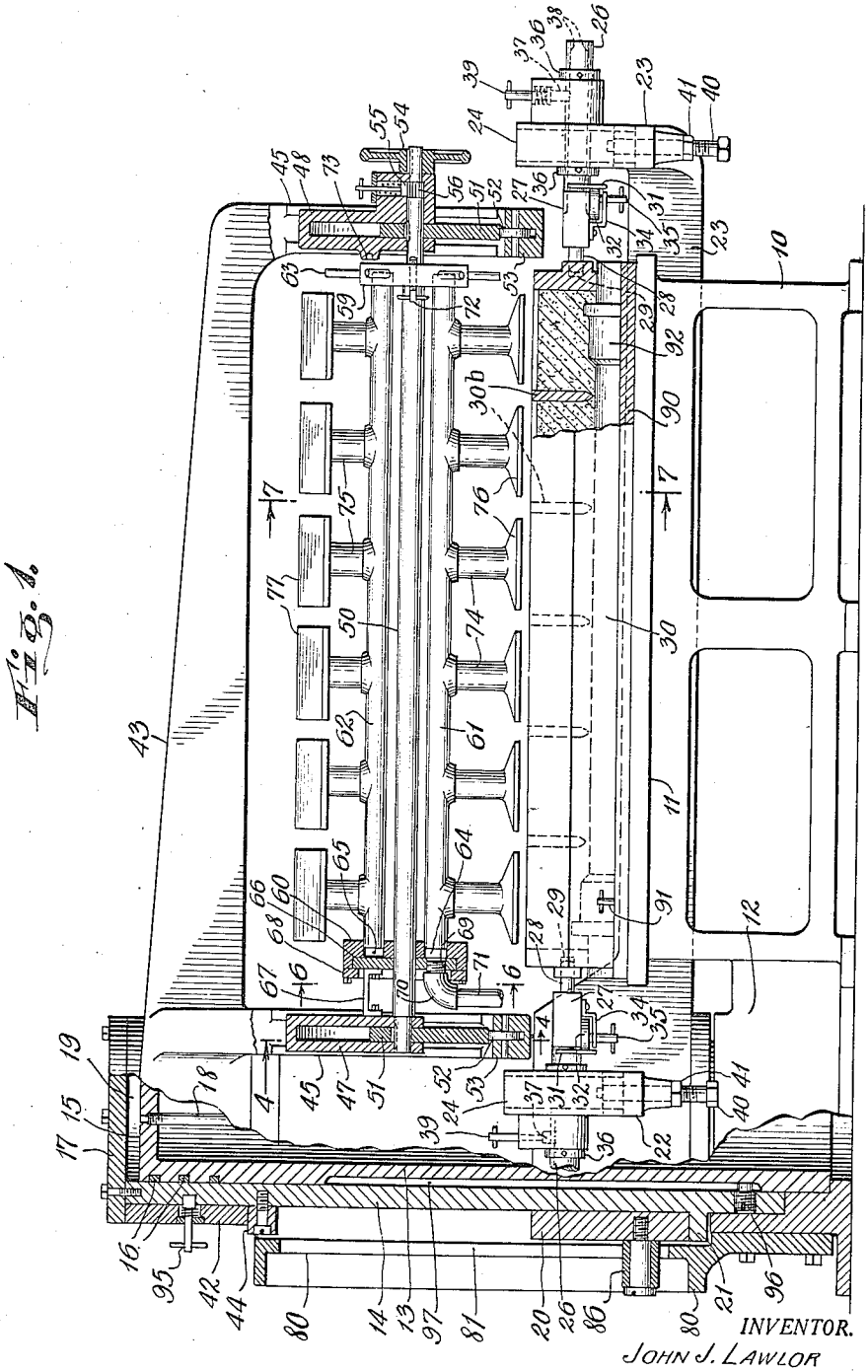
Nov. 17, 1936. J. J. LAWLOR 2,061,280

MOLDING MACHINE

Filed Dec. 7, 1933 3 Sheets-Sheet 1

Fig. 1.



