Feb. 6, 1951 F. W. KRUEGER 2,540,741

FILLING MACHINE

Filed Feb. 13, 1948 4 Sheets-Sheet 1

FIG_2

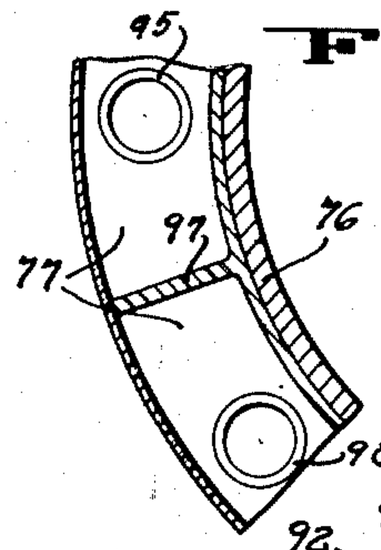

FIG_1

INVENTOR
FRANK W. KRUEGER

BY Philip A. Minnis
Hans G. Hoffmeister
ATTORNEYS

Feb. 6, 1951 F. W. KRUEGER 2,540,741

FILLING MACHINE

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FIG_3

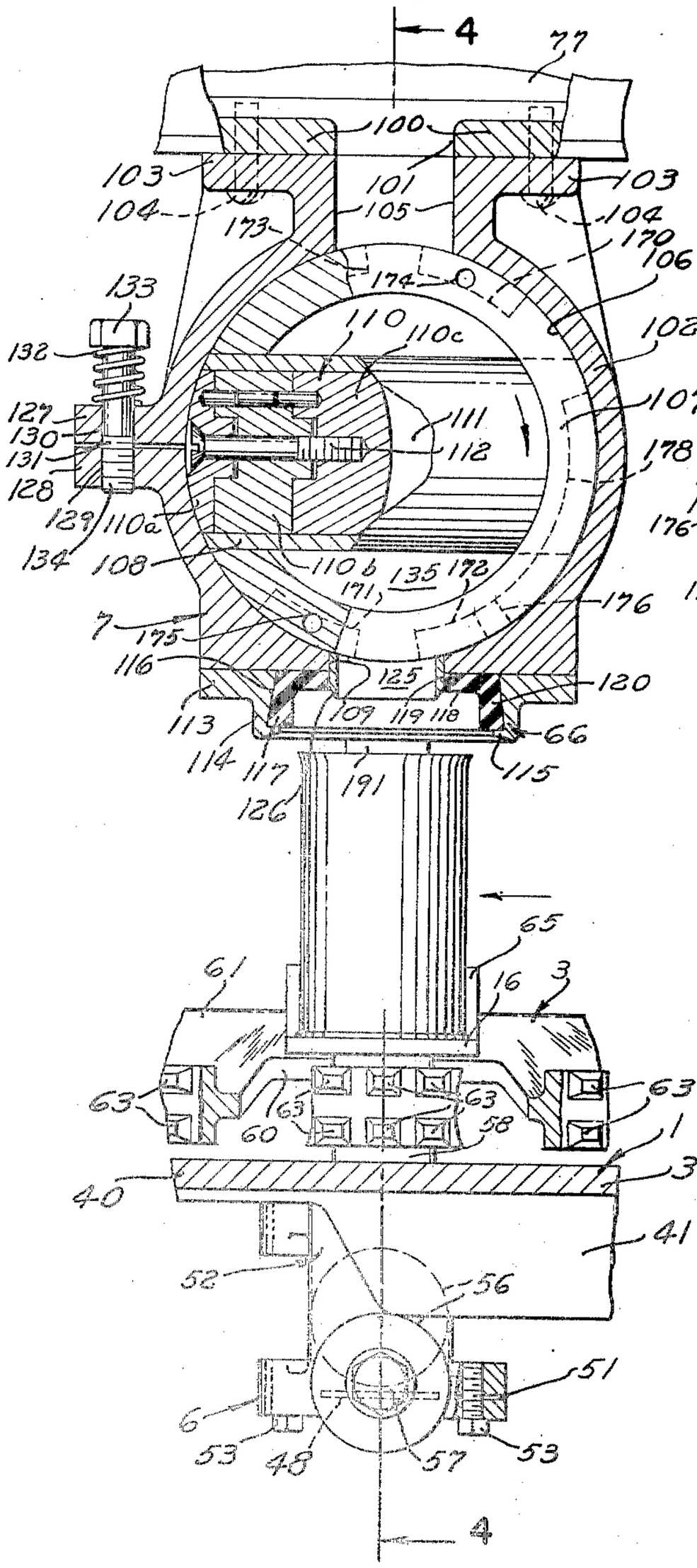


FIG_5

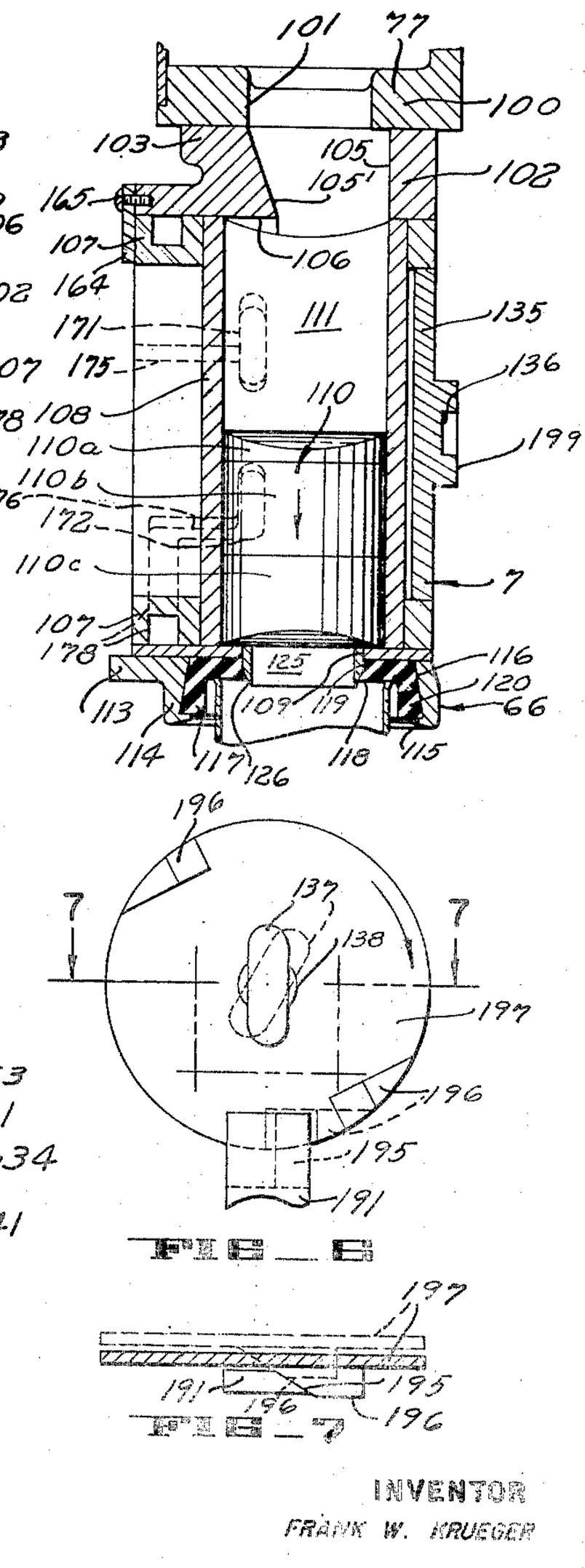


FIG_6

FIG_7

INVENTOR
FRANK W. KRUEGER

BY Philip A. Minis
Hans G. Hoffmeister
ATTORNEYS

Feb. 6, 1951 F. W. KRUEGER 2,540,741

FILLING MACHINE

Filed Feb. 13, 1948 4 Sheets-Sheet 3

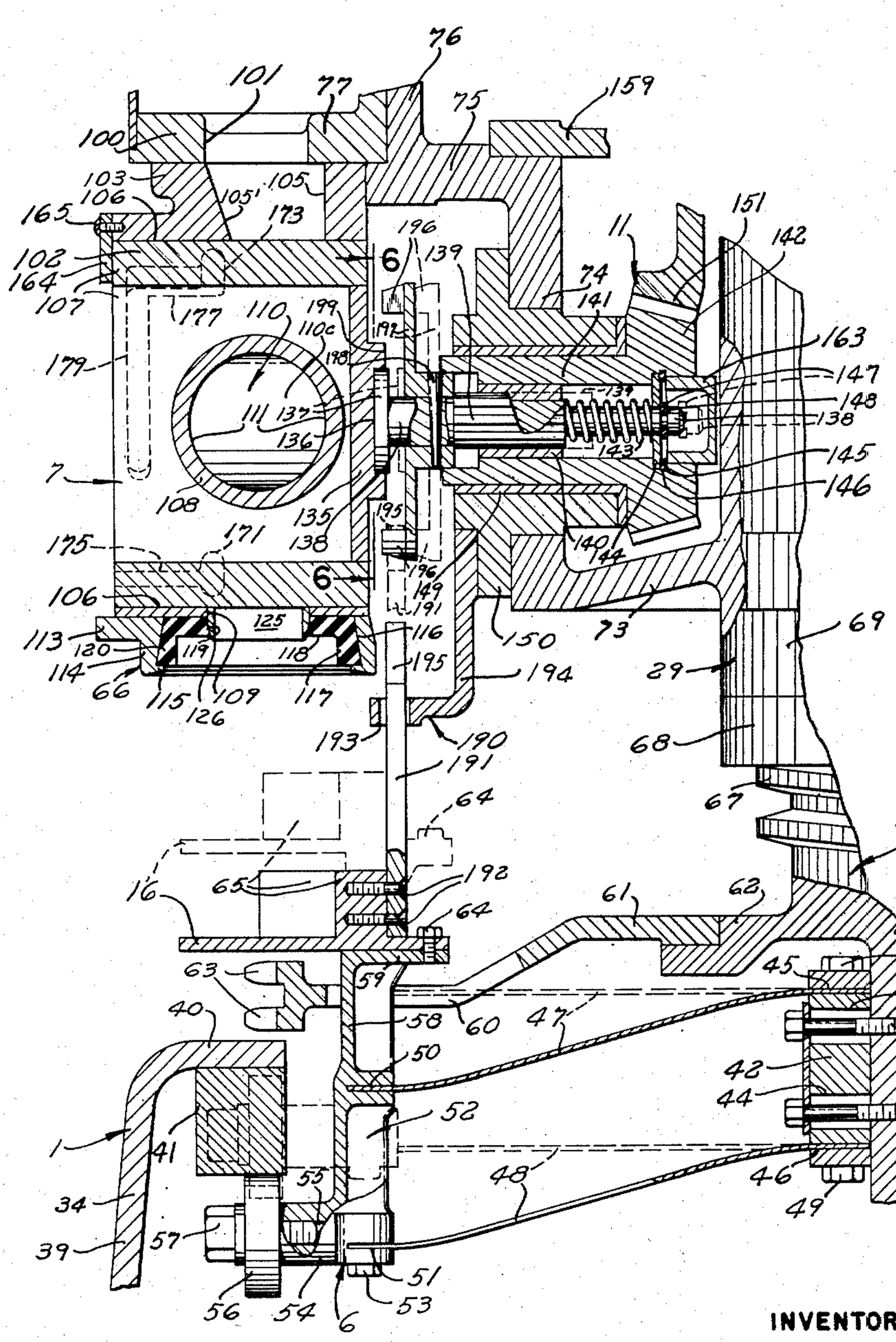


FIG_4

INVENTOR
FRANK W. KRUEGER

BY Philip A. Mennies
Hans G. Hoffmeister
ATTORNEYS

Feb. 6, 1951 F. W. KRUEGER 2,540,741

FILLING MACHINE

Filed Feb. 13, 1948 4 Sheets-Sheet 4

FIG_9

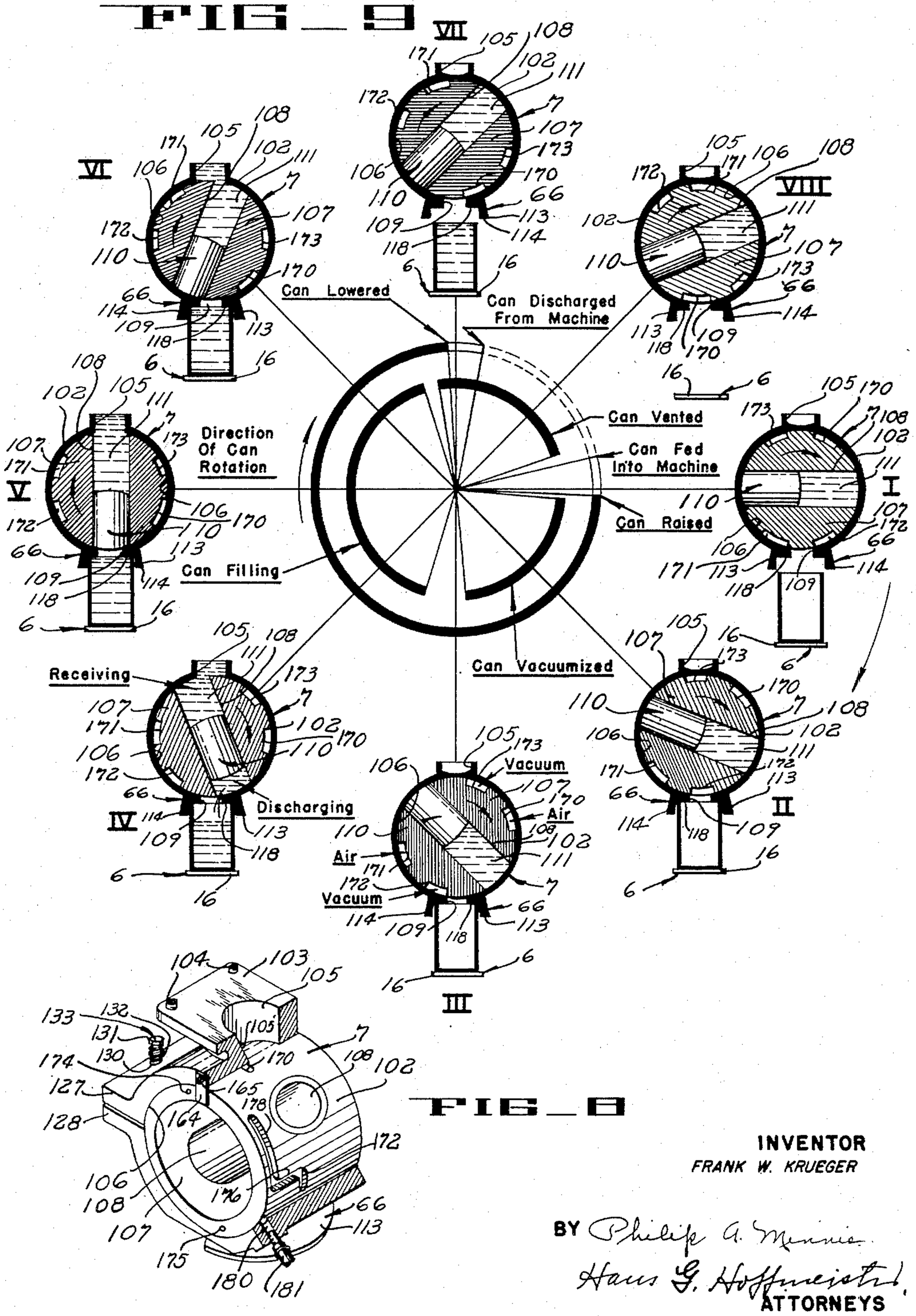
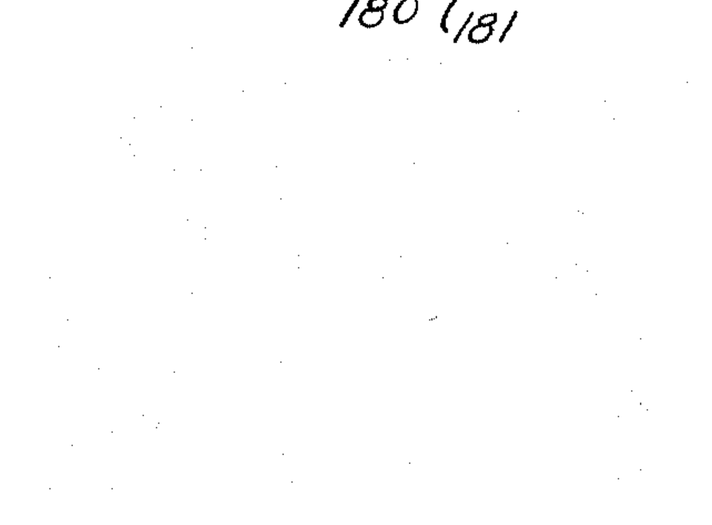


FIG_8



INVENTOR
FRANK W. KRUEGER

BY Philip A. Minnis
Hans G. Hoffmeister
ATTORNEYS

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UNITED STATES PATENT OFFICE

2,540,741

FILLING MACHINE

Frank W. Krueger, Saratoga, Calif., assignor to Food Machinery and Chemical Corporation, a corporation of Delaware

Application February 13, 1948, Serial No. 8,125

13 Claims. (Cl. 226—116)

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This invention relates to filling machines and more particularly to vacuum type filling machines for filling containers at high speed.

The machine of the present invention is especially adapted for filling containers with liquids, viscid substances, and pasty or semi-plastic materials.

