United States Patent [19]

Hemingway

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[54] **METHOD AND APPARATUS FOR PRESSING CONCRETE PANELS**

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[21] Appl. No.: **331,613**

Related U.S. Application Data

[63] Continuation of Ser. No. 104,090, Jan. 5, 1971, abandoned, and a continuation-in-part of Ser. No. 704,715, Feb. 12, 1968, abandoned.

[30] **Foreign Application Priority Data**

Feb. 15, 1967 United Kingdom 7198/67

[52] **U.S. Cl.** **264/333;** 264/86; 264/336; 425/84; 425/410; 425/416; 425/423

[51] **Int. Cl.** **B28b 3/04;** B28b 7/10

[58] **Field of Search** 264/319, 333, 336, 86, 264/87; 425/409, 410, 412, 416, 420, 423, 352, 354, 355, 84, 85

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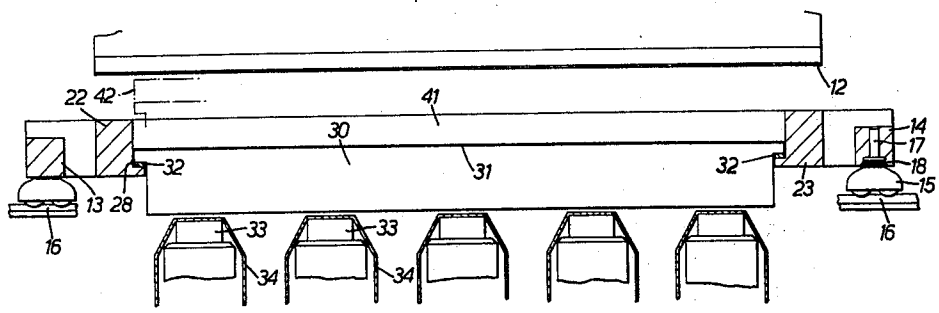
[57] **ABSTRACT**

Pressing of concrete panels is effected by the use of a mold which has a base which can move vertically relative to the top of the mold walls. The concrete mix is inserted in the mold which is then raised to a top platen which has a flat underface and which has horizontal dimensions greater than those of the mold. When the top of the mold walls engage the top platen, upward movement of the mold base only is continued to press the concrete between the top platen and the mold base.

