

United States Patent

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[54] CELLULAR BUILDING STRUCTURE
10 Claims, 11 Drawing Figs.

[52] U.S. Cl..... 52/236,
52/270, 52/281

[51] Int. Cl..... E04h 1/38,
E04h 1/04

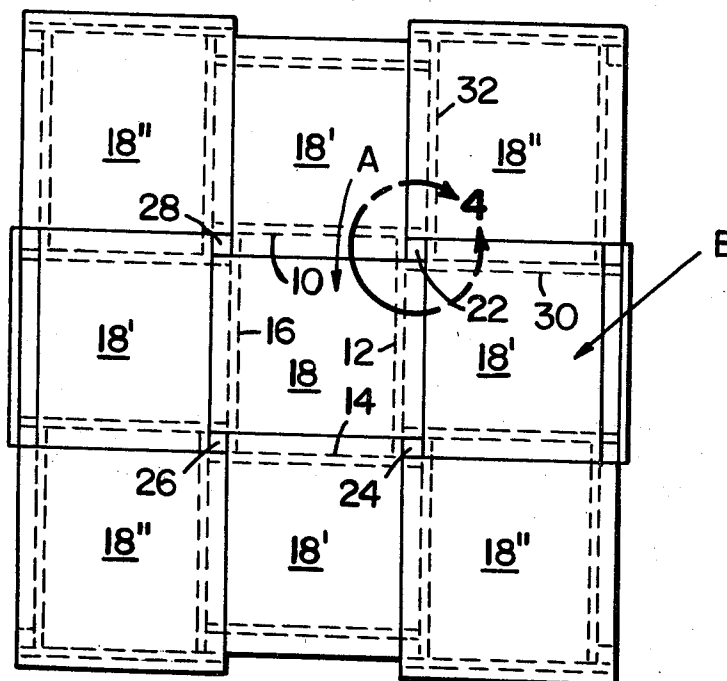
[50] Field of Search..... 52/236,
281, 237, 234, 270, 282, 284; 46/12, 19, 21, 31

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ABSTRACT: A building system containing a plurality of room-sized rectangular cells formed of panels and upright corner posts, each corner post providing vertical support for respective ends of up to four panels. The system possesses flexibility for expansion as well as versatility of design at low cost to the builder.



