Dec. 26, 1950 R. M. SMITH 2,535,656

APPARATUS FOR MAKING MOLDS

Filed Feb. 16, 1948 3 Sheets-Sheet 1

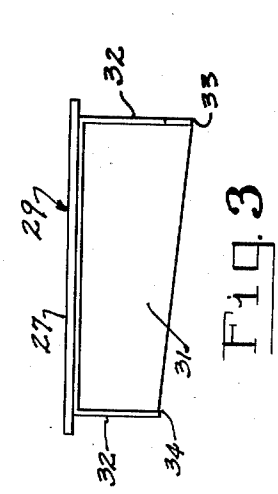

Fig. 3

Fig. 1

INVENTOR.
Richard M. Smith
BY
Harry L. Jennings
Attorney

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Filed Feb. 16, 1948 3 Sheets-Sheet 2

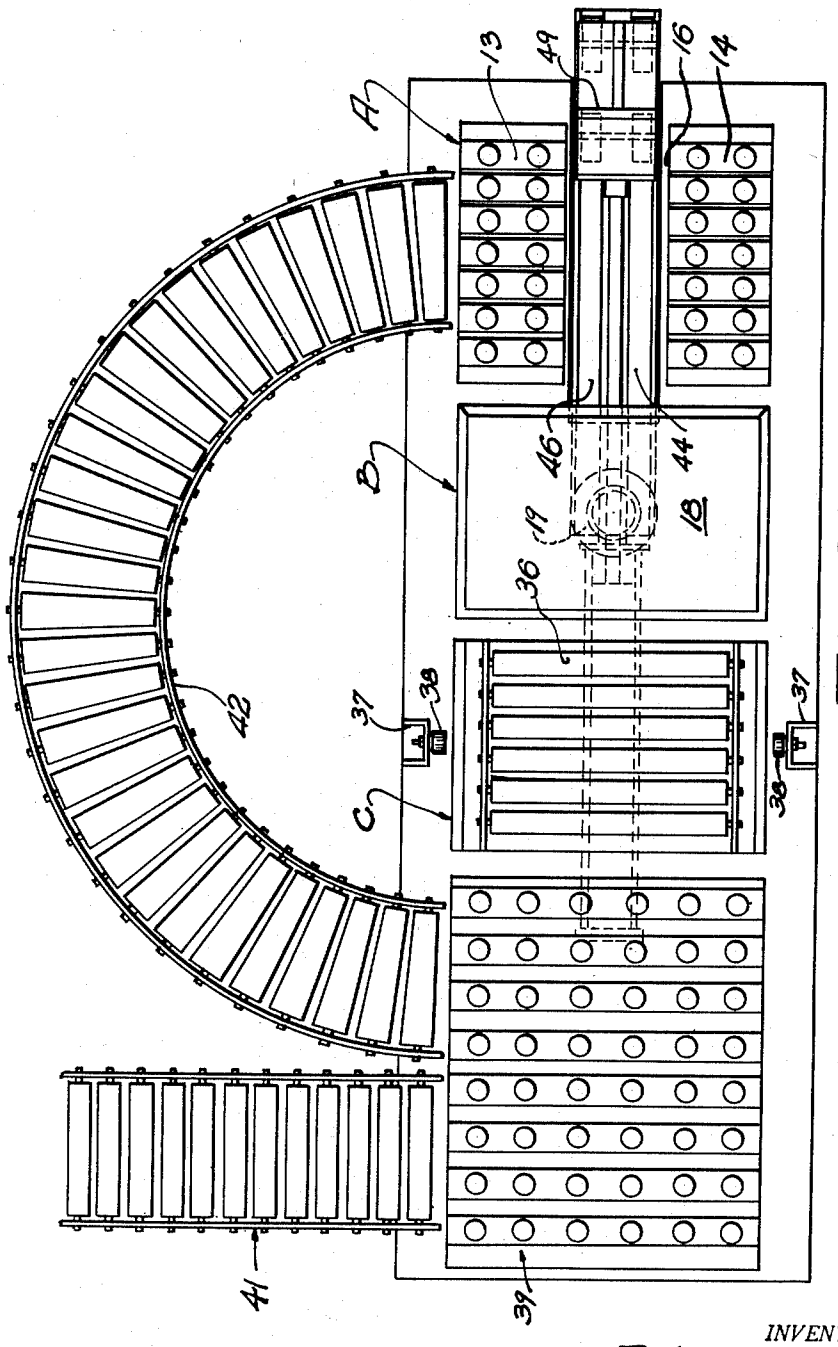

Fig. 2

INVENTOR.
Richard M. Smith
BY
Henry L. Jennings
Attorney

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Filed Feb. 16, 1948 3 Sheets-Sheet 3

