July 29, 1947. C. F. SCHERER ET AL 2,424,712

DRAW UNIT

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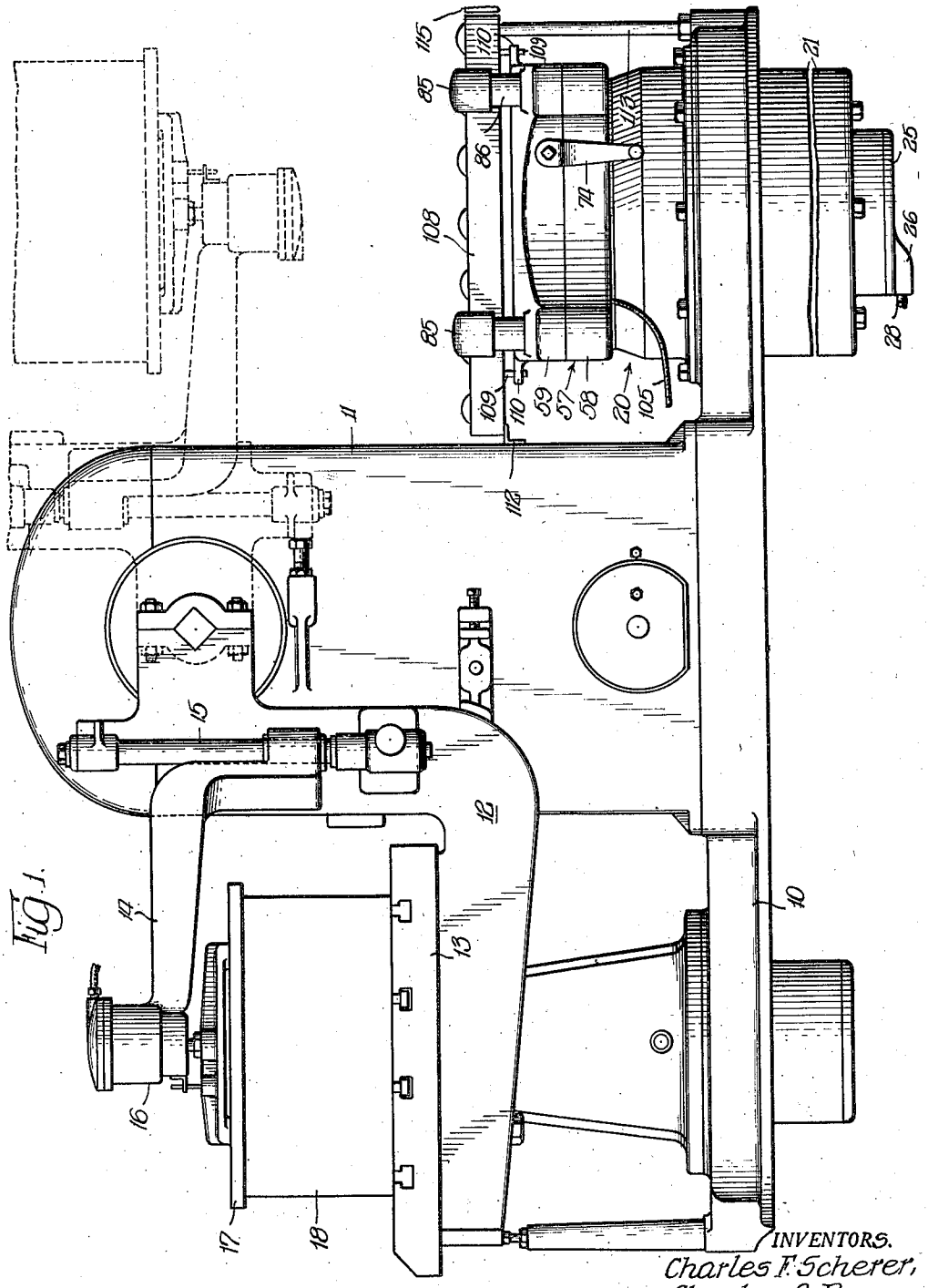


Fig. 1.

