

[54] **MULTI STOREY BUILDING**

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[58] Field of Search..... **52/79, 236, 73**

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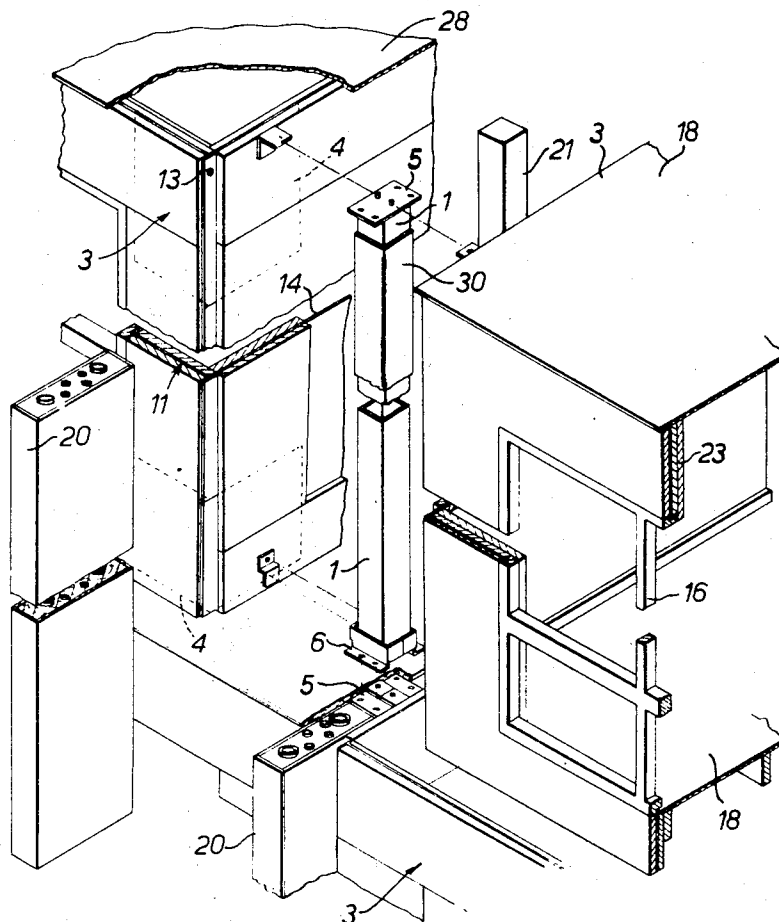
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[57] **ABSTRACT**

This invention is a method of building a housing block in which rigid boxes each in the form of a finished house with rooms and fittings, is lifted by a crane and the boxes are supported on vertical steel staunchions. The lower boxes do not carry the weight of higher boxes, and all the boxes give the vertical staunchion resistance against racking loads.