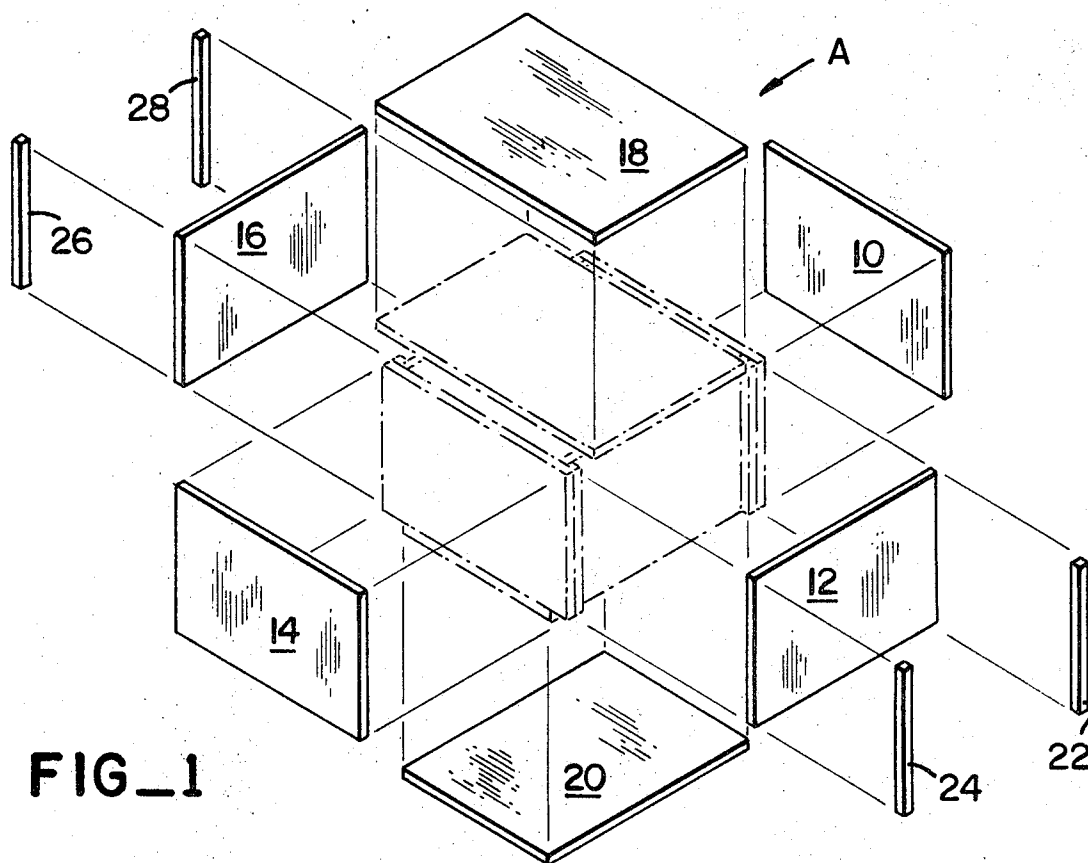


FIG_1

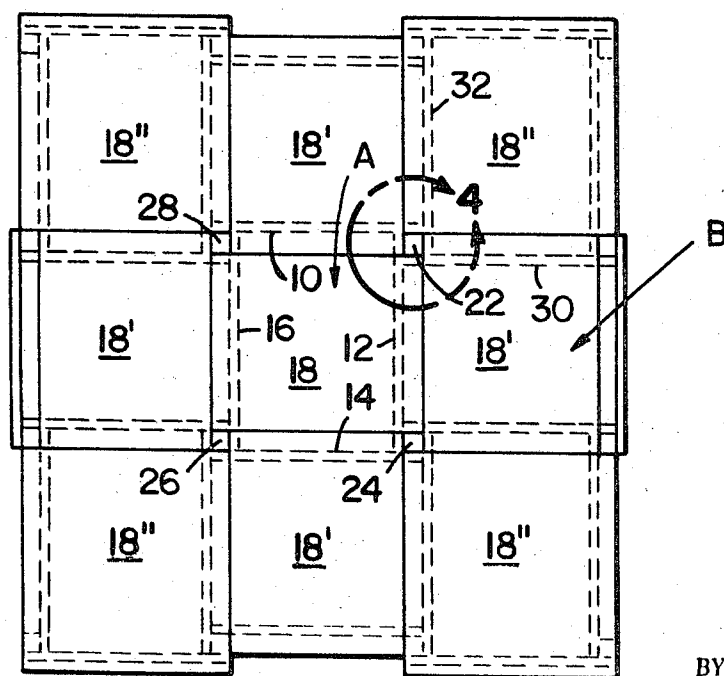


FIG_2

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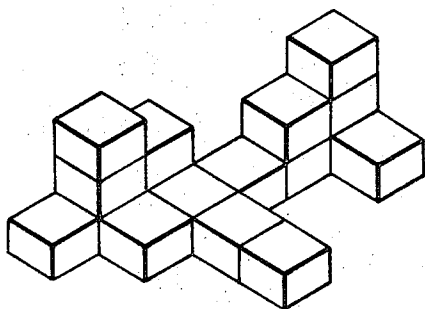