It is one object of this invention to provide a filling machine which is simple in construction and highly efficient in use.

Another object is to provide a machine by which accuracy of filling may be attained irrespective of the speed at which the filling operation is performed.

Another object is to provide a filling machine having constantly driven filling valves operable in timed relation with a can conveyor and-elevator for filling cans in a minimum of time.

Another object is to provide a filling machine having flexible can supporting arms for presenting a can to the filling valve of the machine.

Another object is to provide a filling machine with a filling valve which is operable contingent upon the presentation of a container thereto.

Another object is to provide a filling machine having a filling valve which operates to refill itself simultaneous with the discharge of a previously received quantity of substance therefrom.

Another object is to provide a filling valve of the plunger type for accurately measuring the quantity of substance to be filled into a container and for effecting a complete discharge of such measured quantity of the substance into a container.

Other objects and advantages will become apparent from the following description in connection with the drawings in which:

Fig. 1 is a vertical section through a filling machine embodying the present invention.

Fig. 2 is a fragmentary section taken along line 2—2 in Fig. 1.

Fig. 3 is a vertical section taken along line 3—3 in Fig. 1.

Fig. 4 is a detail section through the mechanism shown in Fig. 3 and taken along line 4—4 thereof.

Fig. 5 is a section through a portion of the filling valve shown in Figs. 1 and 4, with certain parts thereof shown in a different position.

