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Van der Lely et al.

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[54] **HINGED WALL MOLD FOR ROOM CONSTRUCTION**

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Related U.S. Application Data

[63] Continuation of Ser. No. 882,650, Dec. 5, 1969.

[30] **Foreign Application Priority Data**

Dec. 11, 1968 Netherlands 6817800

[52] **U.S. Cl.** **249/185**; 249/26

[51] **Int. Cl.** **B28b 7/30**

[58] **Field of Search** ..... 249/27, 152, 178, 185, 249/194, 131, 170–172, 183, 153, 181, 219 R

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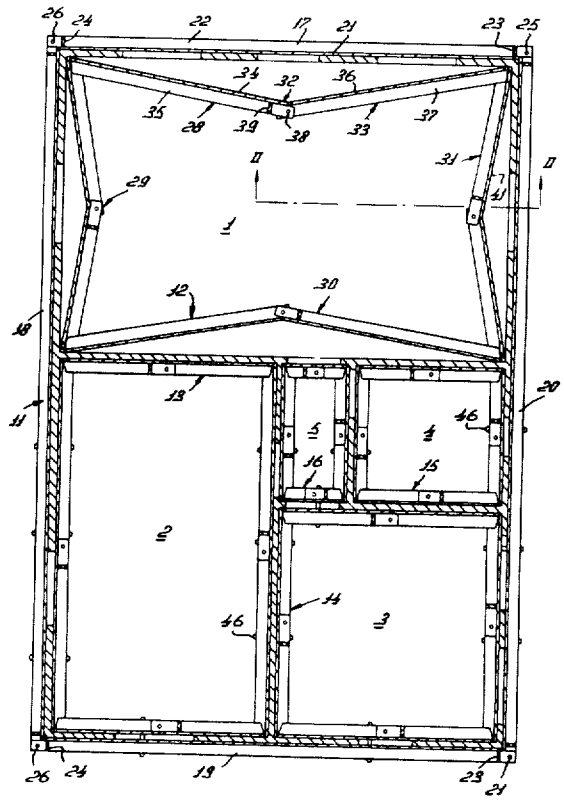
[57] **ABSTRACT**

A method of manufacturing a building made at least partly on the building site in a mold using cast material which involves, first casting a floor on the ground. Thereafter, one or more jigs are arranged on the floor to form a mold in which at least two walls can be cast and these together form the walls of the building. The jigs can be quickly set up on the building site and easily removed after completion. Preferably, at least three walls are cast.