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Fig. 2

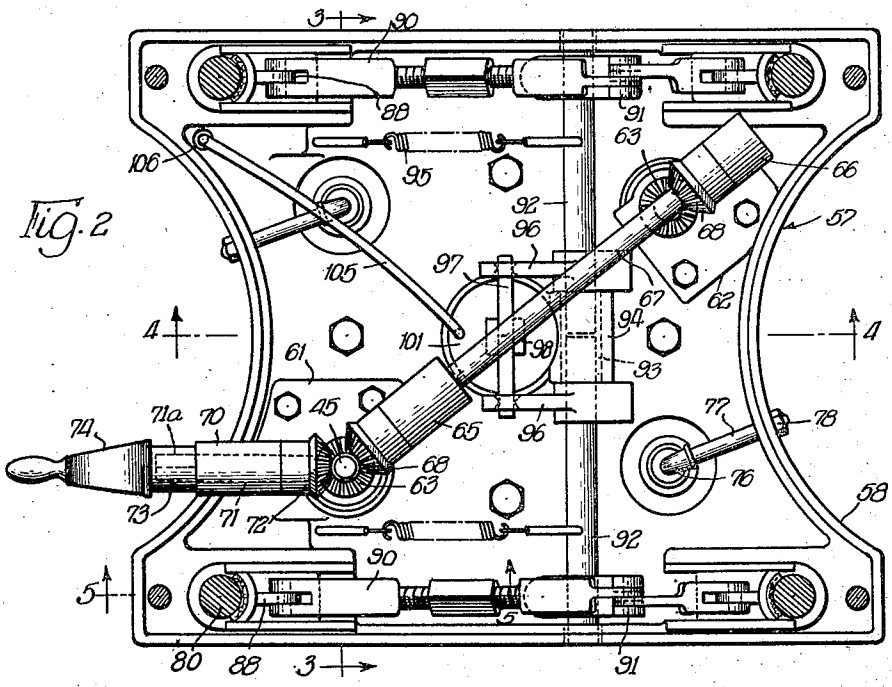


Fig. 5

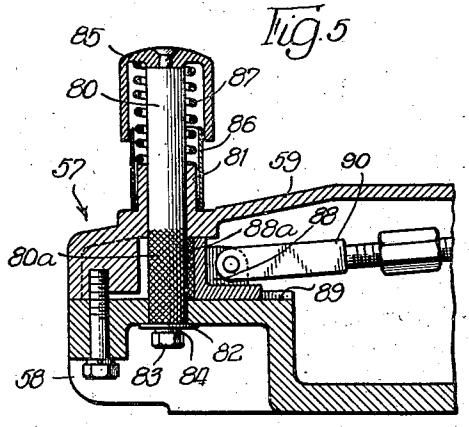


Fig. 6.

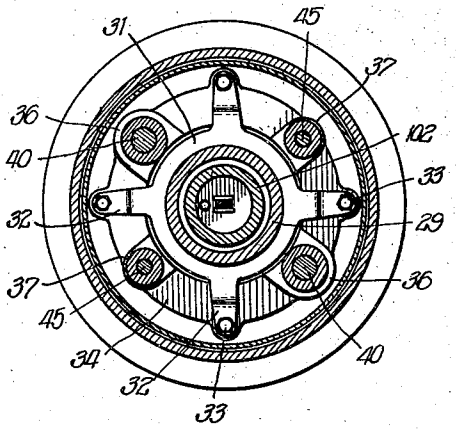
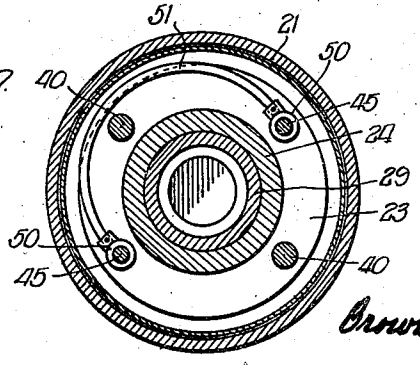


Fig. 7



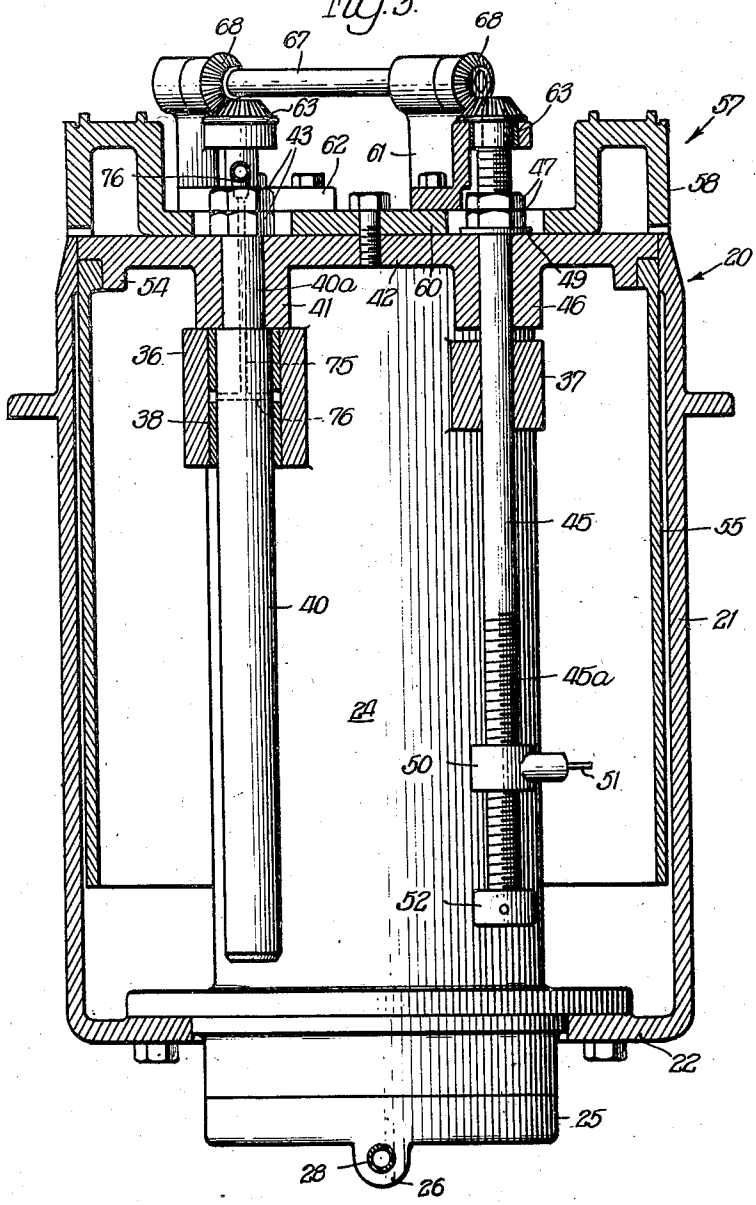
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Fig. 3.



