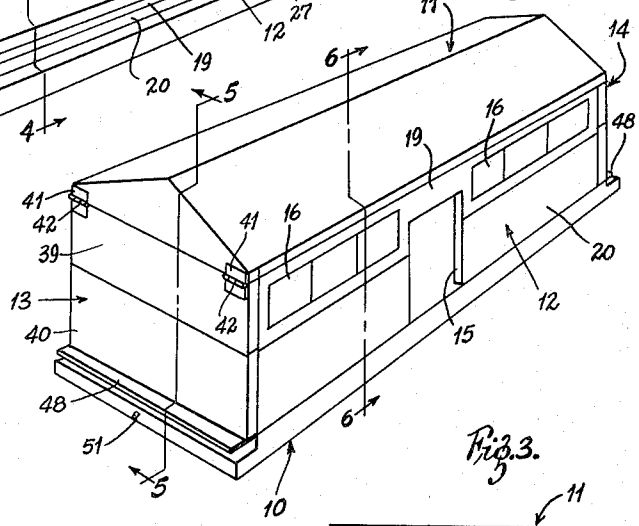


Fig. 5.

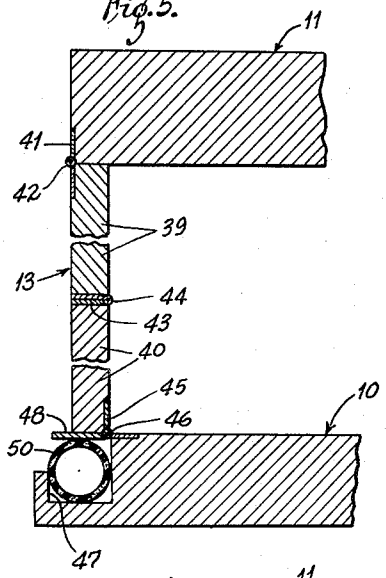


Fig. 3.

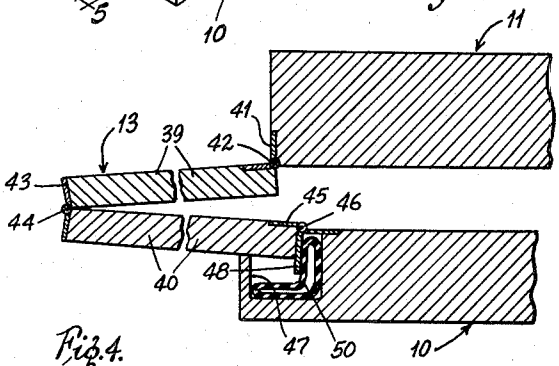


Fig. 6.

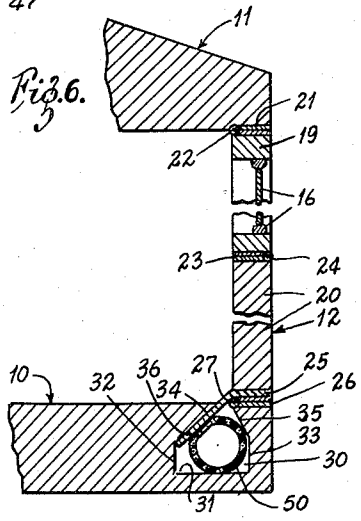
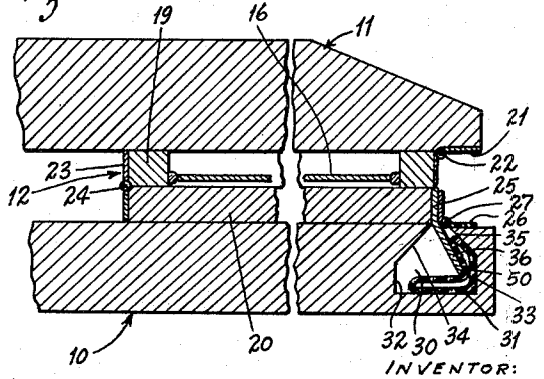


Fig. 4.



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Fig. 7.

