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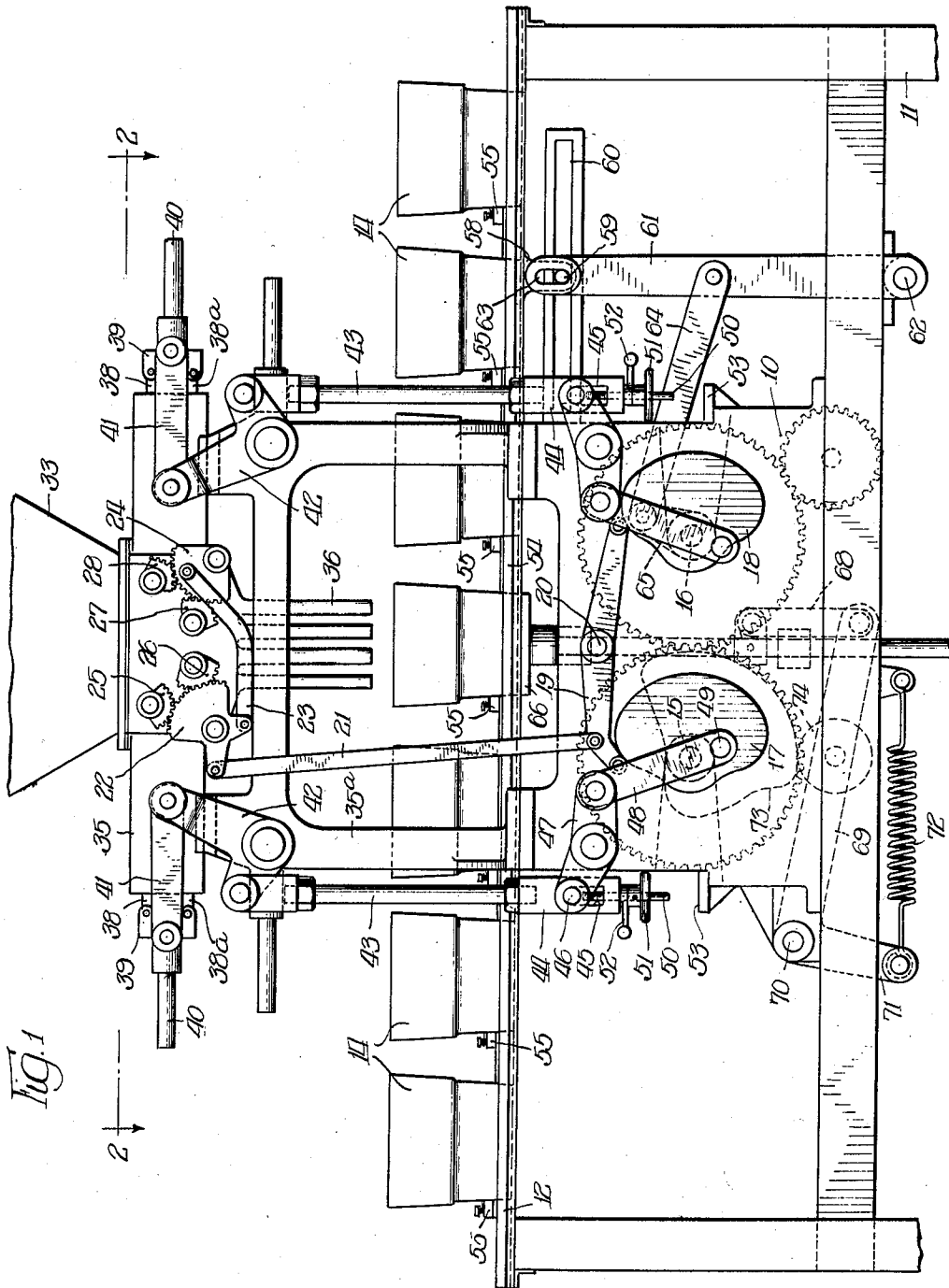
R. B. BAGBY