FIG_3

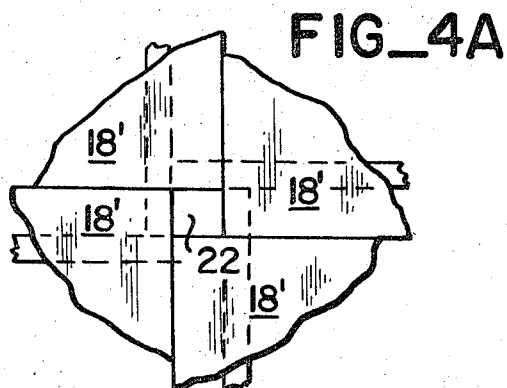


FIG_4A

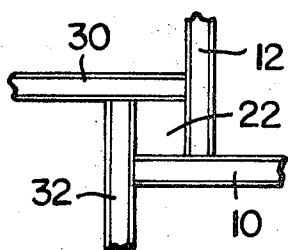


FIG_5A

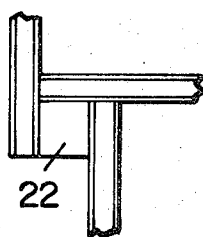


FIG_5B

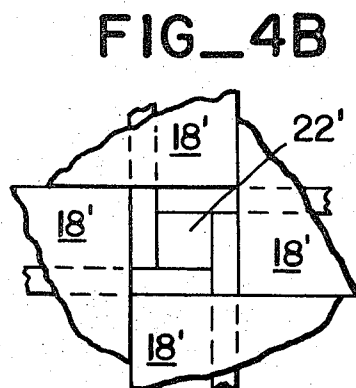


FIG_4B

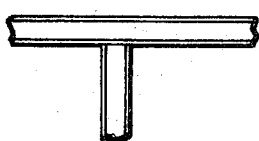


FIG_5C

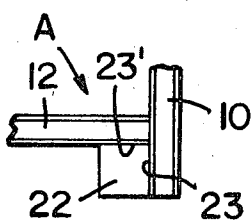


FIG_5D

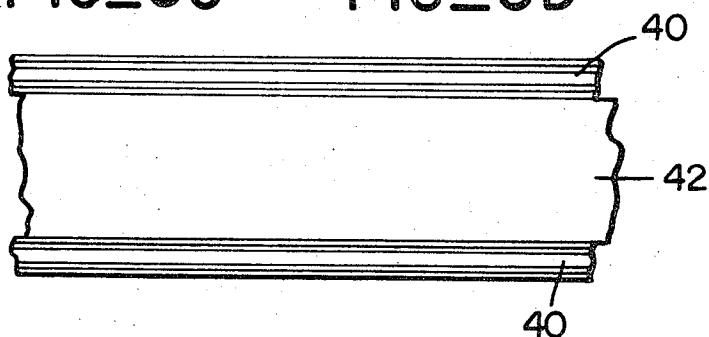


FIG_6

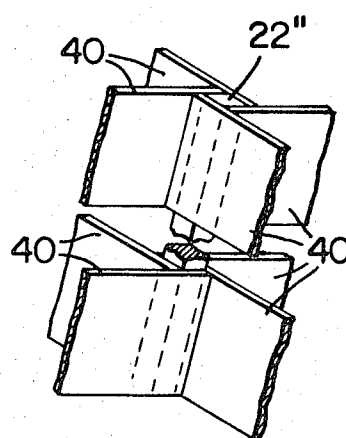


FIG_7

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CELLULAR BUILDING STRUCTURE

This invention relates to a building system formed of a plurality of interrelated rectangular-shaped cellular units (rooms). More particularly, the invention is directed to a building system wherein certain upright cornerposts are utilized to provide support for the vertically disposed wall panels of up to four adjacent rooms.

Various prefabricated housing systems have heretofore been developed in an effort to reduce the cost of individual housing units. However, because of the ever-increasing costs in building construction, most prefabricated housing have become so expensive that it has now reached the point where individual home ownership is beyond the attainment of many middle-class Americans.

Furthermore, presently subsidized prefabricated systems are so rigid in the conceptional characteristics that modification or variation of floor plans and layout are difficult at best.

Therefore, it is a principal object of this invention to provide a low-cost building system, fabricated from standard panel construction, suitable for use in an urban environment or setting as multistory, detached, single or row house arrangements of townhouses, apartments and the like.

It is a further object of this invention to provide a building system than can be easily erected by nonskilled personnel after a minimum period of instruction.

It is another object of this invention to provide a building system which offers design flexibility in both plan and elevation and can accommodate the socioeconomic demands of a wide range of users.

A still further object of this invention is to develop a building system which offers the possibility of expansion to meet new demands, by using a small number of components that are capable of being put in place and secured with a minimum amount of work and time.

It is another object of this invention to provide a building system that does not require intervening supports such as beams, studs, stringers and the like.