8 Claims, 6 Drawing Figures



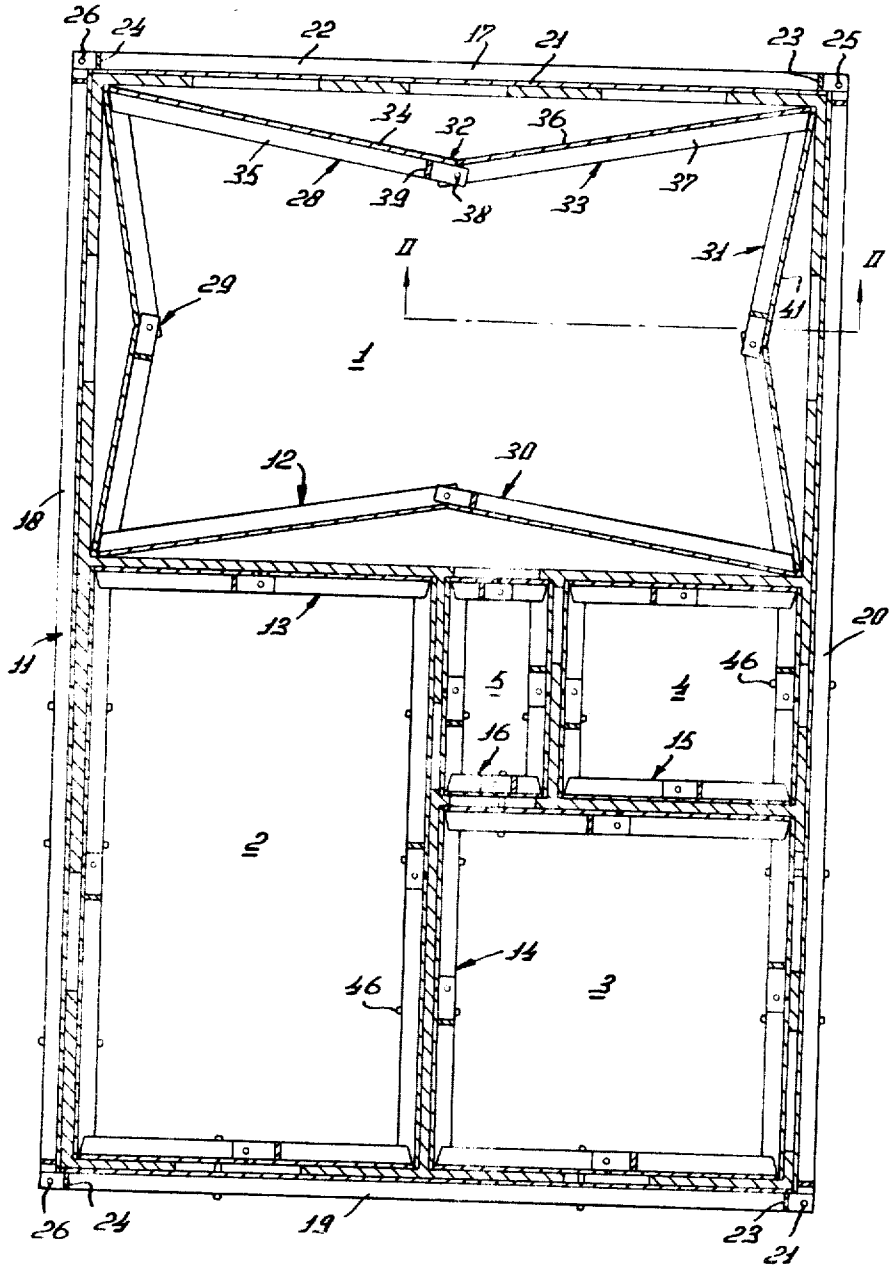


FIG. 1

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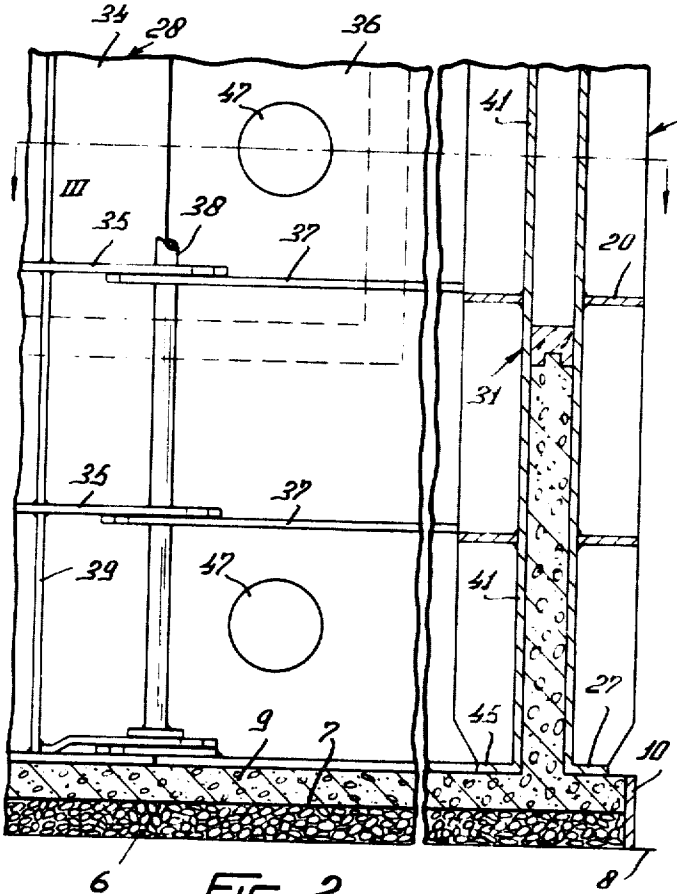