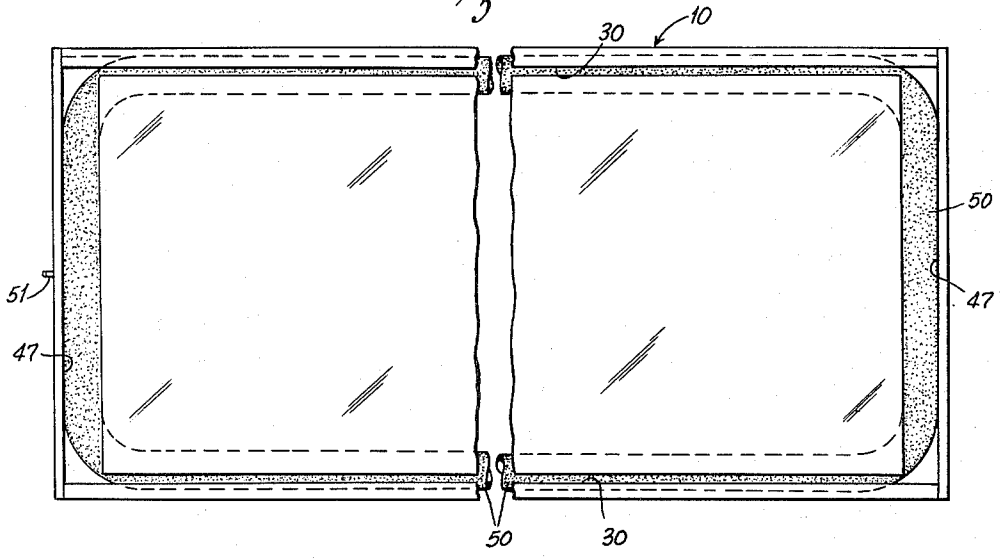
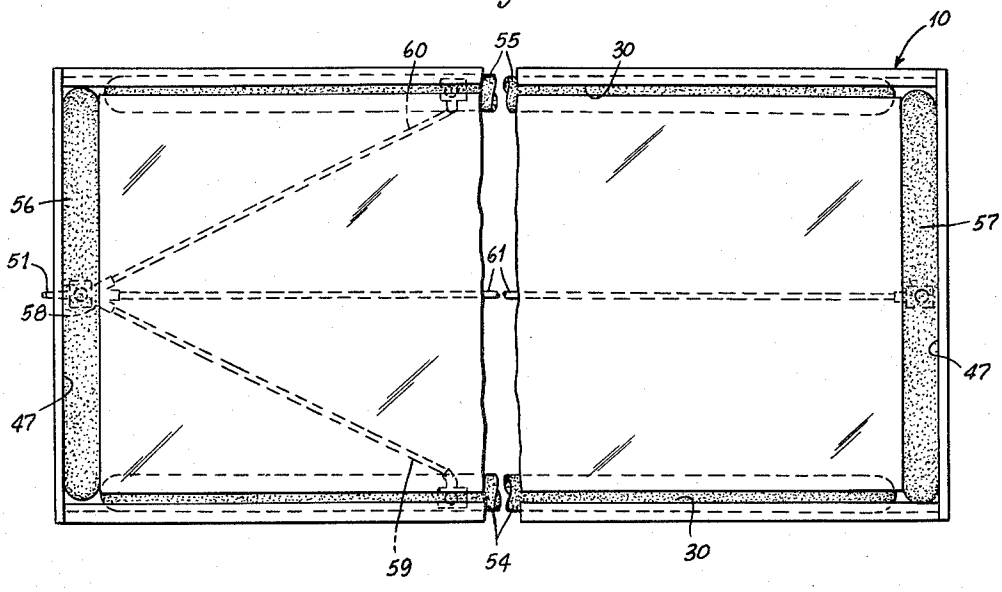


Fig. 8.



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FOLDABLE BUILDING STRUCTURE

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7 Claims. (Cl. 20—2)

This invention relates to a structure and method for erecting a building from a preassembled flat compact condition to a fully erected condition with a minimum requirement of tools and personnel. In general, the invention comprises preassembled floor, wall and roof structures with hinges connecting the walls to the floor and roof and allowing the walls to be folded horizontally until the floor and roof lie adjacent one another. There are one or more pneumatic tubes associated with these hinges. The construction of the hinges and their relationship to the pneumatic tube or tubes is such that upon expansion of the tube or tubes, the walls automatically straighten and push the roof upwardly from the floor. When the walls are completely straight, they are nailed or locked in place and the building is erected.

The principal object of this invention is to provide a building structure that is preassembled in a folding condition and that has built-in pneumatic means for automatically and completely erecting the building on any desired location.

Another object of the invention is to provide a folding building structure that is erected solely by the application of high pressure fluid.

Yet another object of the invention is to provide a building structure that can be folded for compact shipping and storage in a preassembled condition and thereafter transported to a building site for quick and uncomplicated erection.

Still another object of the invention is to provide a method for erecting a building that involves the application of high pressure fluid to certain pressure sensitive areas of the building.

Another object of the invention is to provide a simple and easy-to-operate building erection means that is readily adaptable to any size structure ranging from full size building structures down to doll houses and the like.

Other objects and advantages will be apparent to those skilled in the art.