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MOLDING MACHINE

Filed Dec. 7, 1933 3 Sheets-Sheet 2

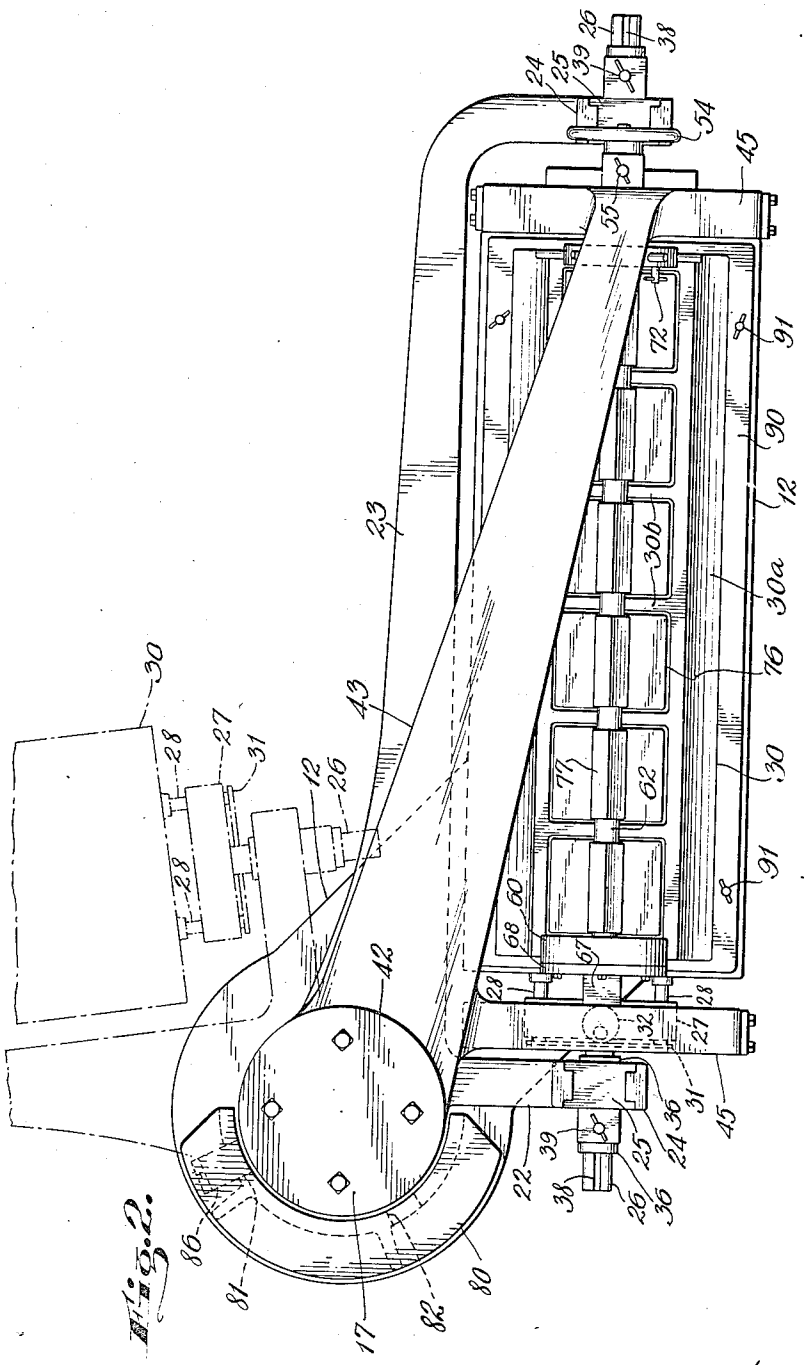


Fig. 2.

