May 9, 1967 I. S. SAEV ETAL 3,318,365

APPARATUS FOR PRODUCING HALF MOLDS BY PRESSING

Filed Jan. 5, 1965 3 Sheets-Sheet 1

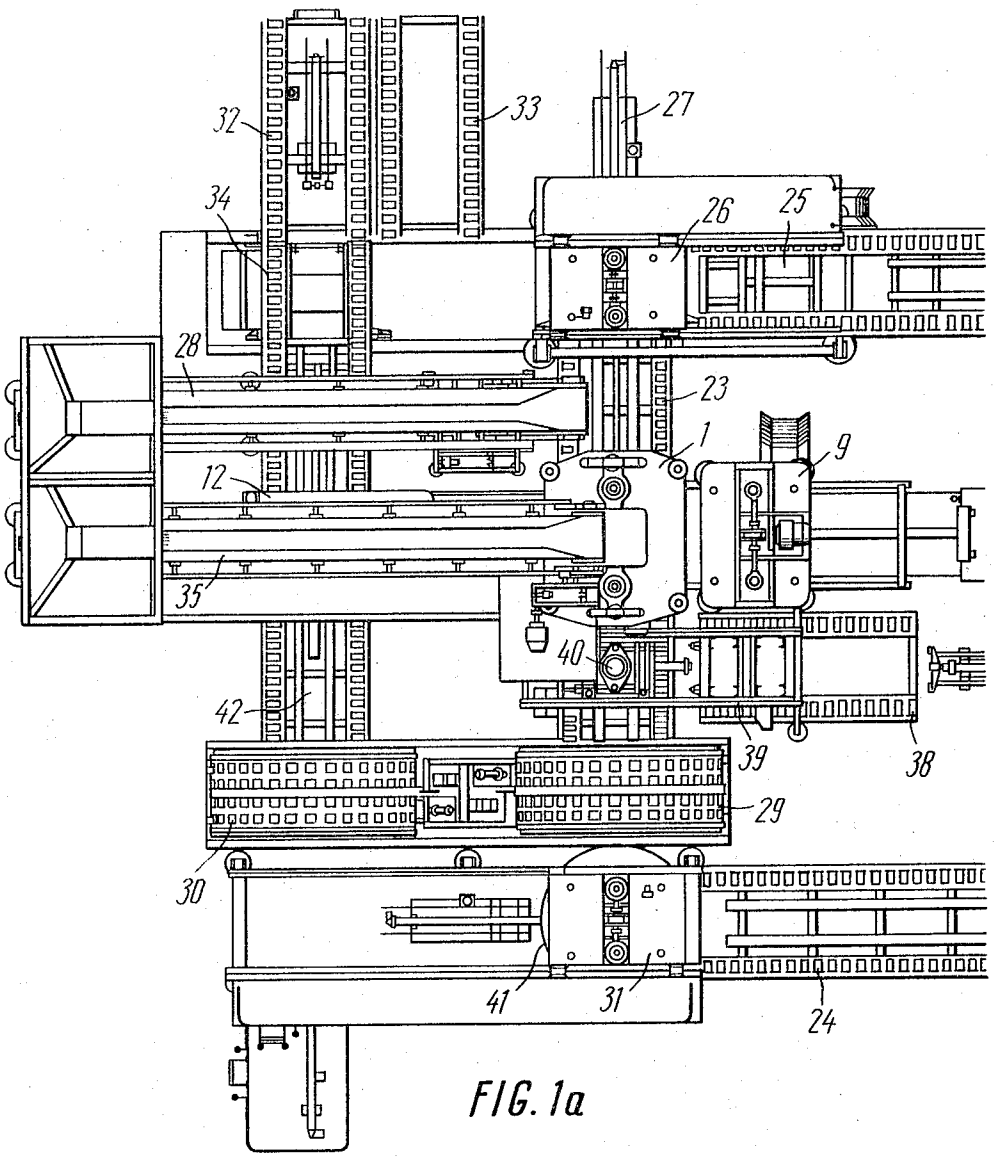

FIG. 1a

APPARATUS FOR PRODUCING HALF MOLDS BY PRESSING

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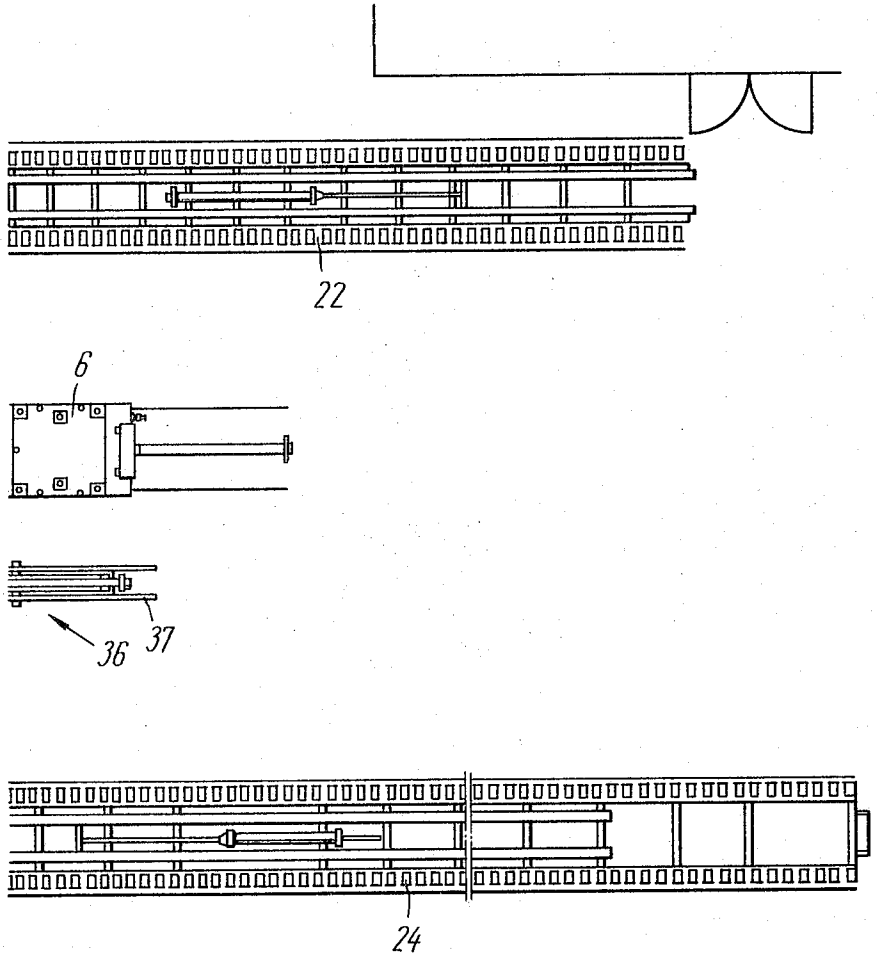