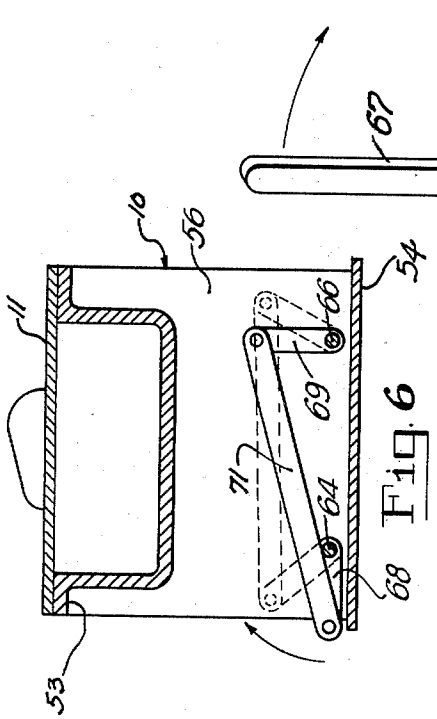

Fig. 6

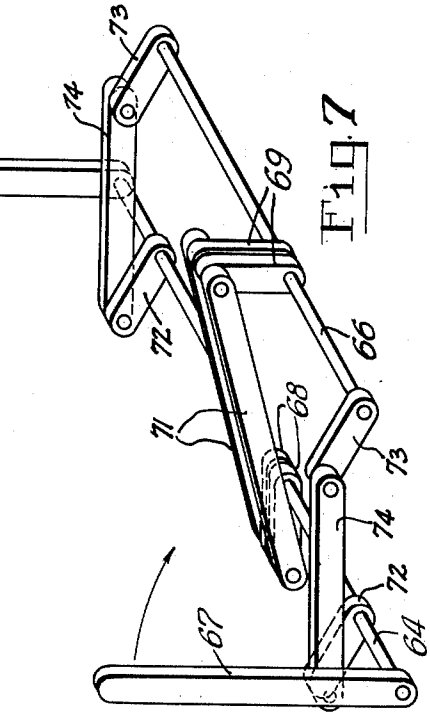

Fig. 7

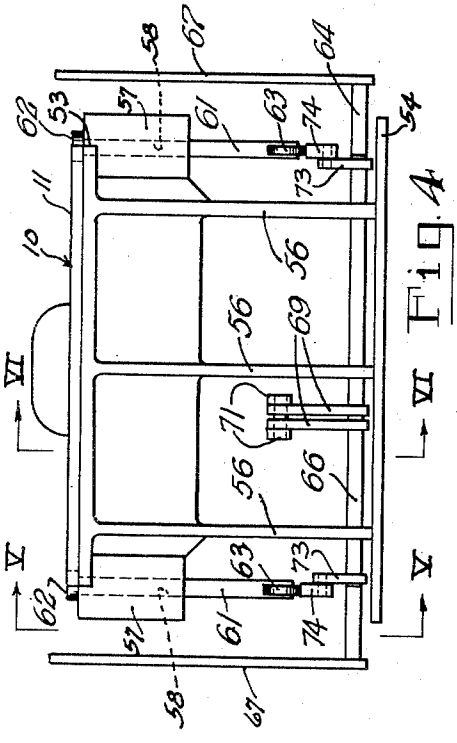

Fig. 4

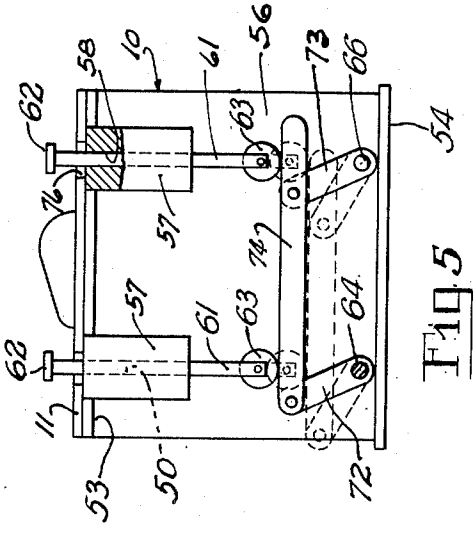

Fig. 5

INVENTOR.
Richard M. Smith
BY
Henry L. Jennings
Attorney

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2,535,656

UNITED STATES PATENT OFFICE

2,535,656

APPARATUS FOR MAKING MOLDS

Richard M. Smith, Tuscaloosa, Ala., assignor of fifty per cent to Leo E. Kiedinger, Birmingham, Ala.

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3 Claims. (Cl. 22—20)

1

My present invention relates to apparatus for the production of molds, and has for an object the provision of apparatus of the character designated embodying a plurality of flask supporting stripper units disposed to move successively from an initial station to a sand filling and jolting station, and thence to a disassembly or final station where the mold is stripped from the pattern, the movement of all of the units between stations being effected by a single piece of apparatus, such as a hydraulic or air cylinder.

Another object is to provide apparatus of the character designated in which the flasks pass successively from the initial to the final station with the upper edges of the flasks substantially in engagement, together with a pivoted strike-off member engageable with the top of each flask as it passes the jolting station, whereby the flasks are struck off and the excess sand thereon is deposited into the next oncoming, empty flask, thus eliminating sand spillage and the necessity of rehandling the same as has heretofore been the practice.

Another object is to provide improved flask supporting and stripping units disposed to receive and support interchangeably pattern plates carrying a cope or drag and embodying mechanism to effect a deep draw of the mold from the pattern, together with means to actuate said mechanism as the strippers carrying the packed flasks approach the final station of my improved apparatus.