FIG. 2

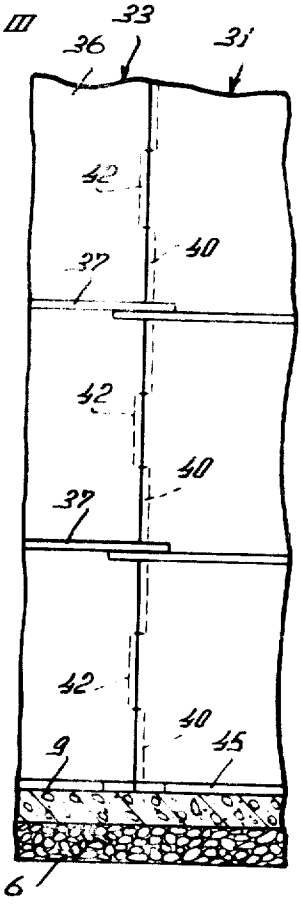
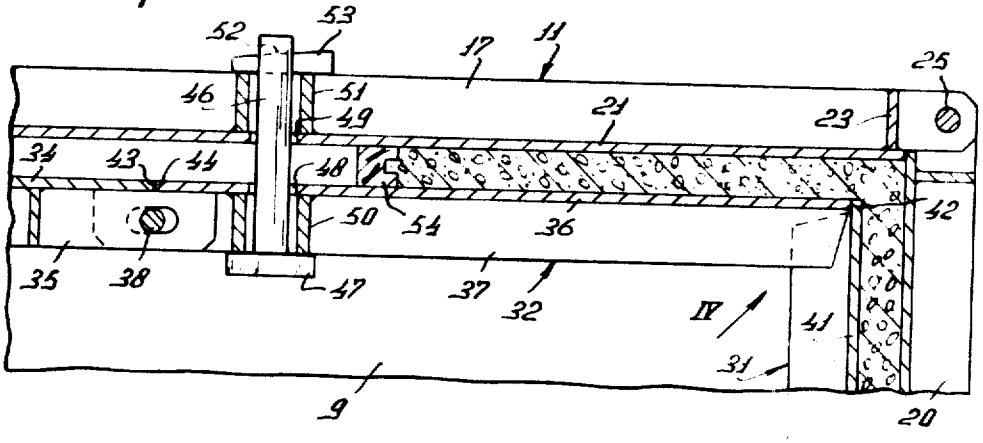


FIG. 4

FIG. 3



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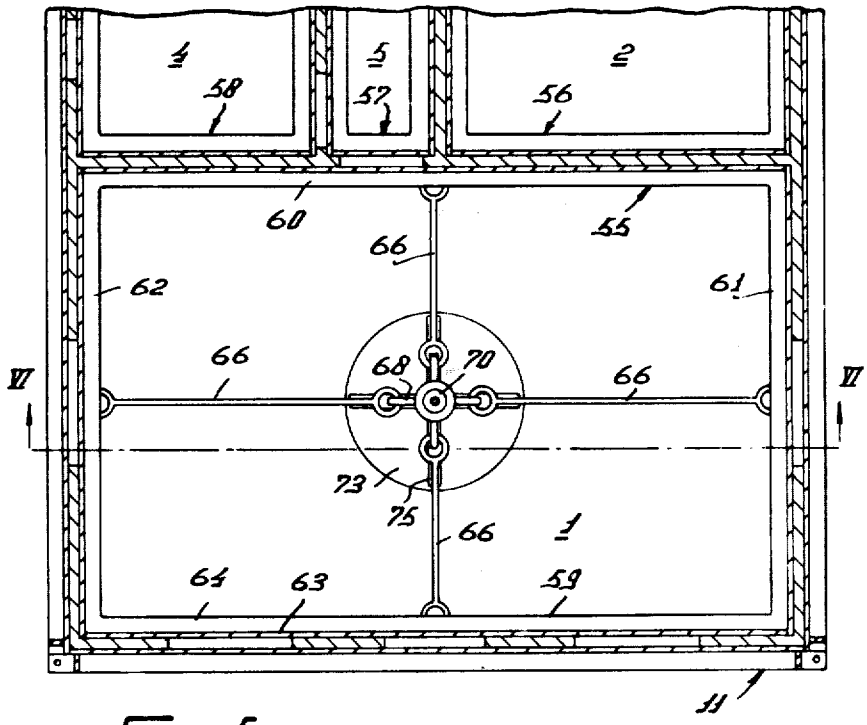