FIG. 1B

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APPARATUS FOR PRODUCING HALF MOLDS BY PRESSING

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FIG. 2

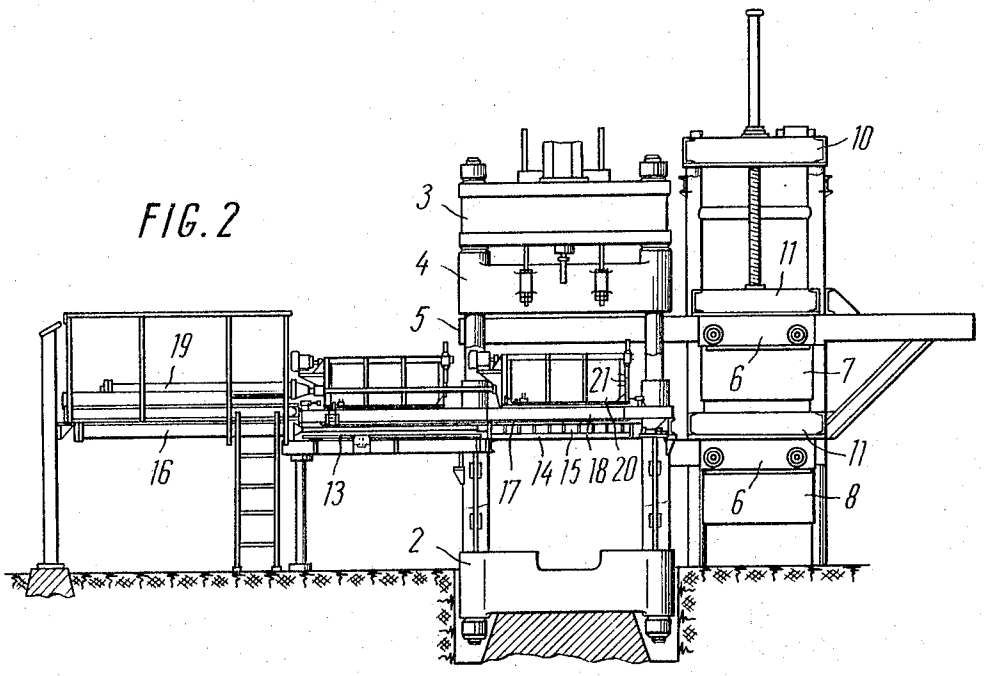
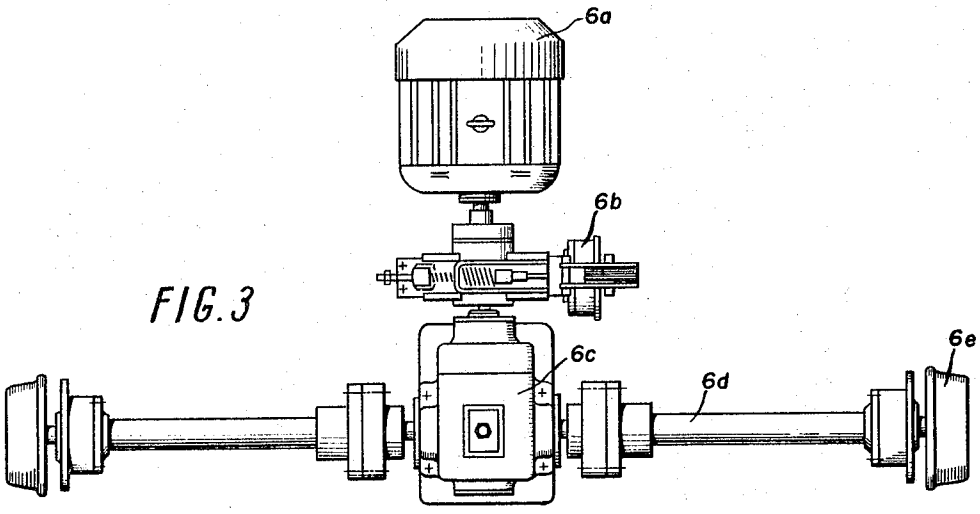