It is still another object of this invention to provide a building system that can be easily disassembled for removal and reuse.

In its ultimate refinement, the present invention, as more fully described hereinafter, can be formulated from as few as three standard-sized elements, i.e., wall panels, floor and/or ceiling panels, and cornerposts. Furthermore, it is preferred that the panels be formed of face skins surrounding a dense polyurethane foam core.

The basic concept of this system involves the use of the elongated vertical sides of the rectangular cornerposts as attaching surfaces for respective portions of contiguous wall panels. Thus, a single rectangular cornerpost (with four sides) can provide support for one extremity of wall panels that form the corner of up to four separate and distinct cellular units (rooms). When constructed in this unique manner, the four wall panels involved provide eight functional wall surfaces for the four cellular units that are spatially arranged around, i.e., emanate from any particular internal cornerpost.

Viewed in another manner, the concept of this invention involves the creation of room-sized modules by supporting two pairs of mutually perpendicular wall panels along respective sides of four upright cornerposts. By arranging one pair of panels so that they are located entirely within the rectangular area defined by the four cornerposts, i.e., abutting internal sides of the cornerposts, and securing the other pair of panels to other outer sides of the cornerposts, a unique modular cell is created that can be interlocked with other cells with substantial elimination of cornerposts and wall panels. In other words, an additional cell can be provided by merely combining three wall panels and two cornerposts with the existing cell. A third cell evolves with the addition of three more wall panels and two cornerposts while a fourth cell is produced by the mere addition of two wall panels and one cornerpost. Thus, four separate rooms can be provided through the use of 12 wall panels and nine cornerposts.

In another aspect, the structure of this invention enables ceiling panels to be structurally supported entirely by the upper edges of parallel pairs of wall panels, while all floor panels on one elevation, i.e., the ceiling panels for the immediately lower elevation, in turn provide structural support for respective wall panels. As a result of this unique structural configuration, substantial elimination of overlapping material is accomplished and the resulting structure is readily self-supporting.

These objects will be better understood and other objects as well as features and advantages will become apparent when reference is made to the following detailed disclosure, especially in view of the attached drawing, wherein:

FIG. 1 is an exploded perspective view of the basic modular cell of this invention;

FIG. 2 is a top plan view showing one arrangement of ceiling panels upon upper edges of wall panels;

FIG. 3 is a schematic view showing one of the infinite number of arrangements of a plurality of the basic modular cell of FIG. 1.

FIG. 4A is an enlarged plan view taken along line 4 of FIG. 2 illustrating one arrangement of ceiling panels (slabs);

FIG. 4B is an alternate embodiment of the arrangement of ceiling panels;

FIGS. 5A, 5B, 5C, and 5D are illustrative of various arrangements of walls in and around a single cornerpost;

FIG. 6 is a fragmentary cross-sectional view of a construction panel useful in this invention; and

FIG. 7 is a partially exploded fragmentary perspective view illustrating a continuous cornerpost with the wall panels in successive layers 90° out of phase.

Referring now to the drawings wherein similar characters of reference represent corresponding parts in each of the several views, FIG. 1 illustrates the basic unit of the building system of this invention as an exploded perspective view. Thus, cell A includes substantially identical wall panels 10, 12, 14 and 16, ceiling panel 18 and floor panel 20, and cornerposts 22, 24, 26 and 28. Although it will be appreciated by one skilled in this art that, as shown in FIG. 3, any number of multiples of cell A can be arranged in any particular order in much the same manner as could a plurality of building blocks, for purposes of discussion of FIG. 1, reference will be made to this single cellular unit A.

The walls of cell A consist of two pairs of spaced parallel wall panels 10 and 14, and 12 and 16, that are generally mutually perpendicular to each other so as to provide a generally rectangular enclosure. One pair of wall panels, such as 12 and 16 are positioned between and within the ends of the other pair of parallel wall panels 10 and 14 so that they are supported by respective sides of cornerposts 22, 24, 26 and 28. As a result, the length of wall panels 12 and 16 determines the internal dimension of cell A. Panels 12 and 16 are arranged contiguous with one side of respective of cornerposts 22, 24, 26 and 28, as well as abutting against appropriate portions of the inner surface of panels 10 and 14, respectively. The resulting cellular unit has a width corresponding to the aforementioned length of panels 12 and 14, but reduced by a dimension corresponding to the sum of the thickness of two cornerposts plus the sum of the thickness of two panels, i.e., posts 24 and 26 and panels 12 and 16.