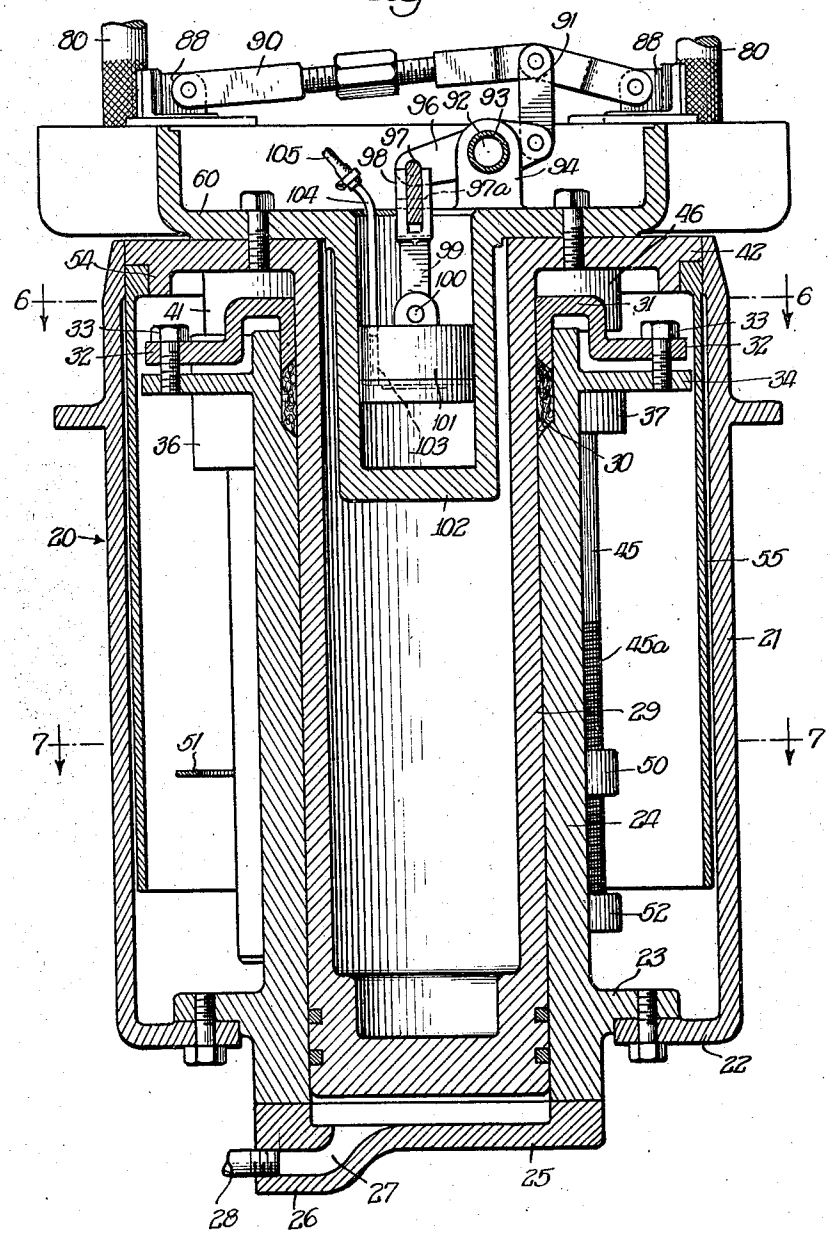
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Fig. 4



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UNITED STATES PATENT OFFICE

2,424,712

DRAW UNIT

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Application May 11, 1944, Serial No. 535,050

8 Claims. (Cl. 22—47)

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This invention relates to molding machines, and has to do with a draw unit for use in a molding machine in drawing or stripping the mold from the pattern.