2,195,441

FILLING MACHINE

Filed March 2, 1939

3 Sheets-Sheet 1



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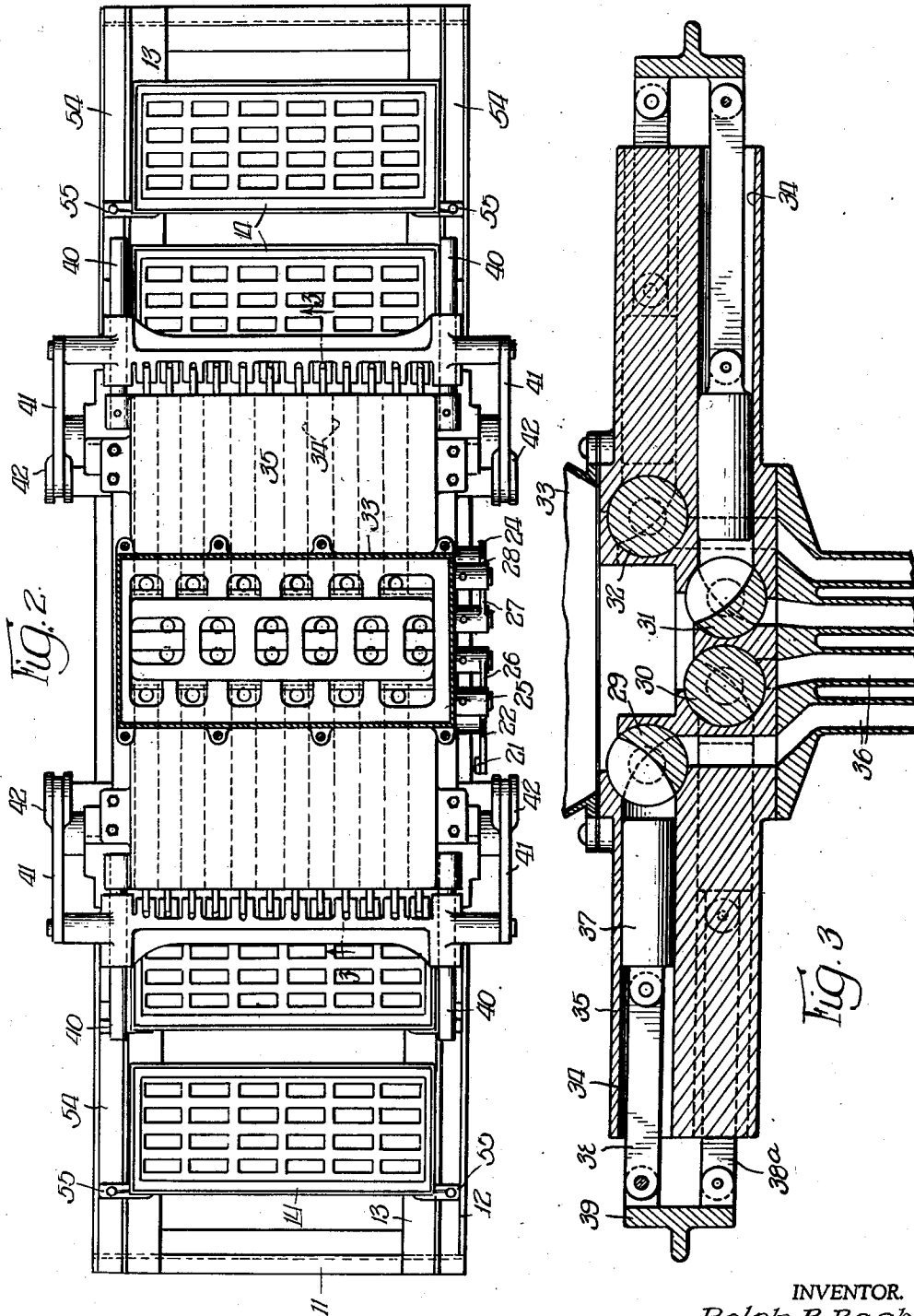
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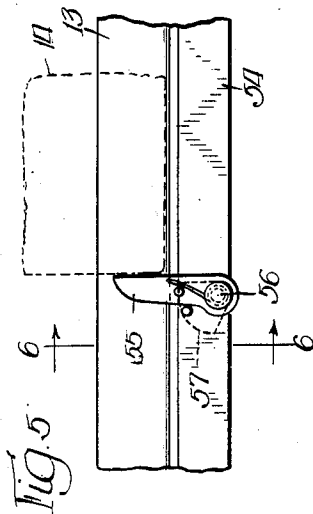