FIG. 5

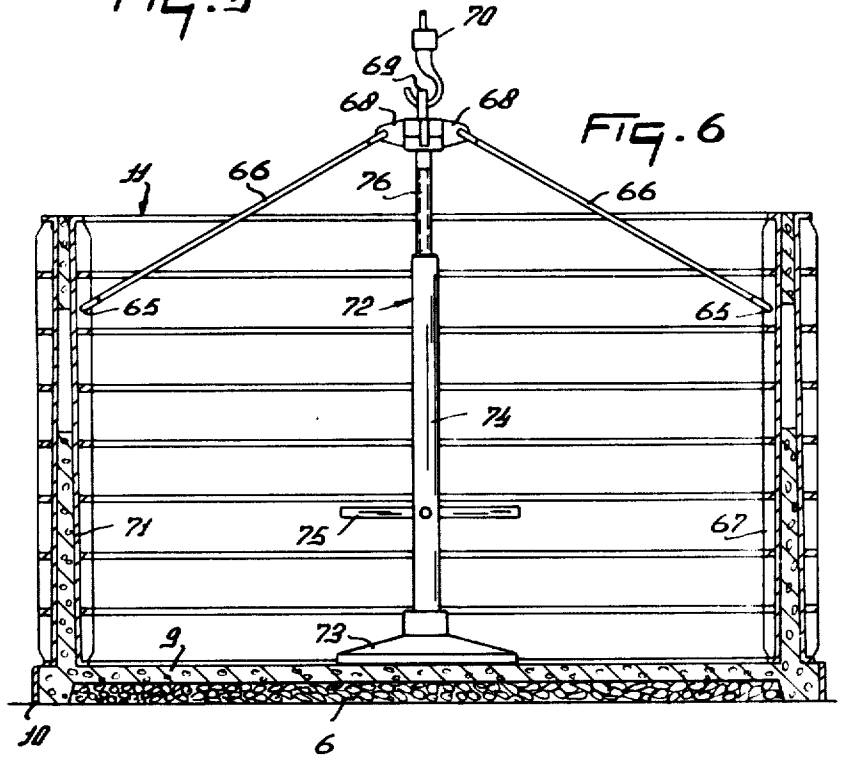

FIG. 6

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HINGED WALL MOLD FOR ROOM CONSTRUCTION

RELATED APPLICATIONS

This is a continuation of application Ser. No. 882,650, filed Dec. 5, 1969 now abandoned.

SUMMARY OF THE INVENTION

In one aspect of the method disclosed herein a layer of stones is applied to the ground, over which a foil is deposited and on which the floor of material is cast.

The invention also is directed to jigs for carrying out the method in which the outer jig consists of a flat jig plate having supporting ridges on the outer side, at least some of which project from the vertical sides of a wall plate where holes for receiving pins are provided.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention reference is made to the drawings.

FIG. 1 is a plan view of a horizontal sectional view of a building erected by the herein disclosed method showing the jigs.