7 Claims, 4 Drawing Figures



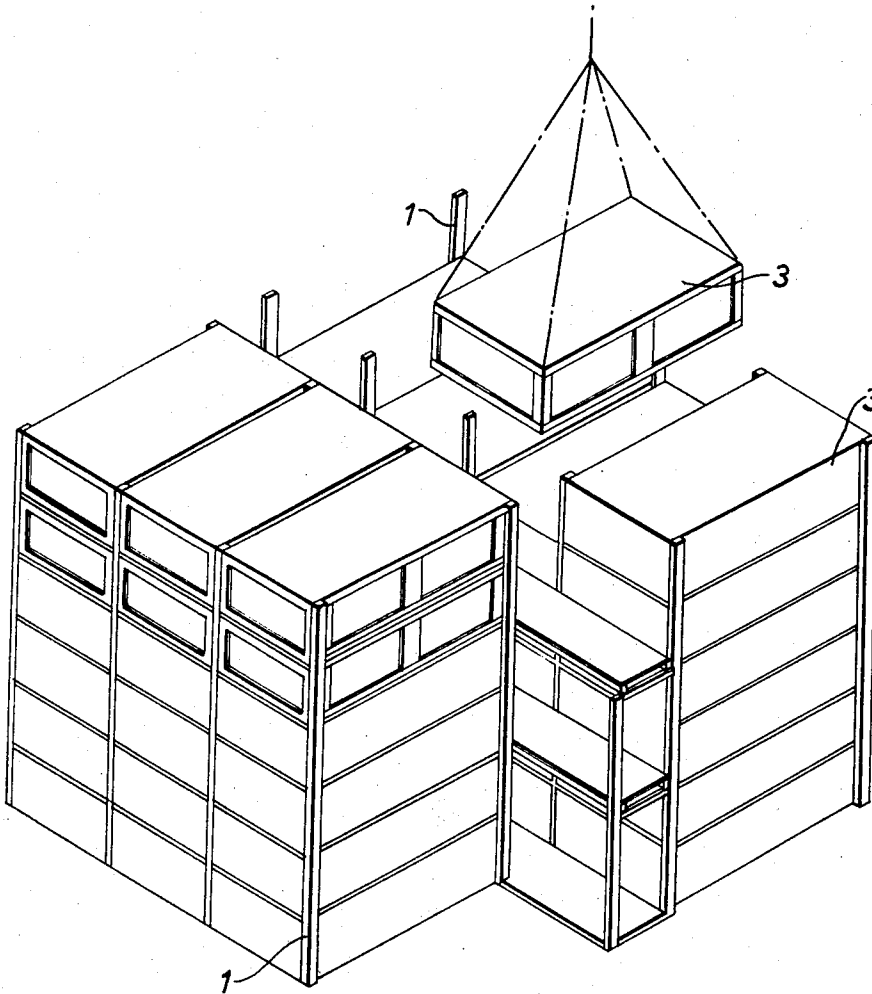
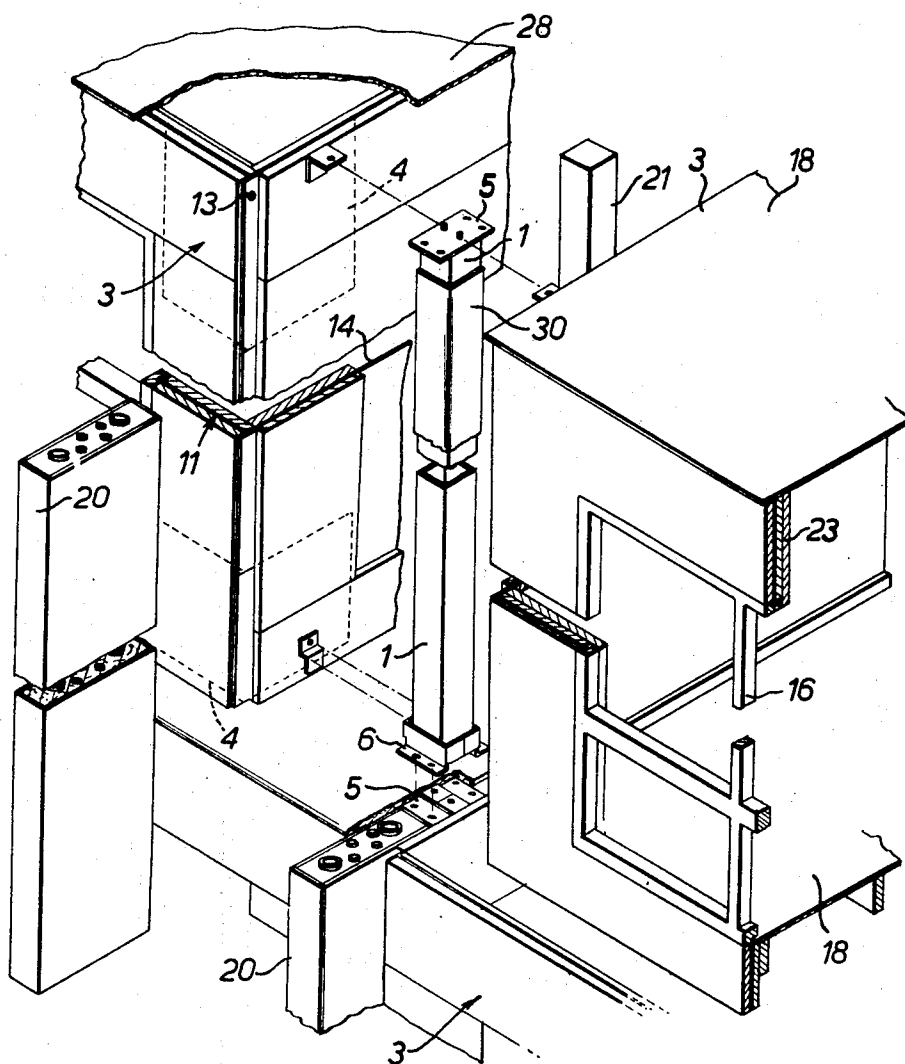