12 Claims, 4 Drawing Figures



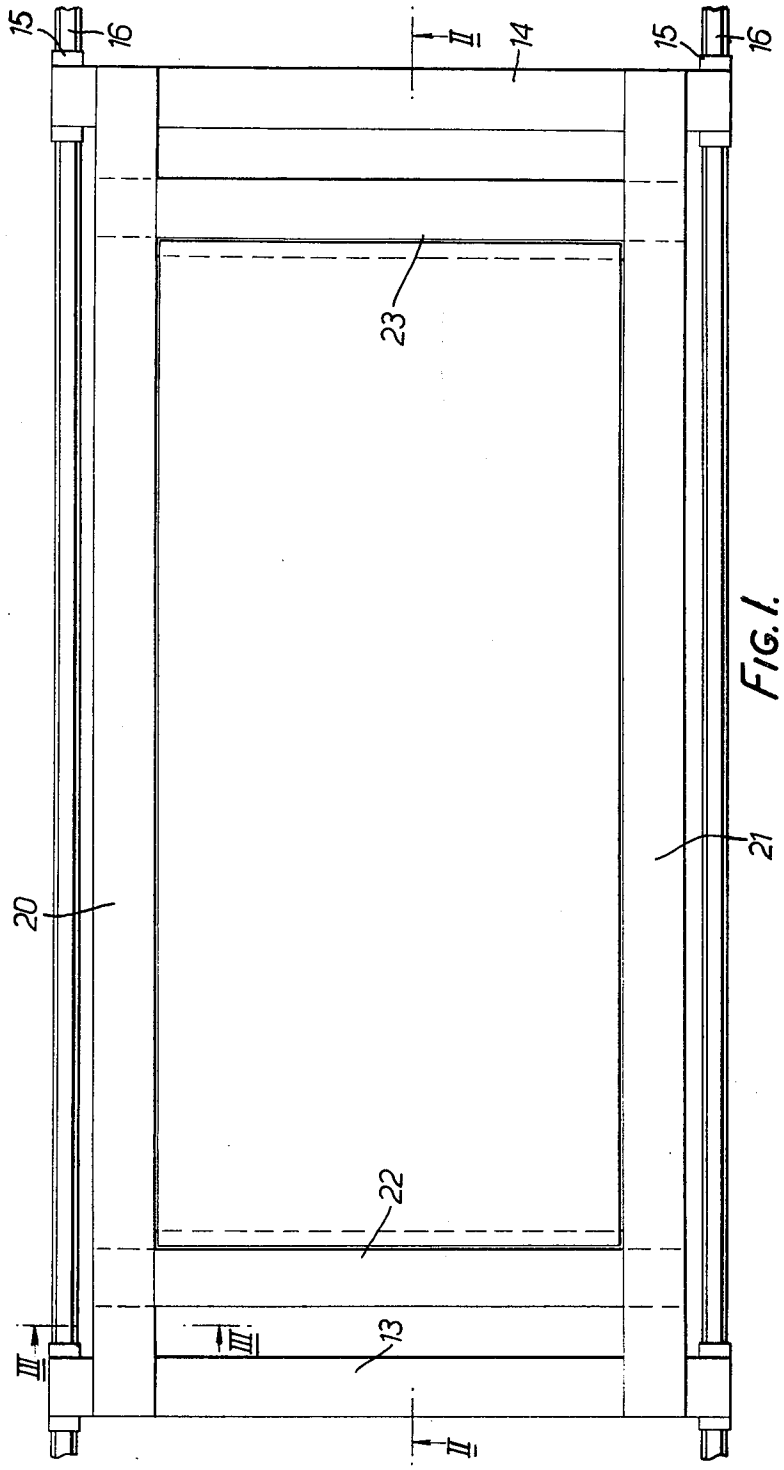


FIG. 1.

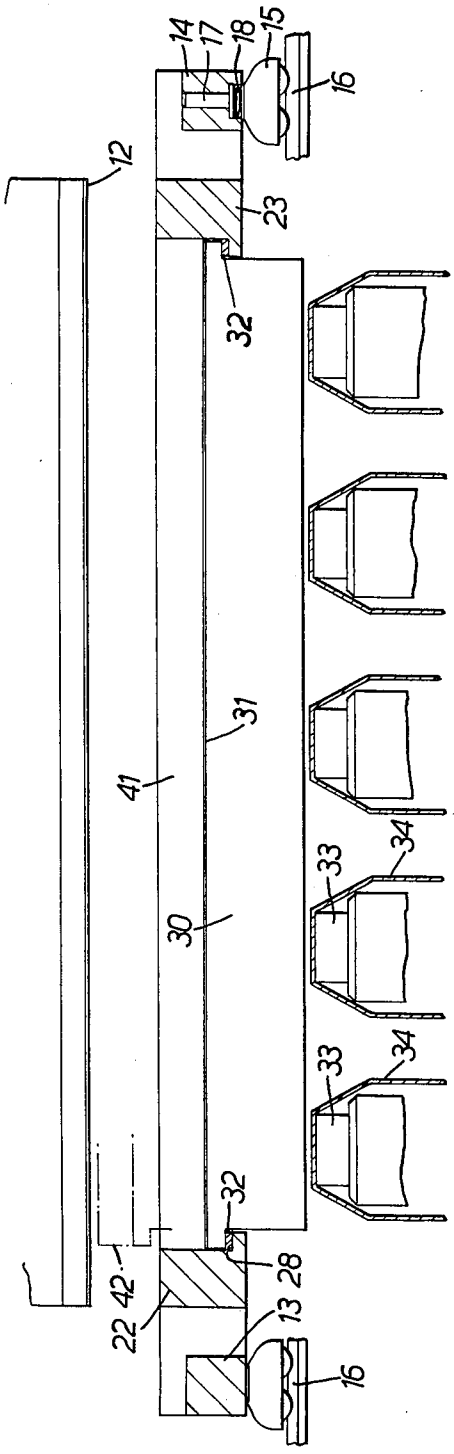


FIG. 2.

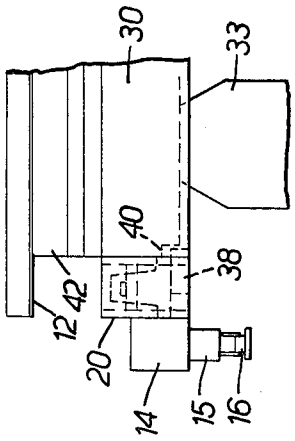


FIG. 4.