It is known to provide rollover molding machines and associated draw units, in which the sand is packed, by jolting or otherwise, in a flask about the pattern secured to the table or pattern plate of the machine, the flask with the contained mold and pattern being then rolled over into position overlying the draw unit, the latter being then operated for drawing the mold; that is, moving the flask with the contained mold downward away from the pattern which remains in position secured to the pattern plate of the molding machine. The draw unit comprises a vertically movable piston provided at its upper end with a head carrying flask leveling and supporting means, stops being provided for limiting the upward travel of the piston. The flask leveling and supporting means includes spring cushioned equalizers which, in the upward travel of the piston, are brought into contact with the bottom board of the flask, these equalizers being then locked in position to assure that the flask is maintained level during lowering thereof. It is important that the upward travel of the piston be limited so that the equalizers do not contact the bottom board of the flask under objectionably high pressure such as would be apt to cause injury to the mold. To that end, stops are provided for limiting upward travel of the piston, these stops being adjusted manually. In draw units with which we are familiar, the stops are adjusted individually, and, in many instances, these stops are enclosed within the unit and difficult of access, so that considerable delay is encountered in effecting the desired adjustment. That is objectionable for obvious reasons.

Our invention is directed more particularly to a draw unit having adjustable stops and provided with means operable exteriorly of the unit whereby similar and simultaneous adjustment of the stops may be effected. More specifically, we provide screw shafts on which the adjustable stops are threaded, these shafts being carried by and movable with the piston, and being slidable and rotatable through fixed stops carried by the cylinder in which the piston operates, the screw shafts being rotatable in either direction by means within the hollow head at the top of the piston, such means including a member extending exteriorly of the head and readily accessible for effecting the desired adjustment of the stops. The screw shafts and the stops and associated

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parts, together with the cylinder, are disposed within a casing, the piston carrying a depending skirt operating through the top of the casing and providing a closure therefor in the movements of the piston, for preventing access of sand to the interior of the unit. This skirt depends from an outwardly extending flange at the upper end of the piston, which flange, in the retracted position of the piston, provides a closure for the upper end of the casing to prevent entry of sand thereinto. Further objects and advantages of our invention will appear from the detailed description.

In the drawings:

Figure 1 is a semi-diagrammatic side view of a rollover molding machine having applied thereto a draw unit embodying our invention, with certain parts broken away and showing fragmentarily and in dotted lines the flask supporting and clamping means and the flask carried thereby in rolled over position;

Figure 2 is a plan view, on an enlarged scale, of the draw unit with the cover of the head removed;

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 2, certain parts being shown in elevation and certain other parts being omitted for clearness of illustration;

Figure 4 is a sectional view taken substantially on line 4—4 of Figure 2, certain parts being shown in elevation and certain other parts being broken away;

Figure 5 is a vertical sectional view through one corner portion of the head of the draw unit, showing one of the flask equalizers and associated parts, certain parts being shown in elevation;

Figure 6 is a sectional view taken substantially on line 6—6 of Figure 4, on a reduced scale; and

Figure 7 is a sectional view taken substantially on line 7—7 of Figure 4, on a reduced scale.

We have shown the draw unit of our invention, by way of example, as applied to a jolt rollover molding machine of known type, a brief description of which will suffice. This machine comprises a base 10 from which extends a main housing 11 within which is disposed means for supporting and operating a pair of arms 12 carrying a pattern plate 13. Associated with arms 12 are clamp arms 14 adjustable on shafts 15 carried by the arms 12, suitable means being provided for turning the shafts 15 about their axes for swinging the arms 14 into operative position extending above the pattern plate 13 and into released position disposed laterally of plate 13 clear thereof. Each of the arms 14 car-

ries a pneumatic clamp 16 for contact with a cover or bottom board 17 positioned upon a flask 18 resting upon plate 13 about the pattern secured to plate 13 in a known manner. While but one arm 12 and associated parts has been shown, it will be understood that two arms 12 and two arms 14 and associated parts are provided in practice, as is known. The pattern is suitably secured upon the pattern plate 13, after which the flask 18 is positioned about the pattern and is filled with sand which is packed about the pattern by jolting, and, after the packing operation has been completed, the bottom board 17 is placed upon the flask, and this board and the flask 18 are then clamped tightly together and against the plate 13 by means of the pneumatic clamps 16. The arms 12 are then turned through an arc of 180° so as to position the flask 18 at the back of the housing 11, as indicated in dotted lines, the flask 18 and bottom board 17 then overlying the draw unit 20 in position for drawing the pattern by means of such unit.