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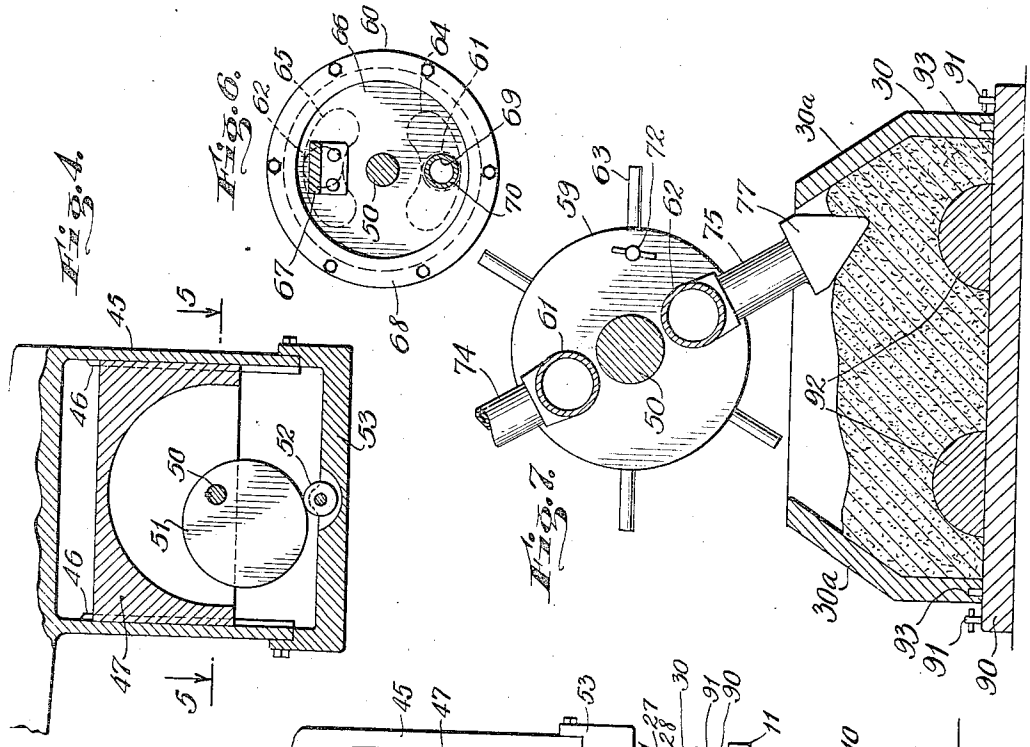
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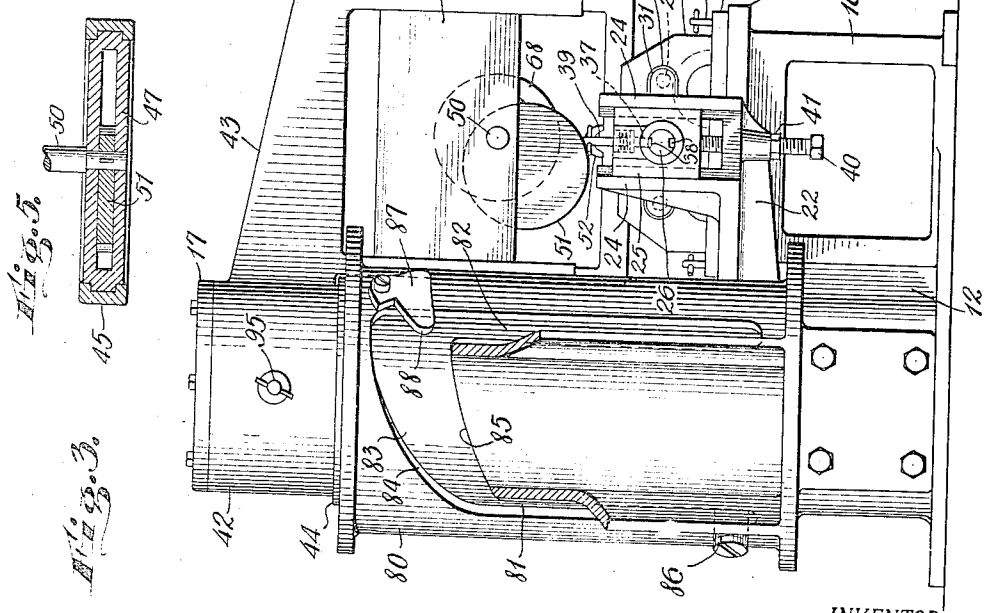
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Filed Dec. 7, 1933 3 Sheets-Sheet 3





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2,061,280

MOLDING MACHINE

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Application December 7, 1933, Serial No. 701,253

7 Claims. (Cl. 22—41)

The present invention relates to molding machines and has for an object to provide novel ramming means therefor.

In molding machines, as heretofore constructed, the flask sections are jarred so as to pack the sand about the pattern, but while sand will pack vertically or in the direction of jarring, it will not pack satisfactorily in lateral direction or at a substantial angle to the direction of jarring, and hence for certain molds it has heretofore been necessary to ram the sand about the pattern by hand. This is particularly true of pipe molds in which the flasks have a substantial flare toward the pattern. In other words, each flask section tapers from a maximum width at the pattern to a greatly reduced width at its outer face, thereby reducing weight and the amount of sand required for each mold and hence the amount of labor required to fill the flask.