Other objects are to provide apparatus of the character designated which shall be simple of construction and operation, and in which molds of high quality may be produced quickly and in large numbers with a minimum of skilled labor; in which a curved return roller conveyor connects the initial and final stations, thus providing means for readily returning the strippers and flasks for reuse; to provide an improved stripper unit in which the molds are stripped responsive to movement of the units, and embodying positively operable actuating mechanism for stripping the molds from the patterns after the molds are formed operable responsive to movement of the strippers.

Apparatus embodying the features of my invention is illustrated in the accompanying drawing forming a part of this application in which:

Fig. 1 is a fragmental sectional view of my improved apparatus showing a stripper unit on each station thereof;

Fig. 2 is a plan view with the stripper units removed and illustrating the arrangement of the

2

roller beds, the pressure cylinder for moving a line of stripper units from station to station, and the return conveyor for empty strippers;

Fig. 3 is a detached plan view of the pivoted strike off member;

Fig. 4 is an elevational view of my improved stripper unit with the flask raising pins thereof in lowered position;

Fig. 5 is a sectional view taken along line V—V of Fig. 4 and showing the flask raising pins in raised position;

Fig. 6 is a detail sectional view taken along line VI—VI of Fig. 4; and,

Fig. 7 is a detached perspective view of the linkage and operating levers for lifting the flask raising pins to strip the molds.