In the drawing:

FIGURE 1 is an isometric view of the building in its folded condition;

FIGURE 2 is an isometric view of the building in its erected condition;

FIGURE 3 is an enlarged fragmentary view in section taken along the line 3—3 of FIGURE 1, but with the hinges shown in section;

FIGURE 4 is an enlarged fragmentary view in section taken along the line 4—4 of FIGURE 1, but with the hinges shown in section;

FIGURE 5 is an enlarged fragmentary view in section taken along the line 5—5 of FIGURE 2, but with the hinges shown in section;

FIGURE 6 is an enlarged fragmentary view in section on an enlarged scale taken along the line 6—6 of FIGURE 2, and with the hinges shown in section;

FIGURE 7 is a fragmentary plan view of the floor of the building with other parts of the building removed; and

FIGURE 8 is a fragmentary plan view of the floor of a modification of the invention.

The building illustrated has a floor structure 10, a roof and ceiling structure 11, a front wall 12, a rear wall (not shown), and side walls 13 and 14. These basic parts of the building may be made of any structural material conventionally used in the construction industry, and particularly those materials that are best suited for prefabricated or preassembled buildings.

In the drawings the ceiling and roof structure 11 are shown as a rigid unit, but there may be spaced between the roof and ceiling to provide room for an attic perhaps containing a refrigeration system, electrical wiring, or other building accessory. The other principal parts of the building, including the floor structure 10 and the wall structure are also rigid except for certain hinged connections as will be described. The front wall 12 may have a door 15 and windows 16. Other doors and windows may be formed in the other walls of the building.

The front wall 12 comprises an upper panel 19 and a lower panel 20. The upper edge of the upper panel 19 is fastened to the roof and ceiling structure 11 by hinges 21, the pivot axes 22 of which are on the inside of the front wall. The upper and lower panels 19 and 20 are connected together by hinges 23 having their pivot axes 24 adjacent the front side of the front wall. The lower edge of the lower panel 20 has a plate 25 fastened to it and hinges 26 are connected to the plate 25 and to the floor structure 10. The pivot axes 27 of the hinges 26 are adjacent the inside of the front wall. The panels 19 and 20 are of equal length, and the pivot axes 22 and 27 of the hinges 21 and 26 are vertically aligned.

The floor structure 10 has a recess 30 in it, as illustrated in FIGURES 4 and 6. The recess 30 is defined by a horizontal wall 31, two vertical walls 32 and 33 and a pair of oppositely inclined walls 34 and 35. The plate 25 fastened to the lower edge of the front wall panel 20 is bent to provide an inclined flange 36 that extends downwardly into the recess 30.

The front wall 12 is pivotal about its hinges between the positions illustrated in FIGURES 4 and 6. As the panels 19 and 20 swing inwardly to the position illustrated in FIGURE 4, the roof structure 11 moves toward and away from the floor structure 10.

Although not illustrated, the rear wall comprises two panels like the panels 19 and 20 and has the various hinge connections that have been described for the front wall 12.

The side walls 13 and 14 are also identical in construction. Each side wall comprises an upper panel 39 and a lower panel 40. The upper panel 39 is fastened to the roof and ceiling structure 11 by hinges 41 having their pivot axes 42 positioned adjacent the outer side of the panel 39. The upper panel 39 is joined to the lower panel 40 by hinges 43 the pivot axes 44 of which are adjacent the inner side of the wall 13. The lower edge of the lower panel 40 is joined to the floor structure 10 by hinges 45 having their pivot axes 46 positioned adjacent the inner side of the panel 40.

The floor structure 10 has a square walled recess 47 cut in it as illustrated in FIGURES 3 and 5. A plate 48 is fastened to the lower edge of the panel 40 and extends somewhat beyond the panel. When the panels 39 and 40 are pivoted about their hinges between the positions illustrated in FIGURES 3 and 5, the plate 48 pivots downwardly into the recess 47.

The building is erected by pneumatic tube means, two embodiments of which are illustrated in FIGURES 7 and 8. In FIGURE 7, a single continuous thin wall tube 50 is fitted within the recesses 30 and 47. Sections of the tube 50 are shown in the collapsed condition in FIGURES 3 and 4 and in the expanded condition in FIGURES 5 and 6. The tube 50 has a circular cross section as illustrated. A conventional check valve fitting 51 is connected to the tube 50 and extends through a side of the floor structure 10.

Using this pneumatic tube 50, the erection of the building is a very simple matter. It is shown in its collapsed condition in FIGURE 1. This is the condition in which