Fig. 6 is a detail of a control mechanism, partly in section, taken along line 6—6 in Fig. 4.

Fig. 7 is a section through Fig. 6 taken along line 7—7 thereof, certain parts being shown in a different position.

Fig. 8 is a perspective view of the filling valve

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of Figs. 3, 4, and 5 with parts thereof broken away for purposes of illustration.

Fig. 9 is a diagram illustrating the various phases of the operation of the filling machine.

The filling machine of the present invention (Fig. 1) generally comprises a base 1 supporting an arbor 2 upon which a turret 3 is mounted for rotation. The turret 3 carries a plurality of lifts 6 and a corresponding plurality of filling valves 7, the latter of which are supplied with the product to be fed into containers. The valves 7 are each drivingly coupled to an epicyclic train 11 operatively associated with the turret 3 and the latter is driven by a gear 13 which meshes with a pinion gear 14 secured to a drive shaft 15. The shaft 15 is driven by any suitable power transmitting mechanism, not shown, so that the turret 3 and its associated parts rotate about the arbor 2.

The lifts 6 are each provided with a can table 16 adapted to receive a can from a feed mechanism (not shown) when the lift is in its lowermost position, the lift subsequently effecting elevation of the can into sealing engagement with the filling valve 7 associated therewith for the reception of a charge of the product to be fed. After receiving a charge of the product, the cans are lowered one after another by the lifts 6 and the cans are then discharged from the filling machine in a manner well known in the art.