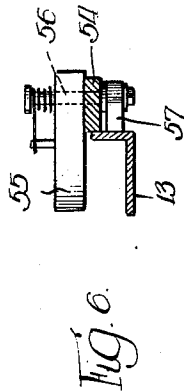
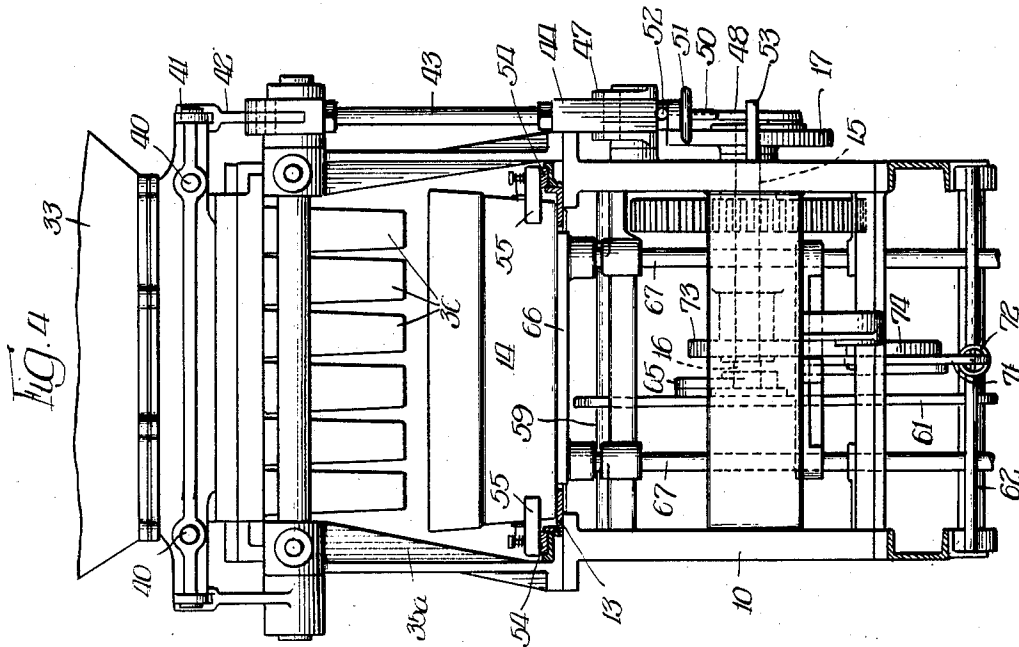
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FILLING MACHINE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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FILLING MACHINE