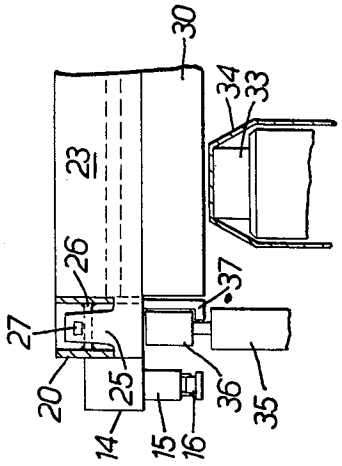


FIG. 3.

METHOD AND APPARATUS FOR PRESSING CONCRETE PANELS

This is a continuation, of application Ser. No. 104,090, filed Jan. 5, 1974, now abandoned.

This invention relates to the molding of articles and is a continuation-in-part of my application Ser. No. 704,715, filed Feb. 12, 1968, now abandoned.

The invention is particularly, but not exclusively, concerned with the molding of concrete panels by placing a wet concrete mix in a mold and subjecting it to high pressure. The pressing action drives out the water of the mix leaving a green panel which is self-supporting and which is sufficiently strong to be removed immediately from the mold. After a setting period, which is small compared with the setting periods normally associated with cast, but not pressed, panels, the panel is ready for use.

This method of pressing or molding lends itself to the fast production of panels and to the automation of concrete panel production; few molds are needed and space requirements are reduced, the stacking of the pressed panels occupying very much less space than the molds that would be needed in casting.

The Dettling et al. U.S. Pat. No. 3002247 patented Oct. 3, 1961, describes apparatus for forming concrete blocks by applying pressure to concrete in a mold box. As illustrated, the mold has a base secured permanently to the side walls and is raised for pressing by a hydraulic ram. A pair of pallets are placed in the mold, followed by a fill of concrete which is said to be levelled off to a fixed depth by a screed. Then the mold is further raised against a pressure platen which has outside dimensions to engage the mold walls but has parts which project into the mold as the mold is raised and which therefore compress the concrete.

The construction of the Dettling et al apparatus is such that only a fixed size product can be molded, no alteration of the dimensions of the products being possible without effective replacement of both the mold and the pressure platen. Moreover, with a given mold and platen, no variation is possible in the thickness of the pressed products or in the degree of compression: the volume of concrete in the mold is fixed by the screed action while the penetration of the platen into the mold is fixed by the engagement of the mold walls with the platen and the size of the projecting parts of the platen. While the Dettling et al. construction is possibly useful for molding a standard sized and shaped product at a limited rate, it is altogether inapplicable to a production unit with such a high production rate that, for proper utilisation of the plant, products of different sizes must be molded in batches, each of which may consist of a high number of products of the same size.

In the mold of the present invention, the base and walls are not fixed together immovably; instead, relative movement is possible between the base and the tops of the side walls. This mould co-operates with a pressing platen which has greater horizontal dimensions than those of the largest mold to be used and which has a substantially planar underface with no downwardly projecting parts. When an appropriate amount of material, e.g. concrete, has been inserted in the mold, the mold is raised until the walls engage against the pressing platen. Unlike Dettling et al., however, the pressing operation is not then complete; instead, relative movement between the platen and the mold base only is continued, relative movement between the walls and platen being prevented by their mutual engagement. This subsequent movement of the base relative to the platen causes compression of the mold contents regardless of the volume of the contents.

With a pressing platen larger in horizontal dimensions than the maximum size of mold to be employed and with a planar underface, modification of the equipment for various sizes of panel is possible, no alteration of the pressing platen being required and modification of only the mold being needed. The mold construction may be such that changes in the mold dimensions are relatively easily achieved.

The pressing platen may be fixed both vertically and horizontally, the mold being mounted to move in two directions. Firstly, the mold can be moved vertically for the pressing operation. Secondly, the mold may be moved horizontally from a filling position displaced from the platen to a second position immediately below the platen. Then, the sequence of operation is (1) fill the mold when in the filling position (2) run the mold under the fixed platen, on rails for example (3) press (4) strip the pressed panel from the mold and return the mold to the filling position.

The invention is illustrated by the following description of a concrete press and its mode of operation, reference being made to the accompanying drawings, in which

FIG. **1** is a plan view of the press mold,

FIG. **2** is a vertical section on the line II—II of FIG. **1**,

FIG. **3** is a section on the line III—III of FIG. **1**, and

FIG. **4** is a view similar to FIG. **3**, but showing the mold walls retracted for stripping.

The molding press illustrated in the drawings has a fixed perforated pressing platen **12** and a mold which is moved upwardly to press the contained concrete against the platen **12**.