FIG. 2 is a vertical sectional view of part of the building shown in FIG. 1 taken on the line II—II in FIG. 1.

FIG. 3 is a horizontal sectional view of part of the jigs for use in the method according to the invention. FIG. 4 is an elevation of the junction of the wall jigs of an inner jig, viewed in the direction of the arrow IV in FIG. 3.

FIG. 5 is a horizontal sectional view of part of a building with a second embodiment of jig structure used in the invention.

FIG. 6 is a vertical sectional view of the construction shown in FIG. 5, taken on the line VI—VI in FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, a building, including rooms 1, 2, 3, 4 and 5 is shown with the smaller rooms 4 and 5 designed to be used for toilet and shower. For constructing this building the ground is first levelled, if necessary, after which a bed 6 of stones or coarse cubes is laid out to form a bed. If desired, the bed is coated with cement or a different cementing material to obtain a firm bedding. A foil 7 is applied to the stone bedding so that it projects the bed over a margin 8. On this foil, a floor 9, preferably of concrete, is cast. Metal reinforcing (not shown) of a type conventional in the art can be used to increase the strength of the cast floor. In casting the floor 9, a jig 10 can be provided and which can be left around the floor 9 with anchors (not shown) in the rims of the jig 10 which are embedded in the floor 9 during casting.

For casting the walls bounding the room spaces 1 through 5 inclusive, an outer jig 11 and inner jigs 12, 13, 14, 15 and 16 are used. For each room formed, an outer jig is used to surround the room space and the outer jig 11 includes four wall jigs 17, 18, 19 and 20. These four wall jigs define a rectangular space. Each wall jig, as for example the jig 17, comprises a flat wall plate 21 to which horizontal stiffening ridges 22 are secured. Near the circumference, the wall plate 21 has vertical ridges 23 and 24. The ends of the horizontal ridges 22 projecting beyond the ridges 23 and 24 are provided with flat wall plates stiffened by horizontal ridges with vertical ridges on their ends. According to their lengths, the vertical sides may have at least one vertical ridge between them.

To erect the jig 11, pins are passed through the holes 25 and 26 in ridges 22 of wall jigs 17 and 19 and the registering holes in the ridges of the wall jigs 18 and 20. It is possible to arrange a pin over the whole height of the wall plates which can be passed through all holes. As an alternative, short conical pins may be provided, which are located only in one hole of a ridge of one jig and in a further hole of the ridge of the other jig. As shown in FIG. 2, the vertical wall jigs are provided with a foot plate 27, by which the jigs can satisfactorily bear on the floor 9 and furthermore a satisfactory closure is obtained on the lower side of the jigs.

The inner jig 12 includes four wall jigs 28, 29, 30 and 31. Each of these wall jigs comprises two relatively hinged parts, i.e., the wall jig 28 comprises the parts 32 and 33. The parts 32 and 33 comprise wall plate 34 and these plates are stiffened by ridges such as horizontal ridges 35. The part 33 has a wall plate 36 with ridges 37. The parts 32 and 33 are hinged to each other by a shaft 38. Near the pivotal shaft 38 the wall plate 34 is reinforced by a vertical ridge 39. In order to obtain a satisfactory junction between the wall plates 34 and 36, the pivotal shaft 38 is located as near as possible to the plates 34 and 36. A satisfactory connection of the jigs, such as jigs 36 and 31, with each other can be obtained by providing the joining sides with fitting serrations.

As shown in FIG. 4, the wall plate 36 has serrations 40, and the wall plate 41 of the wall jig 31 has projecting serrations 42. The serrations 40 and 42 are arranged so that they fit one in the other. Thus a connection at the corner of the jigs is obtained as shown in FIG. 3. The holes in the horizontal ridges 35 and 37 for the pivotal shaft 38 are larger than the diameter of the shaft 38 so that the parts 32 and 33 are allowed to hinge around the joining edges 43 and 44 of the wall plates 34 and 36. These edges 43 and 44 engage each other on the side shown of the inner jig. The inner jigs 13, 14, 15, 16 have a construction identical to that of inner jig 12 except that the circumferences of these inner jigs match the sizes of the room spaces to be formed.