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Application March 2, 1939, Serial No. 259,321

16 Claims. (Cl. 226-107)

My invention relates to apparatus for filling receptacles, and particularly to a multiple filling machine in which a large number of receptacles are simultaneously filled.

In the manufacture of chocolate covered ice cream or other bars, such as "popsickles" and similar bars in which a wood stick is incorporated in the bar, it has been found necessary to reduce the cost of manufacture by substituting automatic for hand operations as far as possible. The vast number of such confections that are sold has called for the design of a filling machine that will automatically deliver into the receptacles in a tray, an exact quantity of ice cream or fruit juices and to do so at high speed.

The development of a machine of this character has involved more than the mere duplication of known filling units, since the space within which the various elements such as the cylinders, pistons and valves are to be located is limited, and it is impractical to construct a machine in which the discharge passages from the valves to the filling nozzles vary greatly in length. The resistance to travel in the passages and nozzles is considerable and where the outlet passages are of greatly different length the filling action will be uneven. In the construction here disclosed, I have overcome the objections to multiple filling devices of this kind by locating the pistons on opposite sides of a central point, over which the filling hopper is disposed, then locating the filling valves which are in the form of elongated plugs in close but staggered relation. In this way I am able to provide a machine that will fill twenty-four receptacles simultaneously, all within a small compass and so arranged as to continuously and rapidly fill the containers, formed as a part of trays, the only manual work being that of keeping trays supplied to the slideway.

Another improvement of importance relates to the construction of the stroke adjusting means for the piston. While it is old to provide a screw for varying the length of a slot in the connecting rod, I believe it to be new to provide means that will insure that the pistons cannot have a longer stroke than desired, due to hydrostatic pressure tending to move them farther out than intended or desired by the operator.

The invention will be more readily understood by reference to the accompanying drawings, in which;

Fig. 1 is a side view of a machine constructed in accordance with my invention;

Fig. 2 is a plan view with the hopper in section;

Fig. 3 is an enlarged sectional view on the line 3-3 of Fig. 2;

Fig. 4 is an end view, and

Figs. 5 and 6 are detail views showing the dogs provided at the entrance end of the slideway for the trays.

The machine is mounted on an integral base or frame indicated generally by the numeral 10 having supporting legs 11 and a platform 12 providing a slideway in the form of angle irons 13 to receive the trays 14. These trays are sheet metal structures having therein twenty-four oblong receptacles, as best shown in Fig. 2.

The apparatus is provided with two transverse shafts 15-16 geared together for operation in unison and driven by a pinion connected to a motor, not shown.

Connected to the overhung ends of the shafts 15-16 and located outside of the frame 10 are cams 17-18 that act on a rocker arm 19 pivoted at 20 to the frame and operating a link 21. The upper end of the link is connected to and serves to oscillate a gear sector 22 and, through a link 23, a duplicate gear sector 24. These sectors, respectively, engage smaller gear sectors 25-26 and 27-28, all secured to the outer ends of plug valves 29, 30, 31, 32, as best shown in Fig. 2, each of these valve plugs having spaced openings throughout their length for connecting the hopper 33 to the interiors of the cylinders, indicated generally by the numeral 34, there being twenty-four of said cylinders, all located within the casting 35 and staggered; that is, alternate cylinders are located in different vertical and horizontal planes; that is, the upper series of cylinders are in a horizontal plane above the lower series and likewise the upper and lower cylinders are in different vertical planes. In another position of the valves 29 to 32 the cylinders are placed in communication with the discharge outlets, four of which are shown in Fig. 3, which outlets communicate with discharge nozzles, indicated generally by the numeral 36 in Figs. 1 and 3.

The casting 35, which contains all of the twenty-four cylinders and the four valve plugs is carried on the superstructure 35a forming a part of the main frame 10.

It will be noted that by reason of the valve and cylinder arrangement shown, I am able to concentrate the parts within a very small space and thus reduce the length of the discharge outlets and render them substantially uniform as to length. By staggering the position of the cylinders and staggering the spacing of the valves as shown in Fig. 3, the operating parts are confined

within a small space at the center of the machine. This does not interfere with the ready removal of the valve plugs for cleaning, as required.

Each of the cylinders is provided with a piston, indicated generally by the numeral 37, a link 38 serving to connect the piston to a cross-head 39, each cross-head at the respective sides of the machine being connected to twelve pistons. The cross-head is mounted to slide on rods 40, the inner ends of which are fixed in bosses carried by the casting 35 and being operated through a link 41, bell crank 42 and connecting rod 43. Mounted on the lower end of the rod 43 is a block 44 having a slot 45 therein, adapted to receive the pin 46 of an operating arm 47. The arm 47 is oscillated through a link 48 which in turn is operated by the crank pin 49 arranged on the cam 17 or 18 as the case may be.

It will be noted that the lower series of six cylinders on each side are arranged to extend inwardly to within a distance from their plug valves which is the same as that of the upper series of cylinders; also that the pistons of the lower series are located farther inwardly to a corresponding degree. Thus the connecting rods 38a for the lower pistons are longer than the rods for the upper pistons. Thus all the pistons travel to the full end of their inward stroke, all adjustment being in the extent of backward travel.