The mold has a carriage constituted by a pair of cross beams **13, 14** each of which at each end has a rail wheel bogey **15**, the wheels of which run on rails indicated at **16**. Each bogey has an upwardly extending guide rod **17** projecting into an opening in the cross beam **13** or **14** and is spring mounted by virtue of a spring **18** interposed between the bogey and an annular shoulder formed in the ends of the beams **13, 14**.

The two cross beams **13, 14** are coupled by a pair of side beams **20, 21**, which constitute one pair of opposite side walls of the mold. These side beams are of fixed length and the ends drop into notches formed at intervals along the length of the cross beams **13, 14**: the notches are arranged symmetrically at each side of the centers of the beams **13, 14**, so that any of a number of different separations can be chosen for the side beams **20, 21**.

The other pair of opposite walls of the mold are constituted by a pair of cross beams **22, 23**, there being a pair of such beams for each possible mold width. The beams **22, 23** can be attached to the side beams **20, 21** again at a number of different positions giving selected separations and hence selected mold lengths. For this purpose, the cross beams **20, 21** are slotted at intervals, one such slot being indicated in FIG. **3**. Each end of the cross beams **22, 23** has a laterally and upwardly extending tongue **25**, the upwardly extending part of which passes through a slot in a cross plate **26** and is held in

position by a wedge **27** forced into a hole in the tongue **25** and overlying the plate **26.**

Each of the cross beams **22, 23** is formed with a shoulder **28** formed on its inner face and extending the full length of the beam. These shoulders **28** normally support a mold base **30** which has an upper surface constituted by a perforated plate **31.** The mold base **30** is however capable of vertical movement off the shoulders **28** and relative to the mold walls **20–23.** Packers **32** may be placed on the shoulder **28,** in order to adjust the depth of plate **31** below the tops of the beams **20–23,** and hence the depth of the mold. There may be a separate mold base **30** for each size of mold obtainable by adjustment of the beams **20–23,** or there may be a single mold base which is adjusted in size to the required mold shape by insertion or removal of plate sections as required.

Below the platen **12** and beneath the level of the mold base **30,** when moved on the rails **16,** there is a series of pressing rams **33,** each having a cover **34** to protect it from concrete spilt from the mold and water passing through the lower perforated plate **31.** Similarly, there is a series of less powerful rams **35** located below the positions of the side beams **20** and each carrying a stripping head **36.** The beams **20, 21** carry catcher plates **37** which extend downwardly at the sides of the stripper heads and then have a hooked portion extending under the stripper heads. Lastly, each side beam **20, 21** has a number of spring-loaded plungers **38,** one of which is shown in FIG. **4,** and which are urged into the path of the mold base **30.** The mold base has cut-aways **40** aligned with the projecting ends of the plungers **38.**

The operation of the molding press is as follows:

The mold is initially run on the rails **16** into a filling position displaced from the platen **12.** It is then adjusted to the size of panel required to be pressed, the ends of the side beams **20, 21** being bolted to the cross-beams **13, 14** when the selected positions have been achieved. While the mold is in the filling position distant from the platen **12,** the mold base **31** is covered with a filter sheet of porous material, the mold cavity **41** is filled with concrete, and the upper surface of the concrete is also covered with a filter sheet of porous material. The mold is then run in on its rails **16** into its operating or pressing position between the platen **12** and the rams **33.** In this position, the lifting rams **35** are first operated to lift the entire mold structure up against the platen **12;** during this movement, the bogeys **15** are left behind on their rails **16,** the guide rods **17** sliding in their openings in the beams **13, 14.**

Next, the main pressing rams **33** are actuated to press the mold base **30** upwardly; since the mold walls **20–23** are held against movement by engagement with the platen **12** and since the mold base and plate **31** are movable vertically relative to the sides of the mold, the concrete filling is pressed against the platen **12** to drive out the included water through the filter sheets, and to compact the concrete.

When the pressing operation is completed, the mold base **30** and hence the concrete are held in position by the rams **33** and the lifting rams **35** are withdrawn, causing, by virtue of the catcher plates **37,** the lowering of the mold walls **20–23** and the attached cross plates **13, 14.** During the downward movement, the beams **13,** 14 are again placed on the bogeys **15** and towards the end of the downward movement, the spring loaded plungers **38** are forced inwardly into the recesses formed by the cut-aways **40.** When the beams **13, 14** are in their fully lowered position, there are clearances between the plungers and the tops of the cut-aways **40,** as indicated in FIG. **4.**

The main rams **33** are next lowered, with the result that the mold base **30** and the pressed concrete panel which is indicated at **42** fall through the distance of the clearances and is brought to rest by the plungers **38;** in this way, the concrete panel **42** is released from the platen **12;** however, the panel **42** is still positioned above the level of the beams **20, 23** and can be removed from the mold with ease. Lastly, the mold is run out of the press on the rails **16** for removal of the panel **42.**

After the panel **42** has been removed for curing, the plungers **38** are withdrawn, allowing the mold base to fall until it is brought to rest by the shoulders **28.** Thereupon, the cycle can be recommenced by the filling of the mold with a fresh charge of concrete. The spring **18** reduces shock on the structure during this filling operation.