Referring to FIG. 2 wherein unit A of FIG. 1 is depicted as being the center unit of a single nine-unit floor of an apartment, it will be apparent that while one surface of wall panel 12 forms a wall for cell A, the opposite side of wall panel 12 provides a wall for unit B. Similarly, with respect to post 22, wall panel 30 is supported along the side thereof as are wall panels 10, 12 and 32. Ceiling panel 18 is provided so that it has a width corresponding to the length of the aforementioned wall panels minus a dimension equivalent to the thickness of two cornerposts. In this embodiment, ceiling panel 18 fully occupies the horizontal space defined by the vertical extensions of cornerposts 22, 24, 26 and 28. Top panel 18 overlaps, is secured to, and depends for its horizontal support upon the

upper edge of wall panels 12 and 16. Similarly, floor panel 20 is arranged either to support the pair of walls panels 12 and 16 or the pair of wall panels 10 and 14 (as shown). Floor panel 20 is in turn supported by either a lower cellular floor (not shown) or by an appropriate concrete footing should cell A occupy a position on the lower floor of the structure being fabricated.

Ceiling (or floor) panels 18' are of similar dimensional configuration to panel 18 as they occupy the horizontal space defined by the vertical extensions of respective cornerposts. Panels 18'' are of an alternate and larger configuration extending over respective cornerposts to provide a pleasant aesthetic appearance for the resulting structure.

The structure of this invention has the advantage of a rigid, sturdy assembly yet involves the use of a single wall panel to provide a dual wall function by utilizing both surfaces of the panel as functional surfaces for adjacent modular cells. Furthermore, cornerposts such as cornerpost 22 are arranged to provide vertical support for successive panels 10, 12, 30 and 32. In this manner, post 22 is in turn provided with support and rigidity by the interlocking relationship of walls 10, 12, 30 and 32, as shown in FIG. 5A.

Referring now to FIG. 5A, the overlapping, interlocking arrangement of wall panels 10, 12, 30 and 32 and cornerposts is shown. Thus, panel wall 10 is secured along its extremities in some conventional manner, such as by nailing, gluing or the like to cornerpost 22 along an area corresponding in configuration to the configuration of one side of cornerpost 22. Similarly, panel 12 is secured to post 22 along an adjacent vertical side and is contiguous with a portion of wall panel 10 along a surface area defined by its end. As shown in FIG. 5D, panel 10 is attached to side 23 while panel 12 is attached to side 23'. Furthermore, panel 30 is secured to another side of post 22 and abuts a surface portion of panel 12 while panel 32 is secured to the fourth side of post 22 and abuts a surface portion of panel 30. Thus the four panels fan out from post 22 in a windmill-type pattern at 90° angular increments. In a similar manner, the remainder of the wall panels of cell A overlap and abut respective of the cornerposts 24, 26, and 28.

Turning now to FIG. 4A, the interlocking overlapping arrangement of ceiling panels 18 and 18' are illustrated. Thus, various of the ceiling panels not only receive support through attachment to upright cornerpost 22, but in turn are provided with rigidity through the contiguous arrangement with adjacent ceiling panels. It will be seen that the arrangement of these ceiling panels around post 22 is in a spiral configuration, much the same as the arrangement of wall panels hereinabove described. However, by arranging the overlap between ceiling panels and wall panels 90° out of phase, i.e., so that each ceiling panel is supported at least by the internally arranged panels in any particular cellular unit, such as cells A or B, sufficient horizontal support is provided. FIG. 4B illustrates an alternate arrangement of ceiling panels wherein the panels do not abut against the respective post 22' but are supported entirely by the transverse overlap of vertical walls.