Threaded within the block 44 is a screw member 50 adapted to be turned by a hand wheel 51 and held in position by a lock nut 52. This serves to vary the length of the slot 45 and thus to change the stroke of the piston. I have, however, provided an abutment or stop 53 that is engaged by the lower end of the screw 50, the screw coming into contact with the abutment at the low point in the stroke, regardless of the adjustment of the screw in the connecting rod. The effect of the adjustment of the screw is to vary the position of the connecting rod but not of the screw, the length of the stroke being positively limited in both directions. This avoids the difficulty of displacement of the piston due to hydrostatic pressure, particularly when the material is so heavy that pressure of some kind is necessary in the hopper in order to bring about adequate delivery.

The means for advancing the trays comprises a pair of bars 54, best shown in Fig. 4, having attached thereto at proper intervals the dogs 55 operated in the usual manner. That is, as the bars 54 are reciprocated the dogs give way to pass behind an oncoming tray, then to catch the tray and carry it along. However, at the entrance end—that is at the left as viewed in Fig. 1—the dog 55 has attached to its pivot pin 56 a rubber segment 57 that bears against the flange of the guide member 13 as the result of which the dog is positively moved to open and closed position as the slide moves backward and forward. Thus on the backward movement the dog is turned inwardly permitting a tray to be slid into position rather than requiring lifting over the dog.

The bars 54 are cross-connected at the right hand end of the machine by means of a cross bar 58 having a pin 59 which operates in a slot 60. An arm 61 pivoted at 62 has a slot 63 in its upper end which engages the pin 59, the arm being oscillated through a link 64 connected to a crank 65 mounted on the inner end of the shaft 16. Thus the trays are advanced one step for each cycle of the machine.

Since it is desirable that the trays containing the openings to be filled should be raised and lowered in accordance with the rate at which

the material is filled, I provide a platform 66, best shown in Fig. 4, underlying the space directly beneath the nozzles, this platform being raised through plungers 67 cross-connected and operated through a link 68 and the long arm 69 of a bell crank pivoted at 70. The short arm 71 is connected to a coil spring 72 which serves as the motivating force for elevating the platform and its contained tray. The platform is lowered to the position shown in the drawings through the cam 73, which bears on a roller 74 carried by the arm 69. The cam is so shaped as to bring about the lowering of the tray in accordance with the rate of delivery of the material to the receptacles; for the remaining considerable distance necessary to bring it out of the plane of the nozzles, the latter motion will be as rapid as possible.

The operation has been described in connection with the description of the apparatus. It may be helpful, however, to explain that the so-called trays are, in fact, molds, each containing twenty-four cavities in the lower half, the wall extended upwardly for a considerable distance being merely for protection against splashing of the refrigerating material, such as brine, within which the trays are placed in order that the molded material may be quickly frozen within the molds. However, before the material is frozen a frame carrying the requisite number of sticks or handles is lowered in such manner that the sticks project into the semi-fluid material as the result of which the sticks are frozen in place in the molds. After freezing, the lower portion of the trays or mold is inserted momentarily in warm water to loosen the frozen confection, whereupon the twenty-four bars are lifted out through the agency of the frame carrying the sticks, the bars being then dipped in chocolate, cooled and wrapped.

The operation of the machine is automatic, each tray or series of molds being raised so that the nozzle 36 enters the rectangular cavities shown in Fig. 2, whereupon the pistons are all simultaneously forced inwardly, ejecting the quantity of material theretofore drawn into the cylinders, the tray being lowered as the material is supplied. While this operation has been going on the bars 54 have been traveling rearwardly and as the tray is filled and lowered to its position of rest the dogs 55 have reengaged a series of trays and the entire series is moved forward placing another tray beneath the filling nozzles. While this movement has been taking place, the pistons have been returned to their outer positions, drawing into the cylinders a quantity of material from the hopper.