As is shown in FIG. 2, for the inner jig 13, the jigs bear on lower rims 45 so that also the inner jigs are adequately supported from the floor 9, with which they form a satisfactory seal on the lower side. The inner and outer jigs are intercoupled by pins in FIG. 3. Each pin 46, has a head 47 which is passed from the outer side of the jigs through a hole 48 in the inner jig and a hole 49 in the outer jig. Between the wall plate of the inner jig and the head 47, a ring 50 is provided, and a sleeve 51 surrounds the pin 46 on the outer side of the outer jig. The pin 46 has a hole 52, through which a key 53 is passed. The pins 46 are preferably provided at a place where a window has to be formed in the walls. When the pin 46 is arranged on the upper side near the window frame, the frame 54 can bear on two pins 46. Thus a simple suspension of the window 54 is obtained while the frame serves at the same time as a spacer between the pins and the outer jig for obtaining the correct wall thickness.

For constructing the building, the walls to be made are cast, preferably from concrete, after the outer jig 11 and the inner jigs 12 to 16 have been erected. The inner jigs are easily disposed by lightly bending the movable wall portions of the inner jigs as shown in FIG. 1 for the inner jig 12. When the jigs are arranged in this

way, the portions of the jig walls can be pressed tight so that they become flat. The wall plates such as **34** and **36** are in line with each other and at the same time the wall jigs at the corners of the rooms to be formed will satisfactorily join each other by the fitting serrations such as the serrations **40** and **42** in FIG. **4.** Window frames, door frames and through-connection sleeves, for example, for ducts, can be arranged prior to casting in the mold surrounded by the jigs between the inner and outer jigs.

The walls are preferably cast when the formed floor **9** has not yet completely cured so that a satisfactory seal between the walls and the floor can be obtained. If desired, reinforcing is used in the walls, which reinforcing is arranged prior to casting between the outer jig and the inner jigs. Such reinforcing is coupled with the reinforcing of the floor **9.** When the walls cast from, for example, concrete, have sufficiently cured, the inner jigs can be removed and this is carried out by loosening the portions **32** and **33** of the wall jig **28** from the cast wall, these two wall portions being hinged relatively to each other, and by moving them into a position as shown in FIG. **1.** When this is carried out for the other jig walls, for example jig **12,** the jig walls can be removed separately from the space **1** by means of a crane which removes the jig walls via the upper side of the space formed from the interior of the cast walls. The portions **32** and **33** of the jig wall **12** have to be hinged relative to each other to an extent so that the interengaging serrations of the joining sides of the wall jigs are detached from each other. The inner jigs **13** to **16** can be removed in the same manner. When the inner jigs are removed, after the pin **46** or a plurality of similar pins or other connections between the inner and outer jigs have been removed, the outer jig **11** can then be removed. This is carried out by taking out the pins **25** and **26,** after which the various jig walls of the outer jig **11** are detached from each other and then lifted away by a crane. As an alternative, first the outer jig is removed and afterward the inner jigs are removed. For removing and loosening the various jigs from the cast walls, the jigs are tapped.

Prior to casting the walls, blocks can be arranged on the upper sides of the jigs between the inner and outer jigs at various places, as desired, so that the upper sides of the walls show recesses which may serve for arranging roof beams.

After the walls are cast and the jigs removed, roof beams are positioned to support a roof and a ceiling can be fastened to the beams. Such a roof can be simply constructed from commercial building sheets, and a suitable framework can be provided on the beams to receive the sheets. Other alternatives will suggest themselves.