Referring now to the drawings for a better understanding of my invention, and more particularly to Figs. 1 and 2 thereof, my improved apparatus comprises three stations, A, B, and C. A plurality of aligned stripper units indicated generally by the numeral 10 and carrying pattern plates 11 and flasks 12, are disposed to move intermittently and successively from the initial station A to the intermediate station B, and thence to the final station C. Station A comprises a divided roller bed having sections 13 and 14 spaced apart to provide an opening 16 therebetween. The sections 13 and 14 preferably are of the ball type, and are supported by any suitable sub-framework 17.

Station B comprises a jolt table embodying a top plate 18 to which is operatively connected a suitable form of jolt mechanism, indicated by the numeral 19. The particular type of jolt mechanism forms no part of my invention as several suitable types will readily suggest themselves to those skilled in the art. Suitable controls for intermittently operating the jolting mechanism 19 may be provided, the same not being shown in the drawing.

Mounted in any suitable manner above the jolt table is a sand hopper 21. At the bottom of the hopper is a pair of pivoted sand gates 22, operatively connected to the piston rod 23 of a hydraulic or air cylinder 24, the other end of which is secured to a bracket 26 on a side of the hopper 21. Suitable controls and a source of air or fluid under pressure, not shown, are provided for moving the piston rod 23, thereby to open the gates 22 and discharge sand from the hopper into a flask positioned therebeneath.

Pivotally mounted on a rod or shaft 27 supported on any suitable framework 28 is an inclined strikeoff member 29. As best shown in

Fig. 3 of the drawing, the strike-off member is in the form of a trough having a bottom 31 and sides 32. The corner 33 of the bottom 31 adjacent the side 32 projects forwardly in the direction of inclination of the trough a greater distance than does the opposite corner 34. The reason for this construction will be presently explained.

Station C comprises a roller bed 36 which preferably is made of a plurality of cylindrical rollers. Mounted on either side of the rollers 36 of station C are upstanding members 37. Mounted on the sides of the members 37 adjacent the roller bed 36 is a roller 38. The rollers 38 are positioned in the path of certain actuating mechanisms presently to be described and cooperate therewith to raise the flask and mold upwardly from the pattern carried by the pattern plate 11, thereby to strip the mold.

Adjacent the station C is another roller bed 39 preferably formed of balls in sockets over which the stripper units pass after leaving station C. A roller conveyor 41 leads away from the section 39 and is disposed to transport finished molds to other stations, not shown, for subsequent treatment or pouring operations. A semi-circular conveyor 42 connects at either end with the initial station A and the roller bed 39. The stripper units 10 are returned to the station A over the conveyor 42 as will be explained later.

Disposed in a suitable pit 43 beneath the stations A, B, and C are tracks 44 and 46. A carriage 47 having rollers 48 mounted to reciprocate on the tracks 44 and 46 carries an upstanding plate 49 adapted to enter the space 16 between the sections 13 and 14 of the roller bed at station A. An air or hydraulic cylinder 51 has its piston rod 52 connected to the carriage 47 and affords means for reciprocating the same on the tracks 44 and 46. Suitable controls and a source of air or fluid under pressure, not shown, are provided to effect reciprocation of the piston within the cylinder 51. The upstanding plate 49 is adapted to engage behind a stripper unit 10 on the station A and push the same, together with the others on stations B and C, to the left as viewed in Figs. 1 and 2.

Referring now more particularly to Figs. 4 to 7 inclusive, each of my improved stripper units comprises a casting having upper and lower rectangular flanges 53 and 54 connected by vertically disposed ribs 56. The upper flange 53 is disposed to receive the pattern plate 11 carrying either the cope or drag section of a pattern. The lower flange 54 of each unit projects at the front and rear of the unit so as to abut the lower flanges of adjacent units when the units are moved by the plate on carriage 47. On each side of the stripper unit, adjacent the top flange, I provide a pair of bosses 57, each of which is drilled vertically as indicated at 58. Disposed in each of the openings 58 is a vertically movable pin 61 having an enlarged head 62. Each pin 61 carries a roller 63 on its lower end.