FIG. 1.

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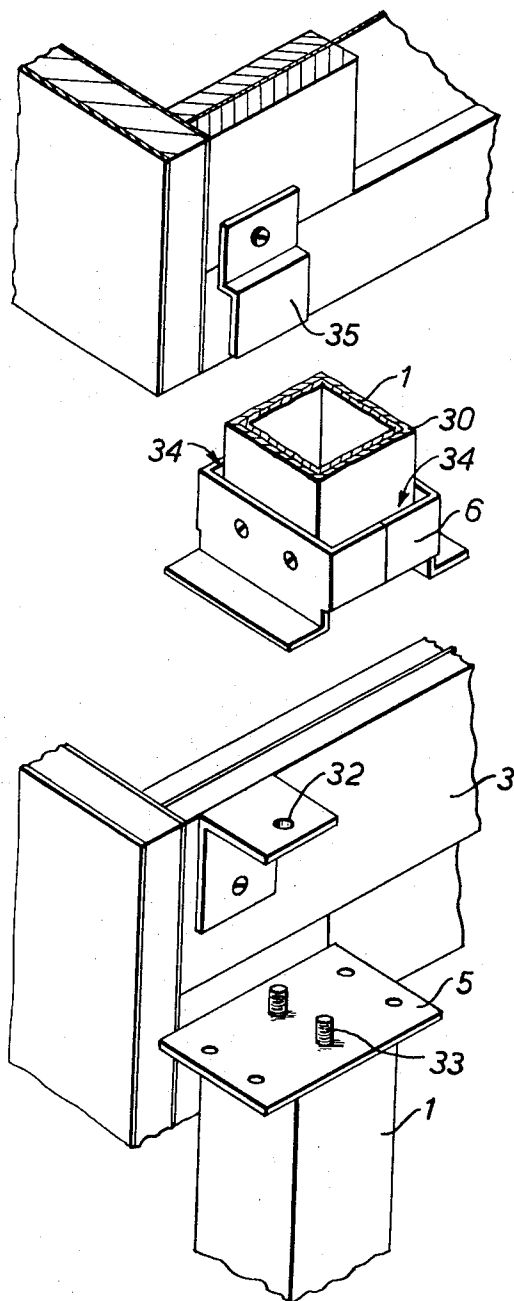


FIG. 3.