The base 1 of the machine (Fig. 1) consists of a pedestal 20 which may be provided with legs or the like, not shown, for supporting the pedestal upon a floor or bench. The pedestal includes a disc portion 21 provided with a central sleeve 22 into which the reduced lower end of the arbor 2 fits to secure the arbor in an erect position above the pedestal.

The arbor 2 is provided with a shoulder 23 which rests upon the upper surface 24 of the sleeve 22 and a thrust bearing 25 fits over the enlarged portion 26 of the arbor so as to rest upon the surface 24 of the sleeve 22.

The turret 3 is so constructed as to provide two main parts, namely, a spindle portion 28 which rests upon the thrust bearing 25 and a carriage portion 29 which is adjustably mounted on the spindle 28 so that it can be raised or lowered with respect to the spindle for reasons later to become apparent.

The spindle 28 of the turret is provided with a bearing 30 at its lower open end which fits over the enlarged portion 26 of the arbor and rests upon the thrust bearing 25. The upper portion of the spindle is provided with an interior flange 31 in which is supported a ball bearing unit 32

having its inner race encircling the arbor 2 for supporting the spindle concentric with respect thereto. The gear 13, hereinbefore mentioned, is secured to the lower portion of the spindle 28 by a key 33 so that the gear 13 and spindle 28 rotate as a unit about the arbor 2.

As clearly illustrated in Fig. 1, the base 1 of the machine includes a casting 34 secured to the pedestal 20 in any suitable manner and formed to provide a housing 35 around the gear 13 and pinion gear 14. The drive shaft 15 for the pinion gear extends through a bearing box 36 supported in the side wall of the casting 34 and a pair of spaced ball bearings 37 and 38 are arranged within the box 36 for rotatably supporting the drive shaft. The casting 34 is also provided with an upstanding wall 39 above the upper wall of the housing 35 and the wall 39 has an inturned flange 40 to which an annular cam 41 is secured.

The lifts 6, hereinbefore referred to, are radially disposed around the mid-portion of the spindle to which they are secured in a manner now to be explained. Each lift comprises a mounting bracket 42 secured to the spindle by a pair of bolts 43 extending through vertical slots 44 in the bracket 42 to permit adjustment of the brackets vertically on the spindle. Each bracket is provided with spaced horizontal slots 45 and 46 adjacent its upper and lower ends, respectively, and a pair of flat springs 47 and 48 have their inner ends disposed in the slots 45 and 46, respectively. The springs 47 and 48 are clampingly secured to the bracket 42 by bolts 49 so as to extend radially relative to the spindle and in spaced parallel relation with respect to each other.

The opposite or outer ends of the springs 47 and 48 extend into slots 50 and 51, respectively, formed in a casting 52 and are secured to the same by bolts 53 so that the casting 52 is supported in a vertical position, in parallel relation with respect to the spindle 28. The casting 52 has a boss formation 54 extending further radially with respect to the spindle and this boss is provided with a tapped bore 55. A roller or wheel 56 is rotatably mounted on a bolt 57 and the reduced end of the latter is threaded into the tapped bore 55 for securing the wheel 56 to the casting 52 for rotation with respect thereto.

The wheel 56 is disposed to engage the annular cam 41 secured to the flange 40 of the wall 39 and when the wheel is depressed by engagement with the deep portion of the cam 41, the springs 47 and 48 will be flexed in parallelism. Consequently, and by reason of the spaced relation of the springs 47 and 48, the outer ends thereof and the casting 52 secured thereto will remain in a vertical position during up and down movement thereof. Although flexing of the springs 47 and 48 causes the casting 52 to move laterally while moving up or down, it will be noted that the change in lateral disposition of the casting 52 during its movement is slight and will not materially affect the result sought to be obtained by raising and lowering of the casting.

The casting 52 is provided with a bracket 58 having an inturned flange 59 which extends upwardly through an opening 60 formed in a disc 61 secured to an annular flange 62 of the spindle 28. The periphery of the disc 61 is provided with sprocket teeth 63 adapted to be associated with a conveyor chain, not shown, provided with lugs projecting through a slotted feed table, not shown, for engaging and feeding containers toward and away from the turret 3 in a conventional manner.

The can table 16, hereinbefore mentioned, is secured by bolts 64 to the flange 59 formed on the bracket 58 of the casting 52 and when the wheel 56 is depressed by the cam 41 in the manner explained above, the can table will be disposed slightly above the sprocket teeth 63 for receiving the container from or for discharging the container onto the conveyor associated with the sprocket teeth 63 in a manner well known in the art.

The can table 16 is provided with a back rail 65 for centering a container on the table as the container is received from the feed conveyor so that the open upper end of the container will register with and have sealing engagement with a sealing cap 66 of the filling valve 7 associated with the lift 6.

The upper portion of the spindle 28 is provided with a threaded outer wall 67 and has a locking ring 68 threadedly arranged thereon. The carriage portion 29 of the turret 3 is provided with a central body 69 having internal threading 70 adapted to fit the thread on the outer wall 67 of the spindle so that the carriage 29 can be adjusted relative thereto for properly spacing the sealing cap of the filling valve 7 from the can table 16 for the reception of one or another size of standard container therebetween. When the central body 69 of the carriage 29 has been set at the desired position of adjustment on the threaded wall 67 of the spindle, the locking ring 68 is turned up against the lower edge of the body 69 to secure the latter to the spindle for rotation therewith.

The central portion of the carriage has a laterally extending disc 73 formed therewith and the disc 73 has an upstanding annular wall 74 at its periphery. This wall 74 has a lateral flange 75 at its upper end and the outer end of this flange 75 is provided with an upstanding wall 76. An annular tube or conduit 77 surrounds the wall 76 and is secured thereto for supplying the material to be dispensed into the containers to the several filling valves in a manner later to become apparent.

A head casting 78 is secured to the upper edge of the wall 76 of the central body 69 and has an upwardly extending hub portion 79 which fits upon the upper portion 80 of the arbor 2 for rotation relative thereto. A distributor 81 is secured to the upper surface of the head casting for rotation therewith and has a conically shaped interior in which a cone shaped valve member 82 is disposed. The valve member 82 has a hollow center 83 which fits over the hub portion 79 of the head casting and the member 82 is pressed downwardly into the conically shaped interior of the distributor 81 by a compression spring 84 resting upon a washer 85. The washer 85 closes the open upper end of the hollow center 83 of the valve member, the spring 84 being compressed by a hand wheel 86 threadedly mounted upon the threaded upper end 87 of the arbor 2.

The cone shaped valve member has a plurality of passages, one 88 of which is adapted to be threadedly connected to a material supply conduit, not shown, through which material to be canned is supplied preferably from a pump, not shown. The other passage 89 of the cone shaped valve is adapted for connection to a material return conduit, not shown, associated with the aforementioned pump in a manner well known in the art. The supply passage 88 extends to an annular groove 90 formed in the periphery of the valve member 82 and the groove 90 registers with

a groove 91 formed in the conically shaped interior of the distributor 81. The return passage 89 has an elbowed bottom which communicates with an annular groove 92 formed above the groove 91 in the distributor 81. The distributor 81 is further provided with a vacuum manifold 93 communicating with a passage, not shown, formed in the conical valve member 82 in the same manner as the material supply and return passages 88 and 89 and adapted to be connected to a vacuum line, not shown, customarily employed in the construction and operation of vacuum type filling machines.