Referring to Figures 3 and 4, the draw unit 20 comprises a cylindrical casing 21 having at its lower end an inwardly extending circumferential flange 22 upon the upper face of which seats a flange 23, formed integrally with and extending outward from a cylinder 24 disposed within casing 21 concentric therewith. Cylinder 24 extends downward a short distance beyond flange 22 and is closed at its lower end by a cap 25 provided with a boss 26 defining passage 27 opening into the lower end of cylinder 24, boss 26 being suitably threaded at its outer end for reception of a pipe 28 screwing thereinto and communicating with a suitable source of oil which, at the appropriate time, is forced into the lower end of cylinder 24 by air under suitable pressure, for forcing upward a piston 29 operating in the cylinder. It will be understood that the flanges 22 and 23 are secured together in any suitable manner, conveniently by bolting, and that the cap 25 is bolted or otherwise suitably secured to the lower end of cylinder 24, there being a gasket between this cap and the cylinder if desired.

Piston 29 is hollow for the major portion of its length and open at its upper end, and operates through a stuffing box 30 adjacent the upper end of cylinder 24, this stuffing box including a follower or gland 31 having outward extending L-shaped arms 32 secured by cap screws 33 to an annular web 34 integral with and extending radially outward from the cylinder 24 a short distance from the upper end thereof. Web 34 integrally connects two diametrically opposite bosses 36 formed integrally with cylinder 24 exteriorly thereof, and two diametrically opposite bosses 37 also formed integrally with cylinder 24 exteriorly thereof. Each of the bosses 36 has a bushing 38 secured therein (Figure 3) through which is slidably mounted a guide rod 40, the upper end portion 40*a* of which is of reduced diameter and passes through a boss 41 depending from a circumferential flange 42 integral with and extending outward from piston 29 at the upper end thereof. Two nuts 43 are screwed upon the upper end of portion 40*a* of rod 40, the lower nut bearing tightly against the upper face of flange 42, these nuts in conjunction with the shoulder at the lower end of reduced portion 40*a* of rod 40 effectively securing this rod against endwise movement relative to flange 42. It will be seen that the two rods 40 cooperate with the bosses 36 for guiding the piston 29 in the upward and downward movements thereof in cylinder 24.

Each of the bosses 37 is suitably bored and slidably and rotatably receives a shaft 45 passing through a boss 46 depending from flange 42. Two nuts 47 are screwed upon the upper portion of shaft 45, the lower one of these nuts seating upon a washer 49 which seats upon the upper face of flange 42, the nuts 47 and washer 49 restraining the shaft 45 against downward movement relative to flange 42. Each of the shafts 45 is threaded at its lower portion 45*a*, and there receives a stop member 50 in the form of a collar threaded on the shaft. The two stop members 50 are connected by a yoke member 51 passing about the cylinder 24 (Figure 7) and secured at its ends to the members 50, restraining the latter against rotation while permitting vertical adjustment thereof along the shafts 45 lengthwise of the latter in either direction, responsive to rotation of these shafts. It will be seen that the shafts 45 move with the piston 29 and that the stops 50 limit upward travel thereof by contact with the bosses 37, which constitute fixed stops. By rotating the shafts 45 in proper direction and to proper extent, the adjustable stops 50 may be adjusted in either direction and to any extent, within limits, so as to limit positively upward travel of the piston 29 as conditions require. Each shaft 45 is provided, at its lower end, with a stop collar 52 fixed thereon and effective for preventing screwing of the stops 50 off of the lower ends of the shafts 45.

The flange 42 corresponds in diameter to the interior diameter of casing 21 and fits snugly in the upper end thereof, when the piston 29 is in its fully retracted position, as in Figure 4, providing a closure for the upper end of the casing effective to prevent entry of sand thereinto. Flange 42 is provided with a depending concentric rib 54 spaced inward a short distance of flange 42, and a cylindrical skirt or sand guard 55 of considerable length is secured to rib 54 and extends downward therefrom into casing 21 concentric therewith, the outside diameter of skirt 55 corresponding to the inside diameter of the upper end of casing 21, that is, to the diameter of flange 42. The length of skirt 55 is such that it extends into the upper end of casing 21 when the piston 29 is in its maximum possible raised position, so that skirt 55 effectively closes the upper end of casing 21 in the movements of the piston and serves as a guard for preventing entry of sand into the casing with resultant abrasion of and injury to the parts therein. It will be seen that the guide rods 40 and the screw shafts 45 and associated parts are at all times effectively enclosed by the skirt 55 and the casing 21 so as to be guarded against access of sand to such parts.