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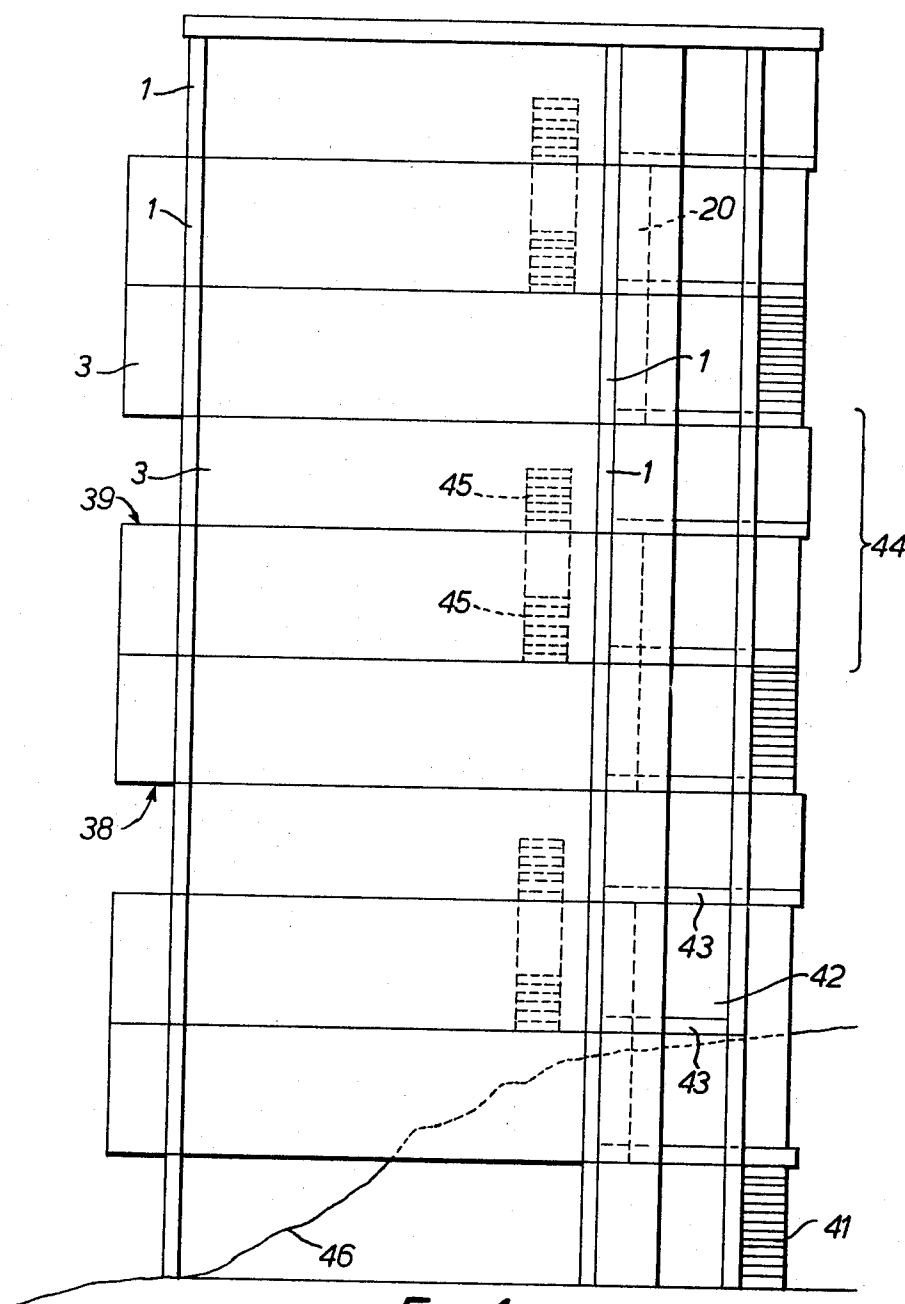


FIG. 4.

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MULTI STOREY BUILDING

This invention relates to a housing block, which expression covers primarily blocks of flats and maisonettes but is not to be construed narrowly so as to exclude other blocks of living and working accommodation even if not used primarily as dwellings.

According to one aspect of the present invention, in a method of building a housing block, housing units each in the form of a rigid box are lifted and supported from a number of structural vertical members which members act to transfer the weight of the units to the foundations.

Thus, each box which may consist of a number of rooms decorated and finished with plumbing and electrical fittings in a factory and delivered to the building site in that form, for support from the structural vertical members, and a higher storey box does not have to be carried on the storeys below it but only supported from the structural vertical members.

The structural vertical members can themselves be built up in sub-lengths so that the full height of the building is not achieved until some of the housing units are already supported from lower sub-lengths, and in this way access to fastenings to the structural members is made easier and in particular a complete steel framework does not first have to be built before the housing units are fitted.