A supply elbow 95 (Fig. 1) has its upper end connected to a port 96 in the distributor 81 for communication with the supply duct provided by the annular grooves 98 and 91 and the lower end of the elbow 95 is connected to the upper wall of the annular tube or conduit 77 for suppling the material thereto. The conduit 77 (Fig. 2) has a partition 97 formed adjacent the point of entrance of the material from the supply elbow 95 and, therefore, the material entering the conduit is caused to circulate through the same toward the opposite side of the partition 97.

A return elbow 98 (Fig. 1) having its lower end connected to the upper wall of the conduit 77 receives the material which circulates therethrough and conducts the same into the annular groove 92 in the distributor 81 for discharge by way of the return passage 89. From the foregoing, it will be apparent that the material entering the conduit 77 is kept in motion so as to prevent heavier particles of the material from settling or any appreciable portion thereof from adhering to the inner walls of the supply tube or conduit. Moreover, it should be understood that material is continually supplied to the conduit 77 so that the latter constitutes a source of supply of material for each of the filling valves and that the material in conduit 77 is maintained at sufficient pressure so as to flow from the conduit by way of openings therein, now to be explained.

The lower wall 100 (Figs. 1, 3, 4, and 5) of the conduit 77 is provided with a plurality of equally spaced discharge openings 101, each of which communicates with a respective one of the filling valve units 7. Each filling valve unit 7 is provided with a housing 102 having a flange 103 at its upper end secured by machine screws 104 to the lower wall 100 of the conduit 77. The housing 102 has a throat 105 which communicates with the opening 101 in the lower wall of the conduit 77 and with the annular interior 106 of the housing. A rotor 107 is arranged within the annular interior of the housing and is provided with a diametrically disposed cylinder 108 providing a passage, the open ends of which are adapted to successively register with the throat 105. The lower end of the housing 102 is provided with an outlet passage 109 diametrically opposite the throat 105 so that as one open end of the cylinder 108 registers with the throat, the opposite open end of the cylinder registers with the outlet passage 109.

A piston 110 is disposed in the cylinder 108 for the purpose of closing off direct passage of the supply material from the upper end of the cylinder toward the lower end thereof. This piston 110 is adapted to move axially of the cylinder for the purpose of discharging a predetermined quantity of material therefrom once during each cycle of operation of the valve.

It will be noted that the outlet passage 109 is slightly smaller in diameter than the cylinder 108, and consequently, downward movement of the piston 110 is stopped at the periphery of the rotor 107 and the piston is, therefore, retained within the cylinder. Simultaneous with the discharge of material from the lower portion of the cylinder by downward movement of the piston, the portion of the cylinder above the piston 110 is evacuated so as to receive another charge of material from the material supply conduit 77. The rotor 107 is then turned, in a manner subsequently to be described, and thereafter the piston is again moved downwardly repeating the discharge and filling of the cylinder as explained above.

The piston 110 is of a size calculated to occupy only a portion of the interior of the cylinder 108 so as to leave a measuring chamber 111 within the cylinder sufficient to receive the exact quantity of material desired to be deposited into the container on the can table 6. Since the filling machine is adapted for filling various sizes of containers, the piston 110 comprises a number of interlocking parts, for example, 110*a*, 110*b*, 110*c*, secured together by a countersunk head machine screw 112 whereby one part, for instance, the part 110*b*, may be removed or another such part inserted between parts 110*a* and 110*c* for the purpose of increasing or diminishing the size of the measuring chamber 111. In this manner, the size of the measuring chamber can be varied so as to assure that each container will receive an amount of produce commensurate with its size.

As hereinbefore pointed out, the open upper end of the container is pressed into sealing engagement with the sealing cap 66 of the filling valve 7. This sealing cap (Figs. 3, 4, and 5) comprises a casting 113 secured to the bottom of the housing 102 and provided with a depending skirting 114 having an inturned lip 115 at its lower end. The casting 113 is provided with a passage 116 in which a resilient sealing member 117 is disposed. This sealing member, preferably made of rubber, has an annular can engaging portion 118 provided with a central opening 119 which is in registration with the outlet passage 109 in the housing. The sealing member 117 is further provided with an annular skirting 120 which is retained within the passage 116 by the inturned lip 115.

The opening 119 and outlet passage 109 are lined with a sleeve 125 having its lower end 126 beveled at its outer periphery so as to extend below the under surface of the can engaging portion 118 to provide a drip edge for preventing the material from adhering to the portion 118 of the sealing member subsequent to the depositing of the material into the container.

It will be noted that the housing 102 (Fig. 3) is split at one side and that it is provided with a pair of spaced lugs 127 and 128. The lower lug 128 is provided with a threaded bore 129 and the upper lug 127 is provided with a hole 130 for the reception of a bolt 131. A compression spring 132 is arranged on the bolt 131 between the head 133 thereof and the upper lug 127 and the threaded portion 134 of the bolt is threadedly connected to the threaded bore 129 so as to yieldingly urge the spaced lugs 127, 128 toward each other. The housing 102 is thereby clamped around the rotor 107 to prevent leakage of material between the housing and rotor.

The side wall 135 of the rotor (Fig. 5), i. e., the wall thereof which faces the center of the

turret, is provided with a clutch seat 136 adapted to receive a clutch tooth 137 (Fig. 4) extending axially from one end of a shaft 138. The shaft 138 has a splined portion 139 drivingly connected to a splined sleeve 140 carried by and secured within the bore of the hub 141 of a bevel gear 142.

The opposite end of the shaft 138 is reduced in size and has a compression spring 143 thereon having its inner end resting against a washer 144. The periphery of the washer 144 is secured in place by an expansion ring 145 seated in an annular recess 146 provided in the bevel gear 142 and that portion of the washer which fits over the shaft 138 is adapted to be engaged by a snap ring 147 seated in an annular groove 148 provided near the end of the shaft 138.

The bevel gear 142 (Fig. 4) is journalled in a bearing 149 provided within a hub casting 150 extending through the annular wall 74 hereinbefore referred to in connection with the description of the carriage portion 29 of the turret. The hub casting 150 is suitably secured to the wall 74 so that the shaft 138 and rotor 107 will be in axial alignment with respect to each other.