It is an object of the present invention to provide a machine by which the ramming may be done mechanically, thus, saving labor costs and not only producing a more uniform and perfect packing of the sand, but also materially reducing the time required to make the molds.

A more specific object of the invention is to provide a molding machine having pneumatically actuated ramming mechanism.

Another object of the invention is to provide a machine of the character described above which will dispense with manual lifting or the use of a crane, the machine being arranged to move a flask automatically from the molding table to an outside support, such for instance as an adjuster.

Still another object of the invention is to provide the machine with means for inverting a flask before it is deposited on said support. Thus a drag may be filled in the usual inverted position and then be turned over and deposited right side up on the support, after which the cope may be prepared on the same machine and transferred without inversion to proper position over the drag upon which it will be lowered automatically to complete the mold. It will be understood, of course, that two machines may be employed, on one of which the drag sections of the mold are made and on the other of which the cope sections are made, the two machines being relatively so spaced from a common outside support or adjuster that one machine will deliver the drag sections to said support and the other machine will deliver the cope sections thereto over the drag sections and in proper register therewith.

Other objects of my invention will appear in the following description of a preferred embodiment and thereafter the novelty and scope of the invention will be pointed out in the claims.

In the accompanying drawings;

Figure 1 is a front elevation of a molding machine embodying my invention, certain parts being broken away to reveal structural details;

Fig. 2 is a plan view of the machine;

Fig. 3 is an end elevation viewed from the left hand end of Fig. 1 with certain parts thereof broken away;

Fig. 4 is a sectional detail view, the section being taken on the line 4—4 of Fig. 1;

Fig. 5 is a view in section taken on the line 5—5 of Fig. 4;

Fig. 6 is a view in section taken on line 6—6 of Fig. 1; and

Fig. 7 is a view in section taken on line 7—7 of Fig. 1, but with the rammers in a different position.

The bed 10 of the molding machine is formed with a fixed table 11. At one side of the table the bed is formed with a cylindrical bracket 12, in which is supported and secured a vertical column or fixed plunger 13. The latter is preferably located adjacent one corner of the table as indicated in Fig. 2. Fitted over the column 13, and adapted to slide thereon is a sleeve or cylinder 14. The plunger is preferably hollow to reduce weight, but is closed at its upper end by an end wall 15 and near its upper end the plunger is provided with packing rings 16 to form an air tight seal between the plunger and the cylinder. The upper end of the cylinder is closed by a cylinder head 17. A pipe 18 leads through the wall 15 and provides means through which air under pressure may be admitted into the working chamber 19 (i. e. space between the cylinder head 17 and the top of the plunger) so as to raise the cylinder with respect to the column. Valve mechanism (not shown) is also provided in connection with the pipe 18 through which air may be exhausted from the working chamber 19 when desired, to permit of lowering the cylinder 14.

Mounted to slide and also to rotate on the exterior of the cylinder 14 is the hub 20 of a flask carrier. This hub normally rests on a flange 21 projecting from the cylinder 14. The flask carrier comprises two arms disposed at right angles to each other. One of these arms 22 lies parallel to the adjacent end face of the table 11 when the parts are in the position shown in Fig. 1. The other arm 23 is much longer than the arm 22 and passes back of the table 11 and around the opposite end thereof. Each arm is formed at its extremity with a pair of laterally spaced vertical

slides 24, as best shown in Fig. 3, to receive a slide block 25.

Each slide block 25 provides a bearing for a trunnion shaft 26. Each shaft 26 has fixed to its inner end a trunnion head 27 from which project two spring pressed pins 28. The latter are adapted to enter sockets 29 formed in a flask section 30. The pins 28 project from the rear of the head 27 and are connected to a yoke 31 which is adapted to be engaged by an eccentric 32 mounted in a suitable bracket 34 on the trunnion head. By means of a handle 35 the eccentric may be turned so as to withdraw the pins 28 from engagement with the sockets 29. Each trunnion shaft 26 is adjustable lengthwise in the slide block 25, but may be secured at any desired adjustment by means of collars 36 disposed on opposite sides of the block and secured to the shaft by means of set screws. Thus, provision is made for considerable variation in the length of the flask sections 30, while slight variations are taken care of by the spring pressed pins 28.