Sub-lengths of vertical members about equal in height to the height of the box may be erected immediately before the box is lifted up to be supported from them, or may be lifted up simultaneously with the box to which they are secured and in either case the sub-lengths will be fastened to lower sub-lengths of the vertical members.

Thus a tower crane on the site can lift the housing units into position one after another and if these are supplied — possibly by a lorry — in the finished form, the work on the site can be accomplished very quickly. Indeed once one block has been built a block beside it can have the housing units lifted into position by a lift acting from the finished block so that the tower crane does not have to be kept on the site.

According to another aspect of the invention a housing block is constructed of housing units in the form of rigid boxes, the weight of each of which is transferred to foundations by being supported by vertical structural members.

In general the boxes will not be structurally connected together, but only through the intermediary of the structural members, except possibly where horizontal steel work is necessary to support common staircases and access galleries.

Preferably the boxes transfer horizontal loads between the vertical members to give the block resistance against racking loads and the structural vertical member may have no other horizontal interconnections. A box may be considered to act as a horizontal box beam supported between the vertical members.

The arrangement has the advantage of good sound insulation from one box to the next and there may be a space between boxes with or without insulating material which spaces may include fire stops to reduce fire hazards.

The invention has particular advantages in the small time that is required on the site since almost all the work can be done in a factory and the work at the site

is very simple. Moreover there is a particular advantage where no horizontal level site is available, because the vertical structural members can be built up to an appropriate level for supporting the boxes. In this way a block can be built directly on the side of a hill.

Various methods of supporting the boxes from the vertical structural members are possible. There may be a simple suspension fastening at the top of the box and a horizontal location at the bottom and in general the use of bonding material at the joints may be desirable to accommodate manufacturing tolerances and to allow some adjustment on site while also acting as good acoustic insulation.

The invention may be carried into practice in various ways and one embodiment will be briefly described by way of example with reference to the accompanying drawings, of which FIG. 1 is a general view of a building in the course of construction,

FIG. 2 is an exploded view showing details of the construction,

FIG. 3 shows a detail of a method of supporting the units, and

FIG. 4 is an elevation of one building embodying the invention.

The building is built up from vertical steel stanchions 1 and cells 3 in the form of rigid boxes, the height of each stanchion corresponding to the height to a storey in the final building, and this being about equal to the height of a cell 3. This enables both the stanchions 1 and the cells 3 for one floor to be positioned before the frame for the floor above is commenced.

Once the stanchions 1 are in position, or before they are lifted into position, completed cells 3 can be suspended from them by means of couplings which may be as described in more detail in FIG. 3. Each cell 3 will be supported at its eight corners and the cell will be strengthened by flitch plate 4 at the corners. Drilled brackets 5 at the top of each stanchion 1 are then ready to receive a bracket 6 at the foot of the next vertical section of stanchion.

Each cell is constructed with side walls having a framework of substantial timbers fitted together in pairs with plywood flitch plates between them as indicated generally at 11. Steel flitch plates 4 can be substituted at points of local stress and those plates may be bolted together as at 13 at the corners.

Thus the sides of the cells act as plate girders helping to give rigidity to the complete construction of frame and cells. The plate girders may include plywood webs such as 14 if there are to be no openings in a wall, or may form an open girder if window or door openings 16 are required. These girders stiffen the boxes so that they can be supported at the four corners only.

The top and bottom walls of the boxes or cells, and possibly also certain of the side walls constitute stressed skins 18, for example of plywood, for the transmission of horizontal forces to the corners. Main services can be led to the individual cells by means of vertical ducts shown at 20, carried in the space between frame members and cell walls and these ducts too can be prefabricated as units each equal in height to one storey.

It will be appreciated that each cell can be completely prefabricated in a factory after the manner of a caravan, and will be light and rigid to be capable of being lifted and placed in position by a crane with a single lift, and the crane could in fact use a component of the skeletal frame as a gantry.

In fact, individual stanchions 1 can be pre-assembled with the neighbouring cells to be lifted into position with them without one obstructing the other, and the arrangement shown enables the connections between frame members to be easily made at this time.