Piston 29 is provided at its upper end with a head 57 comprising a lower portion 58 and a removable cover 59 therefor. The lower portion 58 is shaped as shown, and bottom wall 60 thereof seats upon and is bolted to flange 42. Suitably formed brackets 61 and 62 are bolted to bottom wall 60 of the head, and rotatably support bevel gears 63 secured upon the upper ends of the screw shafts 45. Bracket 61 is provided with a bearing sleeve 65 disposed in alignment with a bearing sleeve 66 carried by the bracket 62. A main adjusting shaft 67 is rotatably mounted in the sleeves 65 and 66 and has secured thereon bevel gears 68 meshing with the bevel gears 63 secured on the upper ends of screw shafts 45. Bracket 61 is further provided with a bearing sleeve 70 in

which is rotatably mounted a stub shaft 71 on the inner end of which is secured a bevel gear 72 meshing with bevel gear 63 secured on the upper end of the adjacent screw shaft 45. The outer end portion of stub shaft 71 is squared at 71*a* for reception of socket element 73 of a crank handle 74. The lower portion 58, of the head 57, and the cover 59 are suitably shaped to fit snugly about the sleeve 70, as will be understood, so as to prevent entry of sand into the head. It will be seen that by means of the stub shaft 71 and the crank handle 74, the screw shafts 45 may be rotated in either direction desired, from the exterior of the head 57, whereby desired adjustment of the adjustable stop 50 may readily be accomplished.

Referring to Figures 2 and 3, each of the guide rods 40 is provided with an axial bore 75 extending from the upper end thereof, intersecting at its lower end a diametrical bore 76. The upper end portion of bore 75 is of increased diameter, and is threaded for reception of a fitting 76 from which a tube 77 extends through the adjacent side wall of lower portion 58 of the head, this tube 77 receiving at its outer end a suitable fitting 78 of known type, by means of which grease or other suitable lubricant may be delivered from suitable pressure means through tube 77 and thence through the bores 75 and 76, to assure proper lubrication of shafts 40 and the associated bearing surfaces. It will be understood that any other suitable means for effecting lubrication of the moving parts may be provided.

A flask leveling and supporting rod 80 is slidably mounted in head 57 adjacent each corner thereof, this rod being slidable through cover 59 and through the lower portion 58 of the head. Cover 59 is provided with an upwardly extending neck 81 for guiding rod 80. Upward movement of rod 80 is limited by a washer 82 at the lower end thereof secured in position by a cap screw 83 with an intervening spring washer 84. A leveling or equalizer cap 85, of cup shape, is riveted on the upper end of rod 80, and, in the uppermost position of this rod, extends downward about the upper end of a guard tube 86 secured at its lower end about the neck 81, the tube 86 and cap 85 preventing entry of sand into either thereof about the rod 80. A compression spring 87 is disposed about the upper portion of rod 80 and confined between cap 85 and the upper end of neck 81, this spring normally holding rod 80 in its raised position shown in Figure 5. Each of the rods 80 has associated therewith a locking shoe 88 slidably mounted in a guide 89 conveniently formed integrally with lower portion 58 of the head. The shoes at the front of the head and the shoes at the back of the head are connected by toggle means 90, and each of the shoes is formed to fit about the lower knurled portion 80*a* of its associated rod 80, the shoe being provided with a suitable lining 88*a* for locking engagement with the rod.

The toggle means 90 is connected, at the hinge thereof, by a link 91, to a shaft 92 rockably mounted at its outer end in the wall of head portion 58 and, at its inner end, in a bearing sleeve 93 carried by a bracket 94 extending upward from bottom wall 60 of the head. The two shafts 92 are coaxial, as shown in Figure 2, and each has anchored thereto one end of a tension spring 95, the other end of which is anchored to the lower portion or section 58 of head 57. The tension springs 95 urge the shafts 92 in counterclockwise direction, as viewed in Figure 4, so as normally to maintain the toggles 90 broken and hold the locking shoes 88 in their retracted positions. Each of the shafts 92 is provided, adjacent its inner end, with an arm 96 secured thereon. A pressure bar 97 is pivoted at its ends in arms 96 and is pivoted, at its midlength, at 97*a*, in a slotted head 98 at the upper end of a rod 99 pivoted at its lower end, at 100, to a piston 101 operating in a cylinder 102 depending from plate 60 into the upper portion of the hollow piston 29. Piston 101 is provided with a bore 103 extending from top to bottom thereof and receiving, in its upper end, a tubular fitting 104 to the upper end of which is attached a flexible hose 105 which passes through an opening 106 in wall 60 and thence to a suitable source of supply of compressed air (not shown) having associated control valve means. By admitting compressed air to the cylinder 102 below piston 101, this piston is force upward so as to turn the two shafts 92 in clockwise direction, as viewed in Figure 4, and straighten or extend the toggles 90, forcing the shoes 88 into locking contact with the flask leveling rods 80, effective for locking the latter against axial movement. It will be understood that the machine has associated therewith a control column, as is usual, provided with control mechanisms, including suitable valves, whereby the operation of the various parts of the machine may be controlled.