The bevel gear 142 is a component part of the epicyclic train 11 hereinbefore referred to and now to be more fully explained. The bevel gear 142 (Fig. 1) meshes with a bevel gear 151 supported upon a bearing plate 152 disposed on the upper surface of the central body 69 of the carriage 29. The bevel gear 151 is mounted upon a bushing 153 for rotation about the arbor 2 and the hub portion 154 of the gear 151 is keyed to a spur gear 155. The spur gear 155 meshes with a pinion gear 156 secured to a stud shaft 157 having its lower end journalled in a boss formation 158 of a bracket 159 in turn secured to the lateral flange 75 of the central body 69. The stud shaft also has a spur gear 160 secured thereto which meshes with a pinion gear 162 fixed to the arbor 2 and the upper end of the shaft 157 is journalled for rotation in a boss formation 161 formed on the underside of the head casting 78.

The machine is driven by the shaft 15 through bevel gears 14 and 13 causing rotation of the turret 3, inclusive of valves 7 and can tables 16 about the fixed arbor 2 in the direction of arrows *a* (Fig. 1). Consequently, since the gear 162 is fixed to the arbor 2, and the gear 160, shaft 157, and pinion 156 revolve about the same, rotation of gear 155 and bevel gear 151 about the arbor 2 in the same direction as turret 3 but at a reduced speed is effected. In the illustrated embodiment of the present invention, the bevel gears 151 and 142 are so proportioned that the rotor 107 of each valve 7 is rotated one half of a revolution in the direction of arrow *b* (Fig. 3) during one complete revolution of turret 3.

The bevel gear 142 (Fig. 4) has a sealing cap 163 inserted in its inner open end and bearing against the expansion ring 145. The opposite end of the cap 163 is adjacent the side wall of the central body 69 so as to maintain a lubricant such as grease within the bevel gear 142. The bevel gear 142 is maintained in proper position against the bearing 149 provided in the hub casting 150 by the bevel gear 151 and the washer 144 within the bevel gear 142 provides a stationary base from which the shaft 138 is urged toward the left (Fig. 4) by the compression spring 143. The clutch tooth 137 is thereby pressed toward the side wall 135 of the rotor 107 for driving engagement in the clutch seat 136 on the side wall 135 of the

rotor. The rotor 107 is restrained against sliding movement outwardly of the housing 102 (toward the left in Fig. 4) by a retaining finger 164 secured by a screw 165 to the outside wall of the housing 102.

From the foregoing, it is apparent that as the turret and lifts are rotated about the arbor the rotor turns within the housing 102 for inverting the measuring chamber 111 from registration with the throat 105 into registration with the outlet passage 109 so that the charge of material within the chamber will always be discharged from that end of the chamber through which the material was received.

The rotor 107 (Fig. 3) is provided with a pair of grooves 170 and 171 which are formed diametrically opposite each other in the periphery of the rotor. Another pair of grooves 172 and 173 are also formed diametrically opposite each other in the periphery of the rotor and these grooves 170, 171, 172, and 173 are disposed in spaced relation and in annular alignment on the periphery of the rotor so as to register with the outlet passage 109 when they pass the same. However, it will be noted from Figs. 4 and 5 that the throat 105 is partially restricted by a beveled side wall 105' (Figs. 4 and 5), the lower end of which lies in the annular path through which the grooves 170 to 173 are moved. Therefore, the material which passes through the throat 105 is prevented from entering or clogging the grooves 170 to 173.

The grooves 170 and 171 are each connected to the atmosphere by way of a lateral bore 174 and 175, respectively, for the purpose of venting a container when it is in sealing engagement with the filling valve subsequent to the actual filling operation as will later be explained.

The grooves 172 and 173 (Figs. 3, 4, and 5) communicate with a lateral groove 176 and 177, respectively, in turn communicating with an annularly extending feeder groove 178 and 179, respectively, disposed adjacent the outer margin of the rotor. These feeder grooves 178 and 179 are adapted to register with a port 180 (Fig. 8) in the housing 102, the outer open end of the port 180 being connected to one end of a flexible tube or hose 181 having its opposite end connected to the vacuum manifold 93 (Fig. 1) in the distributor 81.

The port 180 is located so as to register with either the feeder groove 178 or the feeder groove 179 when the groove 172 or 173 associated therewith is about to register with the outlet passage 109. The feeder grooves 178 and 179 are each of sufficient length as to maintain connection with the port 180 leading to the vacuum line, while its associated groove 172 or 173 moves past the outlet passage 109. It will be noted in the diagram of Fig. 9 that the groove 172 or 173, as the case may be, begins to register with the outlet passage 109 just as a container is about to be lifted into engagement with the sealing member 117 in the sealing cap 66 and, consequently, the container is vacuumized immediately upon its engagement with the sealing member 117. This effects a sudden seizure of the container by suction immediately upon engagement of the container with the sealing member and assures that the container is in proper sealed relation with the filling valve prior to the filling operation.

From the foregoing, it is apparent that as the rotor turns within the housing 102 and the measuring chamber 111 is brought into registration with the outlet passage 109, the material within the chamber is promptly discharged through the passage 109 and into the container. In other

words, the vacuum prevailing within the container plus the pressure with which the material is discharged from the annular tube or conduit 77 causes the piston 110 to be moved downwardly to thereby clear the cylinder 108 of the charge it contained and at the same time to draw a new charge of material from the conduit 77 down into the cylinder 108 as the piston 110 is lowered within the same.

Since the epicyclic train 11 is constantly in motion due to rotation of the turret 3, the rotor 107 continues to turn, i. e., away from can filling position, and eventually the venting groove 170 or 171, as the case may be, registers with the outlet passage 109 to vent the interior of the now filled container. Therefore, when the wheel 56 is depressed by the cam 41 and the springs 47 and 48 are flexed to lower the can table, the container carried thereby is released from the effect of vacuum and is free to descend into a position for discharge from the filling machine by the discharge conveyor associated therewith.

In the event the can table fails to receive a container from the feed conveyor, it is apparent that the charge of material in the measuring chamber would be spilled out of the filling valve onto an empty can table and be lost. In order to prevent the loss of material due to the absence of a container on the can table, each lift and filling valve is provided with a no can-no fill device generally indicated at 190 (Fig. 4) in the drawings. This no can-no fill device comprises a mast 191 having its lower end secured by machine screws 192 to the back face of the rail 65 provided on the can table. The mast 191 passes through a guide 193 provided in a bracket 194 suspended from the hub casting 150 in which the bevel gear 142 is journalled. The upper end of the mast 191 is provided with a cam surface 195 adapted to be moved into the path of cam lugs 196 provided on a disc 197 (Figs. 4, 6, and 7) which is secured by a pin 198 to the extended end of the shaft 138 between the splined portion thereof and the clutch tooth 137 at its outer end.

The mast 191 is ordinarily restrained from movement into the path of the cam lugs 196 when a container on the can table engages the sealing member 117 of the filling valve but when no container is presented to the can table 16, upward movement thereof is not obstructed and the springs 47 and 48 are free to straighten out into the position illustrated in dotted lines in Fig. 4. Therefore, without a container the can table is permitted to rise high enough to move the cam surface 195 of the mast 191 into the path of the cam lugs 196 and, consequently, when one of the lugs 196 engages the cam surface 195, the disc 197 is shifted inwardly, toward the center of the turret, to the dotted line position thereof shown in Fig. 4. The splined shaft 138 is, accordingly, shifted a corresponding distance against the action of the compression spring 143 to thereby withdraw the clutch tooth 137 from the clutch seat 136 in the rotor and the rotor is, therefore, uncoupled from driving connection with the epicyclic train 11.