FIG. 3



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APPARATUS FOR PRODUCING HALF MOLDS BY PRESSING

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The invention relates to foundry equipment and more particularly to apparatus for producing foundry shell half molds by a pressing method used for obtaining shaped castings.

There are conventional installations for obtaining shell half molds by pressing in which a flask and a pattern or bottom board are delivered under a press where a certain batch of molding sand is charged into the flask by means of a batcher unit. Any excess sand accumulated over the top edge of the flask is forced inside the flask by a punch rigidly mounted on a movable crosspiece of the press. The pattern is removed from the shell half mold, which is rammed by the above technique, and the prepared shell half mold is delivered to be assembled.

The operation of such conventional installations requires considerable manual labor, and the difficulties of obtaining shell half molds for castings of various sizes and shapes are increased due to the intricate and time-consuming readjustments of the installation mechanisms.

An object of this invention is to provide foundry apparatus which will eleminate the above disadvantages.

The principal object of the invention is to provide an apparatus which will allow shell half molds for castings of various sizes and shapes to be pressed in flasks of different heights without readjustment of the apparatus as well as without the use of manual labor.

These objects are achieved by pressing shell half molds with the aid of several punches of desired configurations operating sequentially and to position the punches under the press, and withdraw the same therefrom, with the punches being mounted on self-propelled wheeled carriages installed on a frame capable of vertical travel to bring the required carriage to the specified level when the same is placed under the press.

In addition, the apparatus is provided with a filler frame mounted on the press column together with a horizontally-travelling box, the front wall of which is capable of upward and downward movement, and a removal frame which are arranged above and beneath the filler frame respectively and used for batching, uniform distributing of the molding sand in the flask and removing excess sand from the top edge of the flask after pressing.

To mechanize the manufacture of the shell half molds, the apparatus is equipped with conveyors for transferring the flasks during the manufacturing operations, a mechanism for placing an empty flask on a bottom board, a mold tilter and a mechanism for withdrawing patterns from the shell half molds.

The above and other objects of the invention will become more readily apparent to persons skilled in the art from the following detailed specification and accompanying drawings, and in which drawings: FIGS. 1*a* and 1*b* are a top view of the present apparatus; FIG. 2 is a side view of said apparatus; and FIG. 3 is a diagrammatic view of the means for operating the wheeled carriages or bogies.