Adjacent the bottom of each of the stripper units 10 and extending transversely thereof through suitable bearings in the ribs 56 are front and rear shafts 64 and 66, respectively. The front shafts 64 extend outwardly past the sides of the unit as shown clearly in Fig. 4. On the outer end of the shaft 64 I secure levers 67, and adjacent the center of the shaft 64 I provide a pair of short arms 68. Adjacent the center of shaft 66, I provide a similar pair of short arms 69 and the arms 68 and 69 are cross connected by a pair of links 71. On the side of the stripper unit I provide each shaft 64 and 66 with a pair of short arms 72 and 73, respectively, and cross connect each of these pairs of arms by means of a link 74. The links 74 are disposed immediately beneath the rollers 63 at each side of the unit, and it will be apparent that upon upward movement of the links 74, the pins 61 move upwardly in the bosses 57. The arms 68 and 69 and their cross links 71 serve to transmit rotation of shaft 64 to the shaft 66 thus assuring that the arrangement of linkage does not become locked due to being positioned on dead center when the levers 67 are in vertical position.

From the foregoing the operation of my improved apparatus may now be readily explained and understood. The stripper units 10, pattern plate 11, and flasks 12 are assembled at the station A. As will be understood, the flasks are assembled in inverted position on the pattern plate 11 with the arms 67 raised to vertical position, thereby lowering the pins 61. The heads 62 of the pins pass through suitable openings 76 provided in the edges of the pattern plates, thereby to lie beneath the lower flanges of the flasks 12 in position to raise the same upwardly. With a thus assembled unit in position on station A, the hydraulic cylinder 51 is actuated to move the carriage 47 to the left as viewed in Figs. 1 and 2. The plate 49 engages behind the lower flange of the stripper unit 10 and moves the same to the left, off station A onto station B. A charge of sand is now placed in the flask 12 by opening the gates 22 and the jolt mechanism 19 is energized. The pivoted strikeoff member 29 is positioned on top of the flask 12 as shown in Fig. 1. The carriage is now moved to the right and another stripper unit carrying a pattern plate and flask is placed on station A. As soon as the mold occupying station B has been jolted sufficiently to pack the sand therein, cylinder 51 is actuated to move the carriage 47 again to the left. This action brings the lower flanges 54 of the stripper units 10 together and simultaneously the upper flanges 12*a* of the flasks 12 come as close together as possible without touching. The leftward moving carriage thus pushes the two units to the left. As the unit occupying station B moves to the left, the member 29 strikes off the flask and excess sand therefrom is deposited into the flask moving from station A to station B. The forwardly projecting corner 33 of the bottom 31 of the unit 29 bridges the gap between the flanges 12*a*, permitting the flasks to move thereunder. At the same time, the bottom 31 effectively strikes off the flask leaving station B. As the unit occupying station B moves to station C, the vertically disposed levers 67 engage the stationary rollers 38. This effects rotation of the forward and rear shafts 64 and 66 and causes the links 74 to move upwardly, thereby raising the pins 61. The pins engage the lower flanges of the flask 12, raising the flask upwardly and stripping the mold therein from the pattern carried on the pattern plate 11. The mold has thus been formed, packed, struck off, and stripped responsive to the movement from station A to station C. After the flask is raised and while still occupying station C, a workman engages a pair of lifting hooks 75 with the usual trunnions 77 carried on the flask and raises the same upwardly. While suspended from the lift mechanism, the flask is rolled over and deposited on the roller conveyor 41. The flasks preferably are of the snap type and the mold is stripped

therefrom while on the conveyor 41. The introduction of another unit into the line on station A and leftward movement of the entire line moves the unit from which the flask has been lifted onto the roller bed 39. The stripper units 10 carrying the pattern plates are now moved onto the semi-circular roller conveyor 42 from the roller bed 39, and the flask just released may be reassembled thereon at that point. The reassembled stripper unit carrying the flask and pattern plate is returned from station 39 to the initial station A for reuse, it being understood that in the process of reassembling the units the levers 67 are moved again to vertical position, thereby to lower the pins 61.