the building would be shipped and stored, and it is obvious that, when collapsed, the building is quite compact and flat. The front and rear walls are collapsed inwardly and the end walls 13 and 14 are collapsed outwardly. If the hinge connections on these walls were reversed, the front and rear walls could be made to collapse outwardly and the side walls inwardly. As shown in FIGURES 3 and 4, when the building is collapsed, the tube 50 is compressed between the walls of the recesses 30 and 47 and the plates 36 and 48. When a source of high pressure gas or air is connected to the valve 51, the tube 50 begins to expand, applying upward pivotal pressures to the plates 36 and 48. This pressure of the tube 50 causes the lower front and rear panels 20 to pivot about their hinges 26 and the lower side wall panels 40 to pivot about their hinges 45. As these lower panels swing upwardly, all of the upper panels 19 and 39 pivot between their upper and lower hinges until finally, when the tube 50 is completely inflated, the walls are in straight vertical positions as illustrated in FIGURES 5 and 6. Once these walls are completely straightened, the building will remain erect because the moments about the hinges 23 and 43 tend to keep the walls straight. Therefore, even if the air or gas is exhausted from the tube 50, an external inward force on the front and rear walls and an outward force on the side walls is necessary to collapse the building. However, after the building is erected, the side walls may be nailed or otherwise locked to the front and rear walls to prevent collapsing of the building.

In the modification of FIGURE 8, the pneumatic tube means, instead of being a single tube as illustrated in FIGURE 7, comprises four separate tubes. One of these tubes 54 is positioned within the recess 30 adjacent the front side of the floor structure and a similar tube 55 is positioned within the recess 30 adjacent the rear side of the floor structure. Shorter tubes 56 and 57 are positioned within the recesses 47 adjacent the sides of the floor structure. In the arrangement of FIGURE 8, the valve 51 is connected to a manifold 58. An air line 59 leads from the manifold 58 to the tube 54, another air line 60 leads from the manifold to the tube 55, and an air line 61 leads from the manifold to the tube 57. When a source of compressed air or gas is connected to the valve 51, the tubes 54, 55, 56 and 57 are simultaneously inflated because of this manifold connection. Otherwise, the embodiment of FIGURE 8 causes the building to be erected in the same way as was described for the single tube 50.

Various changes and modifications may be made within the purview of this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended thereto.

What is claimed is:

1. An automatically erectable building comprising a rigid floor structure and a rigid roof structure interconnected by at least two opposing walls, each wall comprising an upper panel and a lower panel hinged together, the upper panels being hinged to the roof structure and the lower panels being hinged to the floor structure, recess means between the floor structure and the lower panels, the lower panels and the floor structure having adjacent faces relatively pivotal in a variable arc when the lower panels are pivoted relative to the floor structure, and pneumatic tube means in the recess means and bearing against the said adjacent faces for pivoting the lower panels from generally horizontal positions to vertical positions when the tube means are inflated.

2. The combination of claim 1 wherein the positions of the hinges are such that when the building is erected, the wall panels apply moments about the pivot axes of the hinges in directions tending to maintain the erect condition of the building.

3. An automatically erectable building comprising a floor structure and a roof structure, the floor and roof structures having front edges, rear edges and left and right side edges, front, rear and side walls connected between the floor and roof structures, each of the walls comprising upper and lower panels, hinge means connecting each upper panel to the roof structure, hinge means connecting each lower panel to the floor structure, recess means between the lower panel and the floor structure, hinge means connecting each upper panel to the adjacent lower panel, the hinge means permitting collapsing of the building with the upper and lower wall panels occupying substantially horizontal positions, and pneumatic tube means positioned in the recess means, one of the structures having face means and the panels adjacent the last named structure having face means, the structure and panel face means being positioned on opposite sides of the tube means and being relatively pivotal about the hinge means connecting such structure and panels, the tube means being inflatable to force the panels toward vertical positions.

4. The combination of claim 3 wherein the tube means comprises a single continuous tube.

5. The combination of claim 3 wherein the tube means comprises a plurality of individual tubes interconnected by gas conductors.

6. An automatically erectable preassembled building comprising a rigid floor structure, a rigid roof structure, front, rear, and side walls connected between the floor and roof structures, each wall comprising an upper panel and a lower panel hingedly connected together, each upper panel being hingedly connected to the roof structure and each lower panel being hingedly connected to the floor structure, the floor structure having recess means adjacent to its periphery, the lower edge of each lower panel having a plate fastened to it, the positions of the plates and the hinges being such that when the panels are pivoted to substantially horizontal positions, the plates pivot downwardly into the recess means, and pneumatic tube means positioned within the recess means, the pneumatic tube means having portions positioned between the plates and an opposing wall of the recess means so that inflation of the pneumatic tube means applies pressure against the plates causing the wall panels to pivot to vertical positions.

7. An alternately collapsible and erectable building comprising a roof structure, a floor structure, upper and lower side panels, hinge means connecting the upper edge of the upper side panels to the roof structure, hinge means connecting the lower edge of the lower side panels to the floor structure, hinge means connecting the lower edges of the upper side panels to the upper edges of the lower side panels, recess means between the lower side panels and the floor structure, expandable tube means positioned within the recess means adjacent at least one of the said hinge means between relatively swingable faces on the parts connected by the said one hinge means, the tube means when expanded causing erection of the building.

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JACOB L. NACKENOFF, *Primary Examiner.*