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A flask with a pattern or bottom board is adapted to be delivered to a press **1** (FIG. 1) of a hydraulic four-column type, and bed **2** of which has a recess for a mechanism for transferring the flasks. A top cross-head **3** and a movable cross-head **4** of the press are formed with square openings to admit molding sand to be charged therein with the aid of a conveyor. The movable cross-head **4** is equipped with two channels **5** which are fastened perpendicularly to the direction of travel of the flask. Wheeled carriages **6** are capable of travel along the channels **5** of the movable cross-head **4** and each carriage is constituted by a welded metal box-shaped frame. Operably related to each carriage is a drive assemblage including an electric motor **6***a*, an electromagnetic shoe brake **6***b*, worm reducing gear means **6***c*, output shaft **6***d* and wheels **6***e* at the ends of the shaft. The electric motor is supplied with current via a flexible conduit mounted on a terminal box provided for a hoisting mechanism **9** for the wheeled carriages. Certain of the wheeled carriages **6** are provided with a shaped punch **7** while others with a flat punch **8** and the respective punches are attached to the carriages by means of blocks having T-shaped slots.

From the drawings it will be appreciated that the drive assemblage for each wheeled carriage **6** permits the carriage to be moved horizontally along the channels **5** of the cross-head **4**.

To allow the frame complete with the carriages **6** to travel vertically, a support structure **10** is installed adjacent the press, and such structure includes a gantry the top of which accommodates a drive defined by an electric motor, an electromagnet shoe brake and a worm reducer. The structure **10** supports a plurality of carriages **6** (two in the present case) arranged one above the other, on a pair of channels **11**. When the structure **10** reaches the specified position, one or another pair of the channels **11** registers with the channels **5** on the movable cross-head **4** and, thus, the carriage can run between the gantry and the press, in both directions (the blocking system being designed so as to allow such running only with the cross-head **4** in its uppermost position).

Arranged on the opposite side of the press **1**, with respect to the hoisting mechanism **9** for the carriages **6** is a mechanism **12** for batching, levelling and removing sand. At the level of the top plane of the flasks travelling under the press **1** with a small clearance such as 2–5 mm. therefrom, a metal sheet **13** is fastened and such sheet is somewhat larger than the inside dimensions of the flask. Normal to the direction of the travel of the flask are two rectangular guides **14** along which a removal frame **15** slides. The guides **14** are secured on the columns of the press **1** and along the sheet **13** on its sides. The lower plane of the frame **15** passes over the flask and the sheet **13** with a clearance of 2 to 4 mm. and is transferred by a hydraulic cylinder and piston unit **16**. To fasten the piston rod provision is made for an eye-lug on the back wall of the removal frame and front wall of the frame **15** is provided with a knife at its bottom which, when the frame moves from under the press, severs a layer of molding sand from the top edge if the batch proves in-

accurate and carries the excess sand away onto sheet **13**.

Fastened above the removal frame **15**, with the small clearance, is another sheet **17**, the extension of which above the press is the bottom surface of a filler frame **18**. The sheet **17** and the filler frame **18** allow an open ended box **20** to be moved by means of a pneumatic cylinder and piston unit **19**. The inside dimensions of the box **20** as well as those of the removal frame **15** and the filler frame **18**, correspond to the inside dimensions of the flask. To the lower parts of the side walls of box **20**, supports are welded which are on the guides extending along the sheet **17** and form the side walls of the filler frame **18** under the press **1**. The rear wall of the box **20** extends lower than the side walls and reaches the sheet **13**. The front wall **21** extends somewhat higher than the side walls and is movable upwardly and downwardly by mechanical means. When the box **20** moves from under the press **1**, molding sand therein is carried away with the front wall **21** onto the sheet **13** whereas a layer ensuring a uniform ramming of the shell half mold during pressing is maintained over the flask.

Since the front wall **21** is vertically movable, the height of the molding sand layer to be rammed can be adjusted, which, in turn, allows a uniform density of the molding sand to be obtained when high and low shell half molds are used alternately.

To mechanize the manufacture of the shell half molds in flasks of various height, the apparatus is provided with conveyers **22**, **23**, **24** which serve to transfer the flasks during the manufacturing operation, a flask elevator **25** to lift flasks whose height does not exceed 600 mm., a manipulator means **26** for placing the flasks on the pattern of bottom board, a pusher unit **27**, a mechanism **28** for feeding the facing sand, a tilter for the shell half molds and patterns **29** and **30**, a drawing mechanism **31** and roller conveyers **32** and **33** for patterns.

The operation of the present invention is as follows: the conveyer **22** delivers empty flasks onto the elevator **25**, and the manipulator means **26** transfers a flask from the elevator **25** in its extreme left position and places the flask on the bottom board delivered by mechanism **34**. The set (a pattern or bottom board and a flask) is transferred by the pusher unit **27** onto the conveyor **23** where the feeding mechanism **28** delivers the sand into the flask after which the set is brought under the press **1**. When the set is brought under the press **1**, the wheeled carriages **6** are on the hoist mechanism **9**. After the set is brought under the press **1**, the removal frame **15** and the box **20** are also brought into operative relation thereto, and a mechanism **35** for feeding molding sand delivers such sand through the holes in the cross-heads thus filling the flask, the filler frame **18** and the box **20**.