In the manner described above, a simple building can be rapidly erected on the building site. This method is particularly suitable for constructing a plurality of buildings of generally the same shape so that the jigs need only be displaced from one erected building to the place intended for an adjacent building. If desired, adjacent buildings are shaped in a different form, for example, by using different inner jigs. Although the floor **9** is horizontal, it will be obvious that the floor **9** can be placed in an inclined position to the horizontal. The jigs are then adapted thereto so that the walls to be formed are perpendicular as described before. As an alternative, the jigs as positioned in inclined positions for obtaining non-perpendicular walls. For intercoupling the inner and outer jigs, pins, such as pin **46,** with keys are used. The employment of keys enables the use of simple pins which are not clogged during work. When bolts with screwthreads are used, the screwthread may be soiled by the concrete to an extent such that the bolts will practically be unserviceable afterwards.

FIGS. **5** and **6** show part of a building with jigs for a different form of the construction method in accordance with the invention. FIG. **5** is a plan view of part of the building to be constructed, which is divided in the same manner as is shown in FIG. **1.** The corresponding parts of FIGS. **5** and **6** are therefore designated by the same reference numerals as in FIGS. **1** to **4.**

FIG. **5** shows the room space **1** and part of the rooms **2, 4** and **5.** As in the first embodiment, first a floor is provided and the outer jig for the embodiment of FIGS. **5** and **6** can be the same as that employed in the preceding embodiments. After the floor **9** has been cast, the outer jig **11** is positioned in the same manner on floor **9** as in the first embodiment. In the second embodiment, the inner jigs differ in that an inner jig **55** is provided to form the room **1** and the rooms **2, 4** and **5** are also formed by inner jigs **56, 57** and **58.** The inner jig **55** is formed by a rectangular mold of four sides **59,** 60, 61 and **62** and these four sides are rigidly connected with each other and form a single unit. Each of the walls of the jig **55** comprises a flat portion **63,** stiffened by horizontal ridges **64.** Where desired, a vertical ridge may be provided for strengthening the jig. Each of the walls **59** to **61** is provided with a coupling member **65** adapted to receive a connecting means **66.**

The coupling members **65** are formed by eyelets arranged in vertical ridges **67** of the wall jigs. The connecting means **66** are formed by bars coupled with each other by a coupling member **68** having a hoisting eyelet **69.** The jig may be arranged in place, for example, by a crane which can grip by a hook **70** in the eyelet **69,** so that it is able to displace the jig **55.** Also in this case the jig **55** can be coupled with the outer jig **11.** If desired, spacers are arranged between the inner and outer jigs so that the inner and outer jigs are kept at the correct distance from each other. Where a number of frames for windows and doors are provided, these frames may serve as spacers. In the method illustrated in FIGS. **5** and **6,** the jig **55** is preferably shaped so that on the inner side, a wall surface **71** is formed, which is inclined in upward direction with respect to an opposite wall to the outer side so that a loosening effect is obtained after the walls have been cast and when the jig is removed.

A further releasing effect in removing the jig is obtained by the forces exerted by the hoisting eyelet **70** on the jig walls which are slightly moved towards each other in a resilient manner. When the jig is lifted, the jig walls are thus readily released from the cast walls by forces oriented approximately at right angles away from the cast walls. If desired, a jack screw **72** can be arranged beneath the coupling member **68.** This jack screw has a foot **73** and a tapped pipe **74,** on which a control-bar **75** is arranged. The pipe **74** is rotatably journalled in the foot **73** and accommodates a threaded bar **76,** the upper end of which is fitted in an opening in the coupling member **78.** By turning the pipe **74** so that the bar **76** is screwed out of it, an upward force can be effectively exerted on the coupling member **78** for

initiating the detachment of the jig **55**. When the operation of the jack screw **72** has enabled the detachment of inner jig **55**, the jig is removed further by means of the hoisting eyelet **70** by a mobile crane carried, for instance. The jigs **56**, **57** and **58** can be of the same construction as jig **55**. In this method the construction of the jigs is even more simplified than in the preceding embodiment. However, when out of use, they will occupy more space. The simpler structure of the jigs in this second embodiment has the advantage that after long use, the jigs maintain their dimensional ratios. These jigs do not easily wear out primarily because they do not have relatively pivotable or interengaging parts.