The collars 36 while preventing axial movement of the shaft 26 do not prevent them from turning in their bearings. Each shaft, however, may be locked in either of two angular positions by means of a spring pressed key 37 adapted to engage one or the other of two diametrically opposed keyways 38 cut in each shaft. The key 37 is provided with a handle 39 by means of which it may be lifted out of engagement with the keyway and by turning the handle 39 the key 37 which is wider than the slot will be prevented from entering the same.

Provision is made for adjusting the slide blocks 25 vertically, in order to provide for flasks of different depths. To this end, vertical set screws 40 are screwed into the carrier arms 22 and 23, respectively, under the slide blocks 25 to serve as stops upon which said blocks rest. A lock nut 41 on each set screw serves to hold the screw at desired adjustment.

Mounted to turn freely on the upper end of the cylinder 14 is a hub 42 of a ram support 43. This hub rests on a collar 44 fixed to the cylinder. The cylinder head 17 overlaps the upper end of the hub so that the latter is confined between the cylinder and said collar.

The ram support is generally of inverted U-shape comprising a pair of vertical frames 45 yoked together but spaced far enough apart to more than span the table 11. The frames are each formed with vertical ways 46 in which carriages 47 and 48 are adapted to slide. A shaft 50 is journaled in said carriages. Keyed to this shaft within each carriage is an eccentric 51 which normally rests upon a roller 52 journalled in a bottom rail 53 bolted to each frame 45. The shaft 50 projects from the carriage 48 and has a hand wheel 54 fixed thereon, so that by turning this hand wheel the eccentrics may be rotated on the rollers 52, to raise or lower the carriages. The carriage 48 differs from the carriage 47 in having an extended hub in which a spring pressed latch 55 is provided to engage a notched portion 56 of the shaft so as to hold the shaft at any desired angular adjustment.

A rammer head is mounted to turn on the shaft, comprising a pair of widely spaced hubs 59 and 60 which are rigidly connected by two pipes 61 and 62, extending parallel to said shaft. The hub 59 is provided with spoke handles 63 by which the rammer head may be turned on the shaft. The pipes are closed at their point of connection with the hub 59 but at their opposite ends they open into arcuate slots 64 and 65 respectively formed in the outer face of the hub 60. Said face is recessed to receive a valve plate 66 secured against rotation by means of a tie bracket 67 connecting the plate to the carriage 47. A retaining ring 68 holds this plate in said recessed face maintaining an air tight closure for the slots. However, the plate is formed with a port 69 connected by an elbow fitting 70 to a flexible air line 71.

In Figs. 1 and 6 the port 69 is shown in communication with the arcuate slot 64 so that air from the line 71 will be fed into the pipe 61. However, when the rammer head is turned through an angle of 180 degrees the other slot 65 will communicate with the port and air will be supplied to the pipe 62. Each slot is of sufficient extent to permit of turning the rammer head through a considerable angle without interrupting communication with the port, but when the rammer head is turned 90 degrees from the position shown in Fig. 6, both slots will be closed and neither pipe will be supplied with air. In this position the rammer head may be secured by turning a screw 72 to engage a socket in a lug 73 formed on the carriage 48.

Projecting radially from the pipe 61 is a series of pneumatic rammers 74, and extending in opposite direction from the pipe 62 is another series of pneumatic rammers 75. The interior construction of the rammers is not illustrated and requires no detailed description; suffice it to say that the rammers may be of any suitable type such as may be found in the market. The rammers 74 have flat heads 76 which are pneumatically reciprocated when compressed air is admitted into pipe 61, while the rammers 75 have peen heads 77 which are reciprocated when compressed air is fed into pipe 62.

Means are provided for automatically raising the flask carrier and swinging it to one side as will now be explained. Mounted on the bracket 12 of the bed is a cylindrically curved cam plate 80 (Fig. 3) which partly surrounds the cylinder 14. This cam plate is formed with two vertical cam slots 81 and 82, respectively. These slots are connected at the top by an inclined broad slot 83 which widens toward the slot 82. The inclined slot is defined by two spiral walls 84 and 85, respectively, which connect the outer and inner walls of the vertical slots 81 and 82. A roller 86 is carried by the hub 20 and is adapted to engage the cam slots.