When the filling operation is terminated, the box **20** is removed from under the press **1** thereby levelling the sand and making room for the carriage **6** with a shaped punch **7** which, after pressing the sand, return onto the hoist mechanism **9** for hoisting the carriages. The second pressing operation is performed with a flat punch **8** after additional sand is charged. The removal frame **15** returns to its initial position and its knife removes excess sand from the upper edge of the flask. The set, formed and delivered from under the press, is covered with a bottom plate with the aid of a mechanism **36** for placing the bottom plates which comprises a pusher **37**, a frame **38** for placing the set of bottom plates, a hoist table **39** and a carriage **40** for transferring the bottom plates.

After the set of bottom plates is transferred by the pusher **37** from the frame **38**, it is positioned onto the hoist table **39**. The carriage **40** with its frame lowered, moves from conveyor **23** to the hoist table **39** and, with its hangers, enters the T-shaped slot of the upper bottom plate to raise such plate. When moving in a backward direction, the carriage **40** brings the bottom onto the axis of the conveyor **23**, lowers the bottom and thus covers the shell half mold.

The hoist table **39** is now free to lift the rest of the bottom plates to a height equal to the plate removed, and this procedure continues until the last bottom plate of the set is withdrawn, after which the table is brought to its lower position, and the next set is positioned thereon.

The set, formed and covered with a bottom plate, is tilted 180° in the mold tilter **29** which consists of a drum having a horizontal axis resting free on four rolls. Inside of the drum at the top and bottom thereof, two movable sections of roll tables are assembled. One of the tables serves as an extension for the roll table of the operating flight of conveyor **23** when the drum is in one or another position and the sections of the roll tables can move vertically for fixing the flask together with the pattern and bottom board during the tilting operation. The roll tables may be driven by four hydro-cylinder piston units.

The shell half mold which is on the bottom plate is delivered to a turntable **41** of conveyor **24** as prepared shell half molds. At the same time, the bottom board on the flask moves to the grips of drawing mechanism **31** with its slots, and the frame with the grips moves up and, thus withdraws the bottom board from the shell half mold which is then conveyed to the shell half mold tilter **29**. The pattern outfit turns 180°, and the conveyor **42** brings the outfit to mechanism **34**. If the pattern is to be used again, the mechanism **34** moves the pattern under the manipulator means **26**, otherwise, when the pattern is not used in the further process of manufacturing shell half molds, the pattern is transferred to the roll conveyor **32** the conveyor **33** delivers another pattern to mechanism **34** for the subsequent process.

The installation is controlled by the operators from two panel boards.

This invention is not to be confined to any strict conformity to the showings in the drawings but changes or modifications may be made therein so long as such changes or modifications mark no material departure from the spirit and scope of the appended claims.

What we claim is:

1. An apparatus for producing foundry half molds by flask pressing, comprising a base, columns carried by said base, a press including a movable molding cross-head mounted on said columns above the flask and provided with a through opening, means for feeding a molding mixture into a flask provided with a bottom board through said opening, further columns located immediately adjacent the press, a frame mounted on said further columns, at least two punches mounted on said frame, means for moving said frame and punches vertically, and means for alternatively moving said punches horizontally under the cross-head, with said cross-head transmitting pressure from the punches to the mixture in the immovable flask.

2. An apparatus for producing foundry half molds by flask pressing, comprising a base, columns carried by said base, a press including a movable molding cross-head mounted on said columns above the flask and provided with a through opening and horizontal guideways, means for feeding a molding mixture into a flask provided with a lower board through said opening, further columns located immediately adjacent the press, a frame mounted on said further columns and having guideways, at least two wheeled carriages mounted on said guideways of the frame, an individual drive for each carriage for causing the carriage to move horizontally along the guideways of the frame and the cross-head when said guideways coincide as the cross-head arrives at its uppermost position, a punch mounted on each of said carriages for alternatively moving underneath said molding cross-head for transmitting pressure to the mixture in the immovable flask through said carriages, and means for moving said frame vertically together with the movable punches.

3. The apparatus for producing foundry half molds as claimed in claim **1**, including a filler frame split along

the horizontal plane, a box movable along said frame comprising a vertically movable wall designed for batching and uniformly spreading the molding mixture in the flask prior to molding, a power drive for moving the box along the frame, said split frame having upper and lower portions, said upper portion being secured to said columns for the cross-head and an individual drive for moving the lower portion whereby the lower portion removes excess molding mixture from the flask after molding.

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