Although in the embodiments shown, the inner and outer jigs are invariably formed by four wall portions, the jigs can alternatively be constructed from not more than two, three or even from more than four wall portions in accordance with the desired shape of the buildings to be erected and the rooms to be provided therein.

In order to be able to put down the inner and outer jigs before the floor **9** has completely cured, solid blocks are embedded in the floor to be cast. These blocks are arranged at the places where the jigs have to bear on the floor **9**. The jigs are then placed on the blocks without damaging the floor before it is completely cured. This permits the casting of walls soon after the floor has been cast. Moreover, the adhesion of the walls to the floor is improved when the walls are cast on a floor not yet hardened.

What is claimed is:

1. An inner jig of a mold for casting walls for a room in a building at the building site in cooperation with an outer mold defining means, said inner jig comprising:

at least three vertically standing jig parts for defining the interior of said room, each of said jig parts having at least two portions, said portions of each said part being hinged together by vertically disposed hinge means, the outer vertical edges of each said jig being substantially spaced from said hinge means and forming a relatively sharp angular corner with the adjacent edge of the adjoining jig part including an overlapping area, said vertical edges being in a slideable continuous abutment with each other in their overlapping areas when receiving concrete-like material for casting walls between the inner jig and the outer mold defining means and unconnected by means which limit relative rotation of said adjacent edges about a common axis of rotation, whereby during the initial withdrawal of said jig portions away from the walls as formed therein, said jig portions are rotated about an arc relative to said hinge means and said outer vertical edges are moved away from the walls adjacent thereto without any significent arcuate movement towards said adjacent walls.

2. Structure in accordance with claim **1** with each jig portion having horizontal ridges which overlap with the connecting jig portion in the same jig part, wherein said hinge means comprises a vertical shaft which extends through aligned elongated openings provided in said ridges where they overlap.

3. Structure in accordance with claim **2** wherein said ridges of one said jig part overlap with ridges of an adjoining jig part.

4. Structure in accordance with claim **1** wherein a frame part is disposed between the inner jig and said outer mold defining means, an opening is provided in the inner jig which is aligned with a similar opening in the mold defining means, bolt means extending through said opening and including drawing means for drawing the inner mold and the outer mold defining means against said frame part.

5. An inner jig of a mold for casting walls for a room in a building at the building site in cooperation with an outer mold defining means, said inner jig comprising:

at least three vertically standing jig parts, at least one of said jig parts comprising two adjoining portions which include plate means for defining the interior surface of said wall;

hinge means hingedly connecting said two jig portions together whereby they are relatively rotatable about a vertical axis;

said hinge means comprising ridge members mounted on each said jig portion, overlapping areas of said ridge members proximate the jucture of said jig portions, aligned openings in said overlapping areas, and shaft means received in said openings;

said openings of at least the ridge members of one of said jig portions so formed and cooperating with said shaft means whereby said shaft means may move laterally within predetermined limits, and when said portions are displaced from the wall formed by the casting operation by the turning of said portions relative to said hinge means, said shaft means initially moves relative to said openings of said one jig portion and said jig portions initially turn in an arc;

the edges of each said plate means opposite said hinge means defining at least in part an angular corner of said room and constituting a substantially stationary vertical axis for said initial arc of movement when said portions are displaced from the wall formed by the casting operation.

6. Structure in accordance with claim **5** wherein said openings are elongated in a direction parallel to the adjacent wall to be formed by the casting operation.

7. Structure in accordance with claim **6**, wherein said shaft means comprises a vertically disposed shaft.

8. Structure in accordance with claim **7** wherein a frame part to be permanently included in the wall to be cast is disposed between said inner jig part and said outer mold defining means, means connecting said inner jig part and said outer mold defining means urging said inner jig part and said outer defining means against said frame part.

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