With the parts in the position shown in the drawings, it will be evident that when the cylinder 14 is raised and with it the hub 20, the roller 86, riding in the slot 81, will keep the flask carrier from turning, but when the roller enters the inclined slot 83 and engages the spiral wall 84 it will rotate the hub 20, thereby swinging the flask laterally away from the machine. After the roller has reached the end of the spiral wall 86, if the air be exhausted from the working chamber 19, it will descend into the slot 82. Upon the next admission of compressed air into the working chamber 19, the cylinder will be raised and the roller 86 will be guided by the slot 82, but as the roller nears the top of this slot it will engage a trigger mechanism and be moved laterally thereby over the spiral wall 85, so that when the cylinder recedes again the pin will be guided by the wall 85 to the vertical slot 81, thereby turning the flask carrier to its original position.

The trigger mechanism above referred to con-

sists of a substantially triangular member 87 which is pivoted near one corner thereof to the cam plate 80. The shape of the trigger member is such that it will normally hang by gravity with one nose 88 of the triangle projecting across the slot 82. Hence, when the roller 86 moves downward into the slot 82 it will push the trigger out of its path, but when it moves upward it will strike the nose 88 and will be compelled by the trigger to move laterally over the wall 85.

The operation of the machine is as follows: First the flask carrier is swung to the broken line position shown in Fig. 2 with its roller 86 engaging the groove 82. This leaves the table clear for mounting a pattern and flask thereon. A pattern plate 90 is now laid upon the table and fixed in predetermined position thereon by means of handscrews 91. The pattern plate, as shown in the drawings, may have half patterns 92 formed thereon. A flask section 30 is then placed in position over the pattern plate and may be properly centered thereon by means of dowel pins 93 (Fig. 7) projecting from the pattern plate and engaging suitable sockets in the flask section. The side walls of the flask are inwardly inclined, as shown at 30*a*, in Fig. 7, so that the opening in the upper face of the flask section is considerably narrower than that which contacts with the pattern plate 81. The flask is also formed with the usual transverse bars 30*b* (shown in Figs. 1 and 2) to hold the sand in the mold and it will be observed that the rammers are so spaced as to enter the mold between said bars. Also the flat heads 76 of the rammers 74 are almost as broad as the space between the bars.

The particular flask section, shown in the drawings, is the drag, but the cope section is similarly formed and differs from the drag mainly in the provision of one or more gates through which the mold may be poured.

After the flask section 30 has been fitted in place on the pattern plate, air under pressure is admitted through pipe 18 to raise cylinder 14 and the trigger 87 then swings roller 86 over the spiral wall 85. Thereupon the air pressure is released permitting roller 87 to follow wall 85 into the slot 81 so that the flask carrier will swing over the table and drop to the position shown in Fig. 1, with the trunnion heads 22, 23 opposite the ends of the flask section. The pins 28 which have been held in retracted position by the eccentrics 32, are now released by a turn of the handles 35 and snap into engagement with the sockets 29. It will be understood, of course, that the trunnion shafts 26 may have to be adjusted lengthwise for flasks of different length but once the adjustment has been made for a particular size of flask further adjustment will not be necessary until flasks of a different size are used. Slight variations in length between flasks of the same size will be taken care of by the spring pressure on the trunnion pins 28.