While I have not shown the same in the drawings, it will be obvious that suitable automatic stop means for positioning the units on the various stations may be provided if desired. However, in view of the fact that the jolt table comprising station B is a separate unit from the remainder of the apparatus, it will be apparent that the units do not tend to move about except when positively propelled. Likewise, the usual pins may be provided on the pattern plates for guiding the flasks while being moved upwardly to draw the mold.

From the foregoing it will be apparent that I have devised an improved mechanism for making molds which is considerably simplified and more efficient than apparatus heretofore employed for that purpose. It will be understood that the pivotally mounted strikeoff member 29 is positioned manually on top of the first flask to occupy station B, and that thereafter the same automatically maintains its strikeoff relation with respect to succeeding flasks, the forwardly projecting corner 33 aiding the same in bridging the gap between the upper flanges 12*a* of adjacent flasks. It will likewise be apparent that by connecting the forward and rear shafts 64 and 66 through the linkage shown, the levers 67 may be moved upwardly with a small amount of force to raise the flasks and strip the mold. By the arrangement of linkage shown, I am enabled to obtain a much deeper draw of the mold from the pattern than has heretofore been obtainable with a cam arrangement. It will be apparent that the depth of draw may be determined by the length of the arms 72 and 73.

While I have stated that I prefer to employ snap type flasks, it will be apparent that tight flasks may be used with equally advantageous results. If the latter are used, they are returned to the station A for reassembly on the stripper units by any suitable means, not shown.

I am aware that various types of machines have heretofore been proposed for the continuous production of molds. However, so far as I am aware, all of these machines embody some form of carrier such as chains or conveyors for pulling the flask carrying units from station to station. With the apparatus disclosed herein it is to be noted that the complete flask supporting unit is vibrated, and that the vibration is not transmitted to other units due to the absence of interconnecting members between the units.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In apparatus for making molds embodying a roller bed and a plurality of pattern plate and flask supporting units movable in contact with each other in a line along the roller bed, the combination of means to charge the flasks with sand, means supporting the flasks on said units with an upper edge of each flask as close as possible to an upper edge of adjacent flasks without touching, a strike-off member positioned above the line of units and having a lower edge engaging the top of each flask as the line of flasks moves thereunder, said strike-off member being in the form of a trough inclined upwardly from the direction in which the flasks move and mounted adjacent its upper end for pivotal movement in a vertical plane, thereby to scrape excess sand from the top of the flasks and deposit the same in the next rearward flask of said moving line of flasks.

2. Apparatus as defined in claim 1 in which the lower edge of the trough bottom engages the tops of the flasks and in which one corner of the lower edge of the trough bottom is longer than the other thereof as the trough is viewed in plan.

3. In apparatus for making molds, an initial station embodying a pair of roller beds spaced laterally apart providing an opening therebetween, a second station embodying a jolt table, a third station embodying a roller bed, all of said stations being in side by side relation and in alignment, flask and pattern supporting units movable successively from the initial station onto the jolt table and thence to the last station in contact with each other during movement and supporting the flasks with the top edges thereof as close together as possible without touching, an air cylinder embodying a reciprocable piston rod mounted beneath the jolt table, a pair of tracks, a wheeled carriage on the tracks connected to the piston rod, an upstanding member on the carriage disposed in the opening between the roller beds of the initial station and engageable with the unit occupying the initial station to move it and the units occupying the other stations to succeeding stations, means to fill the flask with sand while on the jolt table, a stationary strike-off member above the jolt table in the form of a trough inclined from its upper end toward the initial station and with the lower end engaging the tops of the flasks as they move thereunder to remove excess sand from the flask on the jolt table and deposit the same in the flask moving onto the jolt table, a roller bed adjacent the third station onto which the units move from the third station responsive to movement of the carriage, and a semi-circular conveyor connecting the last named roller bed and the initial station over which the units are returned to the initial station.

RICHARD M. SMITH.

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