The machine is compact, relatively simple in construction, the valves and pistons may readily be removed for cleaning and in general the machine is capable of operation in such manner as to greatly reduce the cost of manufacture of articles such as described. It will be understood, of course, that while I have described the apparatus as designed for a particular operation, it is equally well adapted for multiple filling operations of all sorts and I do not wish to be limited except as indicated in the appended claims.

I claim:

1. In a multiple-outlet filling machine, the combination with a hopper and filling nozzles, of a plurality of valve plugs in parallel arrangement, each having a plurality of valve openings therein, said plugs, in transverse section, being arranged so that two thereof are staggered, both hori-

zonally and vertically, relative to two others of said plugs.

2. In a multiple-outlet filling machine, the combination with a hopper and filling nozzles of a plurality of valve plugs in parallel arrangement, each having a plurality of valve openings therein, means for actuating said plugs in unison, said plugs, in transverse section, being arranged so that two thereof are staggered, both horizontally and vertically, relative to two others of said plugs.

3. In a filling machine, the combination of a valve body, at least four parallel, elongated plug valve members in said body, each plug having a plurality of valve openings therein, said plugs being arranged, in transverse section, so that two thereof are in the same horizontal plane and two others are in a horizontal plane beneath the first two and in different vertical planes from said first two, and means for actuating said valve members.

4. In a filling machine, the combination of a valve body, at least four parallel, elongated plug valve members in said body, each plug having a plurality of valve openings therein, said plugs being arranged, in transverse section, so that two thereof are in the same horizontal plane and two others are in a horizontal plane beneath the first two and in different vertical planes from said first two, and means for actuating said valve members in unison.

5. In a filling machine, the combination of a valve body, a plurality of valve plugs mounted therein and arranged in parallelism, each of said plugs having a gear sector on an overhung end, a single gear sector engaging two of the gear sectors on said plugs, and a cam for oscillating said operating gear sector for rotating said plugs in unison.

6. In a filling machine, the combination with a valve body of at least four valve plugs seated in said body and rotatable therein, each of said plugs having a gear sector on an outer end, two interconnected operating gear sectors, each of which engages two of the sectors on the plugs, said operating gear sectors being interconnected, and a cam for oscillating said operating sectors.

7. In a filling machine, the combination of a body having two series of opposed cylinders bored therein, said member having a plurality of transverse bores and plug valves therein, each plug having openings registering with the cylinder bores in said member, pistons in said cylinders, a cross-head at each side of the member connecting all of the pistons, bell cranks for operating said cross-heads, connecting rods for operating the bell cranks, means for operating said connecting rods, and means for varying the effective length of said connecting rods.

8. In a filling machine, the combination of a piston and a valve, a connecting rod for operating the piston, an arm for operating the connecting rod, said arm engaging in a slot in the connecting rod, the length of which slot is variable through a screw member, and an abutment against which said screw member rests, whereby to limit the stroke of the connecting rod in one direction at any position of the screw member in the connecting rod.

9. In a filling machine, the combination of a cylinder and piston and a connecting rod for operating the piston, said rod having a slot, a screw member defining the length of the slot and serving to define the extent of inactive movement of the rod-operating means in said slot,

an abutment acting as a stop for said screw member, whereby to establish a fixed limit of movement of the rod in one direction.

10. In a machine for simultaneously filling a relatively large number of molds with a semi-fluid material, the combination of a body having at each of the opposite sides of a center line two series of cylinders each series being arranged in planes one above the other, valve plugs in said body, one for each series of cylinders and arranged perpendicular to said cylinders, each plug having valve openings corresponding to said cylinders, the pair of plug valves for the upper two series of cylinders being spaced from the center line a greater distance than the pair of plug valves for the lower series of cylinders, the inner ends of all the cylinders being at substantially the same point relative to their respective valves, pistons in all said cylinders, and means causing all said pistons to travel to the inner ends of all said cylinders regardless of stroke adjustment of said pistons.