The rammer support although rising and falling with the flask carrier does not turn therewith, but normally maintains a fixed position over the table by reason of a spring catch 95 connecting hub 42 to cylinder 14. The latter is kept from turning by a key 96 engaging a spline groove 97 in the column 13. However, the latch 95 may be disengaged to permit of swinging the rammer head clear of the table when desired. Normally the rammer head is secured in inoperative position by the screw 72 with both of the slots 65 cut off from the air supply and the rammers disposed at right angles to the position shown in Fig. 1. Also the eccentrics 51 are turned to lift the rammer head as high as possible so that there is ample clearance under the rammers for positioning the flask. When the flask is ready for the ramming operation, the hand wheel 54 is operated to lower the rammer head and the latter is turned to such position that the peen heads 77 will enter the flask. This automatically admits air into the pipe 62 so that the entire gang of peen heads will be reciprocated to ram the sand in the flask. If desired, a valve (not shown) may be provided in the air line 71 to control the supply of air. While the peen heads 77 are operating the handles 63 are operated to oscillate the rammer head. Fig. 7 shows the rammers in one position ramming the sand at an angle parallel to one of the inclined walls 30*a* of the flask. The rammer head will gradually rise as the packed sand builds up in the mold. After the mold has been filled and thoroughly rammed with the peen heads, the rammer head is raised farther by operating hand wheel 54 and then the rammer head is turned over to bring the flat-head rammers into operative position. This automatically connects pipe 61 to the air supply and the heads 76 are operated so that on again lowering the rammer head the sand in the mold will receive its final ramming and tamping. The rammer head is again raised clear of the mold and rotated to cut off the air feed thereto and also to turn the rammers to horizontal position. Surplus sand is struck off the top of the flask section and a bottom board is then clamped upon the flask section in the usual manner. The keys 37 are now withdrawn and turned so as to clear the slots 38. Air is then admitted into the working chamber 19 and the flask carrier is thus raised, drawing the mold off the pattern. As the mold rises it rolls over by gravity on the axis of the trunnion shafts because said axis is below the center of gravity of the mold. Thus, the drag which is filled in inverted position turns automatically right side up. As the flask carrier rises, it is turned laterally by engagement of the roller 86 with the wall 84 of the cam slot 83. If the flask is too wide to roll over without striking the rammer head the keys 37 need not be withdrawn until the mold has been swung laterally clear of the rammer head. After the flask carrier has risen to the top of its stroke, air is exhausted from working chamber 19 permitting the carrier to descend (with roller 86 in slot 82) and deposit the drag on a suitable outside support. The trunnion pins 28 are now withdrawn from the flask by operating the handles 35 and the flask carrier is returned to the position shown in Fig. 1 by admitting air into the chamber 19 and then exhausting the air therefrom. Here another flask section has been positioned in the meantime and the trunnion pins are moved into engagement therewith.

The operation in case of a cope section is the same as that described above except that the keys 37 are not withdrawn from the trunnion shafts, so that the cope section will not roll over as it is drawn from the pattern.

While I have described a preferred embodiment of my invention it will be understood that this is to be taken as illustrative and not limitative, and I reserve the right to make various changes in form, construction and arrangements of parts without departing from the spirit and scope of my invention as set forth in the following claims.

I claim:

1. In a molding machine comprising, a table adapted to support a flask, a flask carrier adapted to raise the flask off the table and convey the same laterally to another support, and a carrier supporting a set of rammers and mounted to rise and fall with the flask carrier.

2. In a molding machine, a flask support, a flask carrier adapted to raise said flask off the table and convey it laterally to another support, a carrier supporting a set of rammers, and means for raising and lowering the rammers with respect to the rammer carrier and independently of the raising and lowering of the rammer carrier.

3. In a molding machine, a support for a flask, a rotatable rammer mounted above the support, means for moving the rammer into and out of operative relation with the flask, a feed line for supplying actuating fluid to the rammer, and a valve in the feed line controlled by rotary movement of the rammer, said valve remaining open during movement of the rammer through a predetermined angle in either direction from vertical position but closing as the rammer is moved beyond such angle toward horizontal position.

4. In a molding machine, a flask support, a rammer carrier disposed above said flask support, a sleeve mounted on said support to rotate about a horizontal axis, sets of rammers mounted on opposite sides of said sleeve, and means for bringing any desired set of rammers into or out of operative position with respect to said flask support.

5. In a molding machine, a flask support, a rammer carrier mounted above said flask support, a plurality of oppositely disposed different sets of power driven rammers rotatably mounted on said rammer carrier, a power feed line, and means intermediate said rammers and said power feed line to connect any desired set of rammers to said power feed line, or to disconnect any or all of said sets of rammers from said power feed line concomitantly with change of position of said rammers.

6. In a molding machine, a flask support, a horizontally disposed shaft mounted above said support, a sleeve rotatably mounted on said shaft and power driven rammers carried by said sleeve in operative relation to said support.

7. In a molding machine, a horizontally disposed vertically movable arm, a ram carrier carried by said arm, rammers carried by said ram carrier, and a cam mechanism associated with the outer end of said arm and said ram carrier for moving said ram carrier vertically with respect to said arm.

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