Although the disc 197 and splined shaft continue to rotate after disengagement of the clutch tooth 137 from the clutch seat 136, the cam lug 196 which had engaged the cam surface 195 of the mast 191 passes the cam surface 195 so that the splined shaft is released for movement by compression spring 143 toward the rotor 107.

Since the rotor ceases moving while the splined shaft continues to rotate, the clutch tooth will now be out of registration with the clutch seat and, therefore, when the can table is subsequently lowered and the mast 190 withdrawn the clutch tooth will straddle and abut the surface 199 around the clutch seat 136 on the side wall 135 of the rotor. Consequently, the clutch tooth will continue to rotate relative to the uncoupled rotor until the clutch tooth again registers with the clutch seat thereof and is urged into the same by action of the spring 143 in the usual manner.

Operation

The filling machine of the present invention is adapted to be driven continuously by way of the drive shaft 15 and gears 14 and 13 whereby the turret 3 is rotated about the arbor 2.

In connection with the diagram, Fig. 9, it will be noted that during a little over one-quarter of a revolution of the turret, the can tables are in their lowermost position and the filling valves associated therewith are closed so that empty containers can be received by and filled containers discharged from the machine. It is during this phase of the operation of the machine that the springs 47 and 48 of the lifts 6 are flexed by engagement of the wheel 56 with the deep portion of the cam 41 as is illustrated in Fig. 4, an empty container being delivered to a particular can table just prior to the arrival of the wheel 56 at the declevity of the cam (see Fig. 3).

It should be understood that the turret may carry any number of filling valve units and lifts as desired, however, a machine provided with twelve sets of filling valves and lifts has been found satisfactory for accurately filling approximately 500 cans of 2 oz., 4¾ oz., or 6 oz. capacity per minute. As hereinbefore pointed out, the sprocket teeth 63 of the machine are adapted to mesh with a conventional lug bearing conveyor chain so that a continuous stream of containers supplied to the filling machine will be received in timed relation with the running speed thereof for deposit one after another onto successive can tables 16.

Almost simultaneous with the event of the wheel 56 riding off of the deep portion of the cam 41, the vacuumized groove 172 begins to register with the discharge opening of the valve 7, i. e., the sleeve 125 in the passage 109. Therefore, when the wheel rolls past the declivity of the cam 41 the springs 47 and 28 are released and tend to straighten out by their own resiliency and the can table 16 with a container thereon rises with snap-like action to present the open upper rim of the container into sealing engagement with the central portion 118 of the sealing member 117. Consequently, the container is promptly vacuumized which effects a perfect seal between the container and sealing member. The can table 16 in the meantime is still urged against the bottom of the container by reason of the fact that the container is of a height sufficient to prevent the springs 47 and 48 from completely straightening out and the mast 191 of the no-can no-fill device 190 will, therefore, be restrained from movement into the path of the cam lugs 196 on the disc 197. Consequently, the container is maintained in centered position on the can table as the rotor 107 is advanced within the valve housing 102.

It should here be noted that since the rotor 107 turns only one-half a revolution during each

filling operation of the machine, the sleeve 108 is in a horizontal position (I in Fig. 9) when a container is elevated into filling relation with the filling valve. Moreover, during operation of the machine, the measuring chamber 111 will have been supplied with a charge of material and, consequently, this charge will be delivered toward the vacuumized container, clockwise as seen in Fig. 9 and through positions II, III, and IV thereof. When the rotor has been turned into vertical position, as illustrated at V in Fig. 9, the piston 110 is caused to drop into its lowermost position by the combined effect of the vacuum prevailing within the container and the pressure prevailing upon the material within the supply conduit 77. It is, therefore, apparent that the material within the chamber 111 is discharged from the same as the piston moves downwardly into engagement with the inner periphery 106 of the housing 102. Simultaneously with the downward movement of the piston 110 a new charge of material is drawn downwardly into the opposite end of the cylinder 108 which becomes a measuring chamber 111 preparatory to the filling of the next successive container.

The rotor 107 continues to turn, clockwise (VI in Fig. 9) and just before the wheel 56 of the can table arrives at the acclivity of the cam 41, the filled container is vented (VII in Fig. 9) by communication thereof with the venting groove 170. From the foregoing, it will be understood that the container is no longer air locked relative to the sealing member 117 and that the container is supported in raised position solely by the can table 16. Consequently, when the wheel 56 is depressed by the deep portion of the cam 41, the springs 47 and 48 of the lift are again flexed and the container lowered (VII in Fig. 9) for subsequent discharge from the machine.

Although vacuumization of the containers in the manner explained above is desirable for efficient and accurate filling of containers at a high speed, it will be apparent that this feature may be dispensed with when open or vented containers are to be filled. In such case, the material is forced into the measuring chamber of the valve under sufficient pressure from the supply conduit as to cause a discharge of a measured quantity of material from the opposite side of the valve into a container which is open or vented to atmosphere.

While the invention herein has been described in connection with the specific device disclosed, it will be understood by those skilled in the art that the same is capable of variations, modifications, and alterations without departing from the spirit of the invention. I, therefore, desire to avail myself of all variations, modifications, and alterations coming within the purview of the appended claims.

What I claim as new and desire to protect by Letters Patent is:

1. A filling valve for a container filling machine comprising a filling head having an inlet and an outlet opening, a rotary valve in said filling head provided with a passage adapted to register with said inlet and outlet openings, a container engaging seal around said outlet opening for sealingly engaging a container presented thereto, a material supply line communicating with said inlet opening for transmitting material under pressure into said passage, a piston slidably supported in said passage for obstructing the flow of material through the same and cooperating with said passage for providing a chamber therein for receiving a quantity of material commensurate with the capacity of the container to be filled, a vacuum line, said rotary valve having a vacuum port for connecting said vacuum line with said outlet opening for vacuumizing a container presented thereto, and means for rotating said rotary valve for inverting said chamber for registering the end of said passage carrying the piston with said inlet opening whereby the combined effect of the vacuumized container and the material entering said inlet opening causes movement of said piston axially of said passage for discharging the material from said chamber through said outlet opening.

2. A lift for a filling machine comprising leaf springs having their corresponding ends secured in vertical alignment so that said springs extend laterally in spaced parallel relation one above the other, a can table secured to the opposite ends of said leaf springs for maintaining said springs in parallelism during vertical flexing thereof whereby said can table will remain substantially horizontal during such vertical flexing of said springs, and means for flexing said leaf springs to shift said can table into can receiving or discharging position and for subsequently releasing said leaf springs for return toward their normal position in snap-like action.