When the mold has been formed about the pattern and the flask with the bottom board applied thereto has been clamped tightly in position on the pattern plate 13, the flask is rolled over into the dotted line position indicated in Figure 1 so as to overlie the draw unit, in the manner previously described. Oil under appropriate air pressure is then admitted to the lower end of cylinder 24, so as to raise the piston 29 and bring the equalizer caps 85 into contact with the bottom board 17 of the flask, upward travel of the piston 29 continuing until all of the caps 85 contact the bottom board 17. In that operation the caps 85 should not be brought into contact with the bottom board of the flask under objectionably high pressure, such as would possibly cause injury to the mold within the flask. Having brought the equalizer caps 85 into proper contact with the bottom board of the flask, the stops 50 are then adjusted, by rotating the screw shafts 45 in proper direction, so as to contact the bosses 37, thereby assuring that the upward travel of the piston 29 and the parts carried thereby will be stopped at the proper height for assuring contact of the caps 85 with the bottom board 17 without exerting undue pressure thereon. In the event the initial position of the stops 50 is such that the piston 29 does not have the required upward travel, stops 50 are adjusted downward along the shafts 45 to permit of such travel and, if necessary, are then adjusted so as to contact the bosses 37, as above. Once the stops 50 have been adjusted properly for a given height of flask, they may remain so adjusted so long as flasks of that height are used and assure that the leveling or equalizer caps 85 will be brought into proper contact with the bottom boards of the respective flasks, while avoiding subjecting the board to objectionably high pressure, in the manner noted. The ability to adjust the stops 50 in desired direction and to desired extent, from the exterior of the head of the draw unit, avoids any objectionable delay in effecting adjustment of the upward travel of the piston 29 and the parts carried thereby, which is conducive to operation of the draw unit with expedition and fa-

cility, the advantages of which are thought to be obvious. Likewise, after the desired number of molds have been made from a given pattern and it is necessary to change from flasks of one height to flasks of a different height, the stops 50 may readily be adjusted to suit the height of the flasks being used, with the advantages above referred to.

Preferably, the draw unit has associated therewith a roller conveyor section 108 provided with depending pins 109 operating through lugs 110 carried by cover 59 at the front and the back thereof, there being four such lugs, as will be understood. When piston 29 and head 57 carried thereby are in their lowered position shown in Figure 1, the conveyor section 108 rests at one end upon an angle strip 112 secured to the adjacent wall of housing 11 and, at its other end, on posts, one of which is shown at 113, secured to base 10 of the machine. When piston 29 is moved upward so as to bring the equalizer caps 85 into contact with the bottom board of the flask, these caps are depressed, moving the rods 80 downward in opposition to the compression springs 87. The equalizer caps 85 are then positioned between the clamp arms 14 and the clamps 16 carried thereby, with arms 14 straddling conveyor section 108 and disposed outward beyond caps 85, there being two sets of arms 12 and 14, as previously noted. Rods 80 are then locked against endwise movement, as above described, the clamp arms 14 and the clamps 16 carried thereby are then swung laterally clear of the flask and the bottom board, the flask is vibrated slightly in any suitable known manner so as to free it from the pattern, and the piston 29 is then permitted to move downward, by controlled reduction of the pressure exerted upon the oil supplied to the cylinder 24. When the head 57 reaches its lowered position shown in Figure 1, the bottom board of the flask rests upon the rollers of conveyor section 108, the caps 85 and the rods 80 being then in their depressed position to which they have been moved by pressure contact of the caps with the bottom board of the flask. The flask is then rolled off of the conveyor section 108 onto an aligned roller conveyor 115, shown fragmentarily in Figure 1, by means of which it is transported to any desired location. Thereafter, the compressed air within cylinder 102 is released and the shafts 92 are turned by the springs 95 so as to break the toggles 90, moving the shoes 88 into retracted position and permitting return of the rods 80 to their uppermost position. The draw unit is then conditioned for drawing a second mold, the operation described being repeated for each mold drawn.

It will be understood that changes in construction and arrangement of parts of our invention may be resorted to without departing from the field and scope thereof, and we intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only of our invention has been disclosed.

We claim:

1. In a draw unit, a casing and a cylinder therein, a piston operating in said cylinder having at its upper end a flange disposed to close the upper end of said casing in the retracted position of said piston and a hollow head provided with flask leveling and supporting means, said flange being provided with a depending skirt disposed outwardly beyond said cylinder telescoping said casing and fitting snugly through the upper end thereof in the travel of the piston

providing a guard effective for preventing entry of sand into said casing, fixed stops carried by said cylinder, movable stops carried by said piston cooperating with said fixed stops for limiting upward travel of said piston, and means within said head operable exteriorly thereof effective for adjusting said stops.