As previously characterized, ceiling panels 18 and 18' of respective modular cells A and B, are also utilized as the floor panels of any cellular units disposed in the next higher elevational level above cells A and B, such as provides the random structure shown in FIG. 3, or a more uniformly repetitive unit such as defined by an apartment building or the like. It will be appreciated by those skilled in this art that various arrangements of floor/ceiling panels (slabs) can be utilized. Thus it is not mandatory that a floor panel be coextensive with the ceiling panel of the next lower layer. In fact one cell can have a ceiling panel defined by portions of a number of floor panels from the next higher layer.

Referring to FIG. 6, there is shown a conventional panel consisting of a pair of laminated face sheets 40 of stressed skin plywood and an internal polyurethane core 42. Such sandwich panels with foam plastic cores are now new to the building industry, as they have been used in certain types of construction and as panel infills in structural systems. However, they are

uniquely suitable for employment in the building system of this invention. Other suitable materials include, but are not limited to, gypsum, asbestos and masonite boards.

It will be readily apparent to one skilled in this art that doors and windows can be provided as desired. Furthermore, the utilities can either be disposed within the appropriate panels or between various panels and a confronting false wall. In addition, interior walls or partitions can be disposed anywhere within the cellular unit. Finally, the cornerposts in successive layers need not overlap, i.e., each layer can be developed independently of any other.

FIG. 7 illustrates the use of a unitary cornerpost 22' extending through two layers of cells. Also shown in the "out-of-place" alignment of vertical walls 40 in successively higher layers so that additional interrelated support is provided.

By way of specific example, a building system was constructed that incorporated wall panels in 12 foot × 8 foot sections and having a 2-inch nominal foam core surrounded by one-quarter inch plywood face skins; floor and ceiling panels of 12 foot × 12 foot and having a 4-inch nominal foam core with a three-eighths inch plywood face skin on one side (ceiling) and a five-eighths inch plywood face skin on the other side (floor); and cornerposts of wood having dimensions 6 inches × 6 inches × 8 foot. It will be apparent to one skilled in this art that when various portions of the building system are to be more than one story in height, cornerposts can be utilized that have the requisite length so that they form a continuous upright support for any number of elevational levels.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it will be apparent to those skilled in this art that certain changes and modifications can be practiced within the spirit of the invention as limited only by the scope of the appended claims.

We claim:

1. A building system having a plurality of rectangular cellular units, each having two pairs of parallel wall panels that are vertically supported by four generally upright cornerposts having two pairs of mutually perpendicular sides, said posts being spaced apart so that they define two pairs of mutually perpendicular parallel planes extending through the outer sides of respective of said posts and enclosing a rectangular area having first and second predetermined dimensions, one pair of said parallel wall panels being of a length generally corresponding to a first dimension of said rectangular area and being disposed inside said area, the other of said pair of wall panels having a length generally corresponding to the second dimension of said rectangular area and being disposed outside of said area, said wall panels being secured to respective sides of said cornerposts along contiguous portions thereof so that the internal surfaces of said panels define the walls of adjacent cellular units.

2. A building system in accordance with claim 1 wherein the opposing surfaces of each parallel wall panel define an internal surface of an adjoining cell.

3. A building system in accordance with claim 2 wherein the pair of panels, forming walls adjacent to the panel forming the internal surface of said adjoining cell, are secured to contiguous portions of said cornerposts as defined by sides adjacent said respective sides.

4. A building system in accordance with claim 1 wherein said cellular units are arranged in a plurality of layers.

5. A building system in accordance with claim 4 wherein each of said layers contains a plurality of cellular units.

6. A building system in accordance with claim 1 wherein said wall panels have a pair of outer facing members and a central core.

7. A building system in accordance with claim 6 wherein said facing members are plywood and said core is polyurethane.

8. A building system in accordance with claim 4 wherein the ceiling slab of a cell in one layer is defined by the floor slabs of a plurality of cells in the next higher layer.

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9. A building system in accordance with claim 8 wherein the ceiling slab of a cell on one layer is defined by a single floor slab of the next higher layer.

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10. A building system in accordance with claim 4 wherein at least some of said cornerposts are unitary and extend through at least two layers.

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