3. A filling machine comprising a valve, a leaf spring having one end so secured relative to said valve that the free end of said leaf spring extends laterally beneath and is biased toward said valve for pressing a container into sealing engagement with said valve, means for supporting a container on the free end of said spring, and means for flexing said leaf spring for urging the free end thereof away from said valve for permitting removal of a container from and insertion of a container into said machine and for subsequently releasing said leaf spring for presenting the newly inserted container to said valve in snap-like motion.

4. In a filling machine including a valve for receiving a container in sealing engagement therewith, a lift comprising a leaf spring so secured relative to said valve that the free end of said leaf spring will extend toward said valve, a can support mounted on the free end of said leaf spring for presenting a container into sealing engagement with said valve, and means for depressing the free end of said leaf spring for releasing said container from sealing engagement with said valve.

5. In a filling machine having a filling valve, a can lift comprising spaced flat spring arms arranged one above the other and having their corresponding ends secured in spaced vertical relation with respect to said filling valve whereby the free ends of said arms will flex in parallelism with respect to each other toward and away from said valve, a bar provided with a can table and secured to the free ends of said arms for maintaining them in parallelism during flexing thereof whereby said bar will remain vertical during flexing of said arms, means for flexing said arms for shifting said can table into can discharging and receiving position and for subsequently releasing said arms for return movement by their own resiliency toward their normal position for moving a can on said can table into filling relation with said filling valve.

6. In a filling machine including a carriage carrying a valve adapted to have sealing engage-

ment with a container presented thereto, a lift comprising leaf springs secured to said carriage and extending therefrom in spaced parallel relation for flexing movement toward and away from said valve, a can table secured to the free ends of said leaf springs, a cam track, means on said can table for engaging said cam track, and means for moving said carriage and cam track relatively with respect to each other for causing progression of said cam engaging means relatively with respect to said cam track for parallel flexing said leaf springs for moving said can table into container discharging and receiving position and for subsequently releasing said cam engaging means with respect to said cam track to thereby permit said leaf springs to return toward their normal extended position in snap-like action for presenting a container to said valve.

7. In a can filling machine having a revolvable turret carrying a filler valve adapted to have sealing engagement with a container presented thereto, means for presenting a container into sealing engagement with said valve comprising leaf springs secured to said turret so as to extend radially therefrom in spaced parallel relation for flexing movement toward and away from said valve, a can table disposed to present a container to said filling valve and secured to the free ends of said leaf springs for maintaining them in parallelism during flexing thereof, and a cam adjacent said turret for engaging a portion of said can table for flexing said leaf springs into can receiving and discharging position and for subsequently releasing said can table to permit return of the leaf springs toward their normal position whereby a container on said can table will be presented to said valve in snap-like sealing action.

8. A filling machine comprising a valve having an inlet and an outlet opening, a supply of material communicating with the inlet opening, means for presenting a container into sealed relation with respect to said outlet opening, a rotor in said housing having a passage simultaneously communicable with said inlet and outlet openings, a piston arranged in said passage for obstructing flow of material through the same and leaving a predetermined space in said passage for the admission of material from said inlet opening, a vacuum line communicating with said valve, said rotor having a port for communicating said vacuum line with a container presented to said outlet opening for vacuumizing the container presented thereto, and means operating in timed relation to the container presenting means for turning said rotor for inverting said passage whereby the material lodged in the predetermined space thereof is advanced into the vacuumized container incident to the admission of another like quantity of material into the opposite end of said passage.

9. In a filling machine including a turret carrying valves adapted to having sealing engagement with a container presented thereto, means for lifting a container into filling relation with each of said valves comprising leaf springs secured to said turret so as to extend radially therefrom in spaced relation for flexing movement toward and away from said valve, a can table secured to the ends of said leaf springs, a cam track, means on said can table for engaging said cam track, means for rotating said turret for causing progression of said cam engaging means along said track for flexing said leaf springs to move said can table into container receiving and discharging position and for subsequently releasing said cam engaging means to thereby permit said leaf springs to return toward their normal extended position in snap-like action for presenting a container to said filling valve.

10. A filling machine comprising a base, a turret mounted for rotation on said base, a filling head carried by said turret and having diametrically opposite inlet and outlet openings, means for presenting a can into sealed relation with the outlet opening of said filling head, a vacuum line, a rotor in said filling head having a vacuum passage for communicating said vacuum line with said outlet opening for vacuumizing the can presented thereto and for holding said can in sealed relation to said filling head, said rotor having a passage adapted to communicate said inlet and outlet openings, means for supplying material to said inlet opening, a piston reciprocable within said passage for obstructing the flow of material therethrough and for supporting a predetermined quantity of material admitted into said passage, and means for turning said rotor for inverting said passage whereby said predetermined quantity of material is discharged into the vacuumized can incident to admission of material into the opposite end of said passage.

11. A filling machine comprising a turret, a filling head associated with said turret and having an inlet and an outlet opening, means on said turret for receiving a container for presenting said container into sealed relation with said outlet opening, a rotor in said filling head provided with a passage adapted to register with said inlet and outlet openings, a material supply conduit communicating with said inlet opening for transmitting material into said passage, a reciprocable piston in said passage for obstructing the flow of material through the same whereby a predetermined quantity of material is retained in said passage, means for rotating said turret, means for releasably connecting said turret and rotor for turning the latter during rotation of said turret to thereby invert said passage so that the end thereof carrying the piston registers with said inlet opening and incoming material effects movement of said piston axially of said passage for discharging the material from the passage through said outlet opening, and means operable by said container receiving means when no container is received thereby for releasing said connecting means for staying inversion of said chamber.

12. A filling machine comprising a turret, a filling valve on said turret, a container lift supported by said turret normally tending to move toward said valve for pressing a container supported by said lift into filling relation with the valve, means engageable by said lift during rotation of said turret for urging said lift away from said valve for the reception and discharge of a container, means for rotating said turret, a relesable coupling between said valve and said turret for operating said valve in timed relation with said turret, and means operable by said lift when no container is received thereby for engaging said releasable coupling for releasing said valve from coupled relation with said turret.

13. In a container filling machine the combination comprising a filling head having an inlet and an outlet opening, a rotary valve in said filling head provided with passages adapted to communicate said outlet opening successively with a vacuum line, said inlet opening, and an air vent in that order upon each one half revolution of said valve, a container engaging seal around said outlet opening for sealingly engaging a container

presented thereto, a material supply line communicating with said inlet opening for transmitting material under pressure thereto, a piston slidably mounted in the passage adapted to communicate the outlet with the inlet opening in said filling head, for obstructing the flow of material through the same and cooperating with said passage for providing a chamber therein for receiving a quantity of material commensurate with the capacity of a container to be filled, means for presenting containers successively in sealed relation to said outlet opening, and means operating in timed relation to said container presenting means for rotating said rotary valve one half

revolution upon the sealed presentation of each container to said outlet opening.

FRANK W. KRUEGER.

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