In place of the construction illustrated having two sets of lifting rams **35** and **33** for lifting respectively the entire mold, and the mold base only, the construction described in application Ser. No. 737,780 filed June 17, 1968, now abandoned, may be utilised. In the latter construction, the mold walls are carried by the mold base but are telescopic or collapsible in height; a single set of rams, which act on the base may now be used, the entire mold with the extended side walls being first raised until the tops of the walls engage the top platen **12.** Then further movement of the base by the rams is accompanied by telescoping or collapsing of the mold walls, the separation between the mold base, on the one hand, and the top platen and the top of the walls, on the other hand, being decreased as before to cause compression of the concrete within the mold.

What is claimed is:

1. A process for molding a concrete panel comprising the steps of

inserting a wet concrete mix into an open mold having mold walls and a mold base which is vertically movable relative to said mold walls when said mold is in a first filling position,

moving said mold horizontally to a pressing position vertically below a fixed horizontal platen,

raising said mold bodily until said mold walls are brought into contact with said platen,

then raising only said mold base to effect compression of said mix,

stripping the resulting molded panel from said mold, and removing said panel.

2. A process for making molded panels from a settable cementitious comprising the steps of

a. inserting said material at a filling position into an open mold having a base and upstanding mold walls, the horizontal dimensions of said mold being adjustable up to predetermined maximum dimensions

b. moving said mold substantially horizontally from said filling position to a pressing position in which said mold is disposed beneath a fixed horizontal platen having horizontal dimensions exceeding said predetermined maximum dimensions and having a substantially flat underface free from downardly projecting parts;

c. moving said mold upwardly until said mold walls contact said platen underface and continuing upward movement of said base to compress the contained material against said platen;

d. lowering said mold from said platen,

e. moving said mold horizontally from said pressing but unset position,

f. removing the pressing but unset material from the mold, and

g. allowing said material to set.

3. A process as claimed in claim **1** in which said base is covered with a filter sheet of porous material before said settable material is introduced.

4. A molding press for molding panels comprising

a. a stationary constantly horizontal platen having a substantially flat underface free from downwardly projecting parts;

b. a mold having upstanding side walls and a perforated base;

c. means for moving said mold horizontally between a pressing position beneath said platen and a filling position which is remote from said platen and at which said mold is filled with panel-making material; and

d. power means at said pressing position and acting on at least said mold base for first vertically moving said mold to bring said mold walls into engagement with said underface of said platen and the effecting further movement of said base towards said platen to cause said material in said mold to be compressed;

e. the horizontal dimensions of said mold being adjustable up to predetermined maximum dimensions;

f. and said platen having horizontal dimensions exceeding said predetermined maximum dimensions.

5. A molding press according to claim **4** in which said power means include

first power means for raising said mold bodily and

second power means for raising said mold base relative to said mold walls.

6. A molding press according to claim **5** in which said first power means are operable, subsequent to pressing, to lower said mold walls while said second power means support said base against movement, whereby said mold is stripped.

7. A molding press according to claim **4** in which said mold base is normally carried by said mold walls but is movable vertically within said mold walls.

8. A molding press according to claim **4** in which said mold includes wheels on which said walls are detachably mounted to facilitate movement between said filling and pressing positions,

said wheels being detached from said walls when said mold is raised by said power means.

9. A molding press according to claim **4** in which said mold walls are horizontally movable to occupy any one of a plurality of fixed positions in which they are prevented from further horizontal movement during pressing, thereby permitting changes in the horizontal dimensions of said mold up to said predetermined, maximum dimensions.

10. A molding press according to claim **9** in which said mold includes a support and adjustable mounting means on said support for mounting a first opposite pair of said mold walls at an adjustable separation,

the second opposite pair of said mold walls being carried by said first pair at an adjustable separation.

11. A molding press according to claim **10** in which said mold base is supported, prior to pressing, by said second pair of mold walls.

12. A molding press according to claim **11** in which said power means comprise a first set of hydraulic rams acting on said second pair of mold walls, and a second set of hydraulic rams acting on said mold base.

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