For reducing the danger of fire being transmitted from cell to cell or from cell to frame, the cell walls may incorporate mineral wood, and fire stops 21 may be inserted in the spaces and external cover plates may be fitted around the stanchions to prevent the passage of flames in the cavities between cells. This protection could be supplemented by wrapping the stanchions with a jacket 30 of mineral wool.

In any case, the cells are preferably provided with non-combustible layers or linings 23.

Further protection can be provided by fire curtains, possibly on steel mesh inserted in the vertical cavities between adjacent cells. A fire curtain can have a steel mesh frame with spikes at either side on which mineral wool blankets can be impaled.

Spread of fire vertically is restricted by mineral wool mattresses 28 laid between cavities between ceiling of lower box and floor of higher box, and each mattress may be carried across the gap between side-by-side cells to prevent these cavities acting as flues.

Sound insulation between cells is good because of the arrangement already described for mounting cells on the frame and because air-borne sound transmission is reduced by the compliant nature of the cells in conjunction with the wide air spaces and the insulation material contained therein.

FIG. 3 shows how a lower stanchion 1 with its upper bracket 5 can carry a cell 3 by virtue of an angle 31 secured to a top corner of the cell and having a hole 32 with clearance around a bolt 33 on the bracket 5. A sealing resin can fill the gap after mounting to give good sound insulation from stanchion to cell. This arrangement supports the weight of the cell and also provides location in horizontal directions.

The next stanchion has a bracket 6 at its foot for bolting to the bracket 5. This bracket 6 is in the form of a box having slots 34 for depending tongues 35 at the lower corner of the next cell, whereby that connection gives horizontal location, but does not take vertical loads.

Again, space left for manufacturing tolerances can be filled with a plastics material.

FIG. 4 shows how some cells can have up to one quarter of their length as an overhanging cantilever 38 to give more scope for variety in design. The top of such cantilever could be a transparent or translucent plate 39.

At the right-hand side in FIG. 4 is shown an arrangement of staircases 41 and access galleries 42 added on horizontal steel members 43 extending between stanchions 1.

Where two cells together form a maisonette 44, each may be provided with a part staircase 45, of which one can be fixed in its cell, while the other is swung into connection with it after the two cells have been positioned.

For building on quite steeply sloping ground 46 the lower cells could be omitted and stanchions bedded into foundations and built up until a cell can be suspended horizontally, so that the great expense of levelling may be avoided.

What we claim as our invention and desire to secure by Letters Patent is:

1. A multi-story building structure comprising horizontally spaced vertical structural members extending upwardly from the ground level, each said member comprising a plurality of interconnected sub-length vertical sections, and a number of vertically stacked housing units each in the form of a rigid box, said units forming at least the stories above the ground floor of the structure, the length of each said section being substantially equal to the height of each said box, each said section at each level of the structure being connected at its opposite ends to each said box at each said level near two vertically spaced corners thereof, each said box thereby being connected to said sections at each said level near each of its eight corners, whereby the weight of each said box is solely supported by said vertical members so that said boxes constitute the sole means transferring horizontal loads between said vertical members, a plate bracket at the respective upper and lower ends of each said section, means interconnecting respective ones of said upper and lower brackets of vertically adjacent sections for each said member, and an outwardly extending horizontal plate member on each said box near the upper corners thereof respectively connected to said upper brackets of respective ones of said vertically adjacent sections.

2. The building structure according to claim 1 wherein a flitch plate is provided at each of said eight corners of each said box for strengthening each said box thereat.

3. The structure according to claim 1 in which there is space between adjacent boxes.

4. The structure according to claim 4 including fire stops to impede against the flow of flame or smoke provided in the spaces between said boxes.

5. The structure according to claim 1 in which one of said boxes has a portion extending as a cantilever horizontally beyond the vertical members supporting it.

6. The structure according to claim 1 including a duct located between said boxes for any of electrical, drainage, gas, and exhaust services having connections to a number of said boxes.

7. A block as claimed in claim 2 in which each rigid box has both vertical and horizontal walls.

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