11. In a machine for simultaneously filling a relatively large number of molds with a semi-fluid material, the combination of a body having at each of the opposite sides of a center line two series of cylinders, each series being arranged in planes one above the other, valve plugs in said body, one for each series of cylinders and arranged perpendicular to said cylinders, each plug having valve openings corresponding to said cylinders, means for actuating all said valves in unison, the pair of plug valves for the upper two series of cylinders being spaced from the center line a greater distance than the pair of plug valves for the lower series of cylinders, the inner ends of all the cylinders being at substantially the same point relative to their respective valves, pistons in all said cylinders, and means causing all said pistons to travel to the inner ends of all said cylinders regardless of stroke adjustment of said pistons.

12. In a machine for simultaneously filling a relatively large number of molds with a semi-fluid material, the combination of a body having at each of the opposite sides of a center line two series of cylinders, each series being arranged in planes one above the other, the individual cylinders in each series being vertically offset, valve plugs in said body, one for each series of cylinders and arranged perpendicular to said cylinders, each plug having valve openings corresponding to said cylinders, the pair of plug valves for the upper two series of cylinders being spaced from the center line a greater distance than the pair of plug valves for the lower series of cylinders, the inner ends of all the cylinders being at substantially the same point relative to their respective valves, pistons in all said cylinders, and means causing all said pistons to travel to the inner ends of all said cylinders regardless of stroke adjustment of said pistons.

13. In a machine for simultaneously filling a relatively large number of molds with a semi-fluid material, the combination of a body having at each of the opposite sides of a center line two series of cylinders, each series being arranged in planes one above the other, the individual cylinders in each series being vertically offset, valve plugs in said body, one for each series of cylinders and arranged perpendicular to said cylinders, each plug having valve openings corresponding to said cylinders, means for actuating all said valves in unison, the pair of plug valves for the upper two series of cylinders being spaced

from the center line a greater distance than the pair of plug valves for the lower series of cylinders, the inner ends of all the cylinders being at substantially the same point relative to their respective valves, pistons in all said cylinders, and means causing all said pistons to travel to the inner ends of all said cylinders regardless of stroke adjustment of said pistons.

14. In a machine of the class described, the combination of a casting containing four series of cylinder bores, two series being arranged on opposite sides of a transverse center line, the two series at each side being arranged one above the other and the cylinders of the lower series at each side terminating at a point nearer to said center line than the cylinders of the upper series, a plug, arranged parallel to said center line, for each series, said plug having a valve opening for each series, means for rotating said plugs to connect said cylinders alternately with a supply inlet and a discharge outlet, said plugs being located at the same point relative to the inner ends of the cylinders of all series, pistons in said cylinders, and means causing all said pistons to travel to the inner ends of the cylinders regardless of the length of stroke of the pistons.

15. In a machine of the class described, the combination of a casting containing four series of cylinder bores, two series being arranged on opposite sides of a transverse center line, the two series at each side being arranged one above the other and the cylinders of the lower series at each side terminating at a point nearer to said center line than the cylinders of the upper series, a plug arranged parallel to said center

line, for each of the four series, said plugs having a valve opening for each cylinder, means for rotating said plugs to connect said cylinders alternately with a supply inlet and a discharge outlet, said plugs being located at the same point relative to the inner ends of the cylinders of all series, pistons in said cylinders, means causing all said pistons to travel to the inner ends of the cylinders regardless of the length of stroke of the pistons, and means for positively limiting the extent of outward travel of the pistons.

16. In a machine of the class described, the combination of a casting containing four series of cylinder bores, two series being arranged on opposite sides of a transverse center line, the two series at each side being arranged one above the other and the cylinders of the lower series at each side terminating at a point nearer to said center line than the cylinders of the upper series, a plug arranged parallel to said center line, for each of the four series, said plugs having a valve opening for each cylinder, means for rotating said plugs to connect said cylinders alternately with a supply inlet and a discharge outlet, said plugs being located at the same point relative to the inner ends of the cylinders of all series, pistons in said cylinders, means causing all said pistons to travel to the inner ends of the cylinders regardless of the length of stroke of the pistons, and means for positively limiting the extent of outward travel of the pistons, one adjusting means being provided for all of the pistons on each side of the center line.

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