2. In a draw unit, a cylinder and a piston operating therein having a hollow head provided with flask leveling and supporting means, bosses fixed to said cylinder exteriorly thereof, shafts carried by said piston slidable and rotatable through said bosses, stops on said shafts cooperating with said bosses for limiting upward travel of said piston, said shafts and said stops having cooperating means for adjusting said stops lengthwise of said shafts upon rotation of the latter, and means within said head operable exteriorly thereof for rotating said shafts.

3. In a draw unit, a cylinder and a piston operating therein having a hollow head provided with flask leveling and supporting means, bosses fixed to said cylinder exteriorly thereof, screw shafts carried by said piston slidable and rotatable through said bosses, stops threaded on said shafts for adjustment lengthwise thereof and cooperating with said bosses for limiting upward travel of said piston, means restraining said stops against rotation, a main shaft mounted for rotation within said head and having driving connection to said screw shafts for rotating the latter in either direction, and means operable exteriorly of said head for rotating said main shaft.

4. In a draw unit, a cylinder and a piston operating therein having a hollow head provided with flask leveling and supporting means, bosses fixed to said cylinder exteriorly thereof, screw shafts carried by said piston slidable and rotatable through said bosses, stops threaded on said shafts for adjustment lengthwise thereof and cooperating with said bosses for limiting upward travel of said piston, means restraining said stops against rotation, a main shaft mounted for rotation within said head and having driving connection to said screw shafts for rotating the latter in either direction, and means operable exteriorly of said head for rotating said main shaft, said head comprising a lower portion and a removable cover therefor with said main shaft and said means carried by said lower portion and readily accessible by removal of said cover.

5. In a draw unit, a cylinder and a piston operating therein having a hollow head provided with flask leveling and supporting means, said head comprising a lower portion and a removable cover therefor, bosses fixed to said cylinder exteriorly thereof, screw shafts carried by said piston restrained against downward movement relative thereto and slidable and rotatable through said bosses, stops threaded on said shafts for adjustment lengthwise thereof and restrained against rotation, said stops cooperating with said bosses for limiting upward travel of said piston, a main shaft rotatably mounted within said head carried by the lower portion thereof, bevel gears secured on the upper ends of said screw shafts, bevel gears secured on said main shaft meshing with the gears on said screw shafts and cooperating therewith for restraining the latter shafts against upward movement relative to said piston, a stub shaft rotatably mounted within said head extending exteriorly thereof and carried by the lower portion of said head, and a bevel gear secured on said shaft meshing with the bevel gear secured on one of said screw shafts.

6. In a draw unit, a cylinder and a piston oper-

ating therein having a hollow head provided with flask leveling and supporting means, said head comprising a lower portion and a removable cover therefor, bosses fixed to said cylinder exteriorly thereof, screw shafts carried by said piston restrained against downward movement relative thereto and slidable and rotatable through said bosses, stops threaded on said shafts for adjustment lengthwise thereof, a yoke member extending about said cylinder connecting said stops and restraining them against rotation, said stops cooperating with said bosses for limiting upward travel of said piston, a main shaft rotatably mounted within said head carried by the lower portion thereof, bevel gears secured on the upper ends of said screw shafts, bevel gears secured on said main shaft meshing with the gears on said screw shafts and cooperating therewith for restraining the latter shafts against upward movement relative to said piston, a stub shaft rotatably mounted within said head extending exteriorly thereof and carried by the lower portion of said head, and a bevel gear secured on said shaft meshing with the bevel gear secured on one of said screw shafts.

7. In a draw unit, a cylinder and piston operating therein having a hollow head provided with flask leveling and supporting means, bosses fixed to said cylinder exteriorly thereof, screw shafts carried by said piston slidable and rotatable through said bosses, stops threaded on said shafts for adjustment lengthwise thereof and cooperating with said bosses for limiting upward travel of said piston, a yoke member extending about said cylinder connecting said stops and restraining them against rotation, and means within said head operable exteriorly thereof for rotating said shafts.

8. In a draw unit, a casing and cylinder therein,

a piston operating in said cylinder having at its upper end a flange disposed to close the upper end of said casing in the retracted position of said piston and flask leveling and supporting means, said flange being provided with a depending skirt disposed outwardly beyond said cylinder telescoping said casing and fitting snugly through the upper end thereof in the travel of the piston providing a guard effective for preventing entry of sand into said casing, fixed stops carried by said cylinder, rotatably mounted shafts carried by said piston slidable through said fixed stops, stops threaded on said shafts cooperating with said fixed stops for limiting upward travel of said piston, and means carried by said head for rotating said shaft.

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