April 23, 1957 P. R. FECHHEIMER 2,789,589

BYPASS SYSTEM FOR FILLING MACHINES

Filed May 23, 1955 2 Sheets-Sheet 1

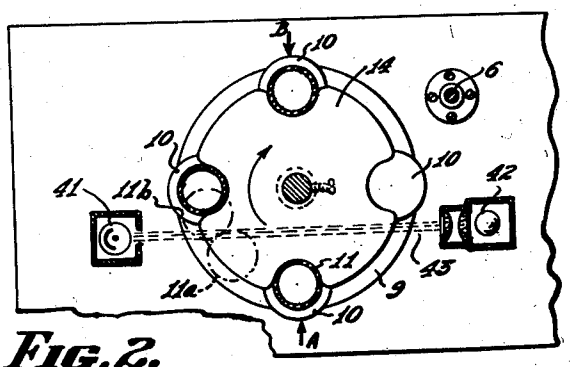


FIG. 2.

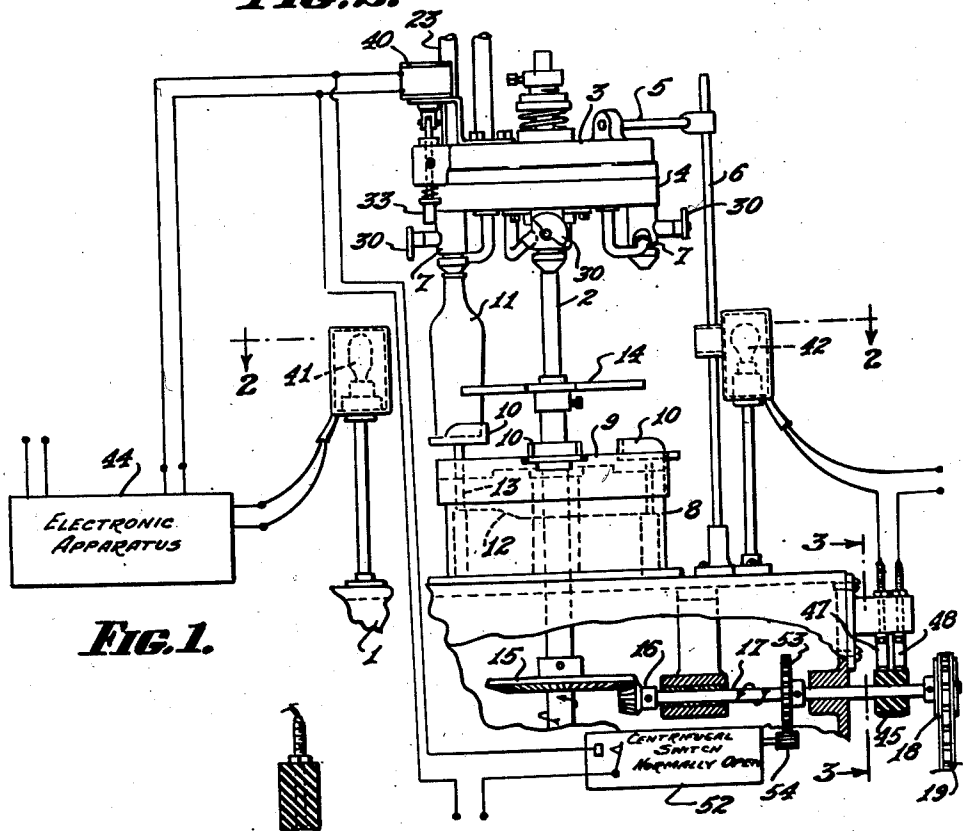


FIG. 1.

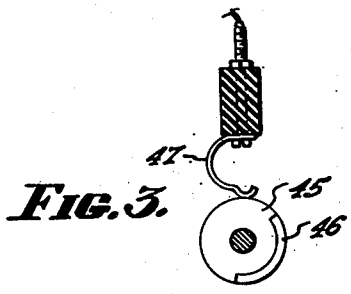


FIG. 3.

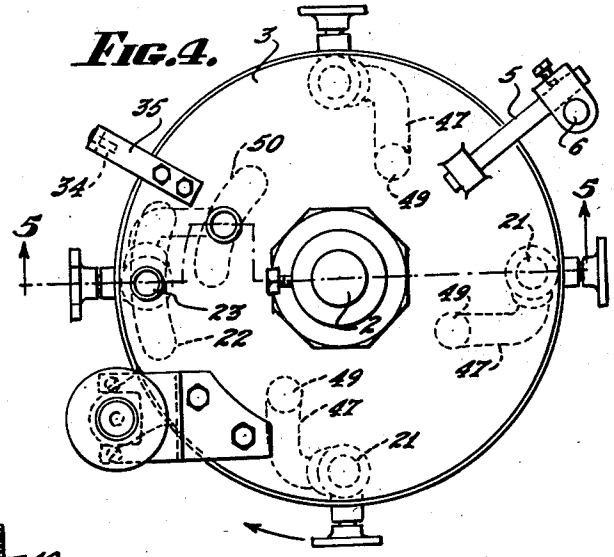
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Filed May 23, 1955 2 Sheets-Sheet 2

FIG. 4.



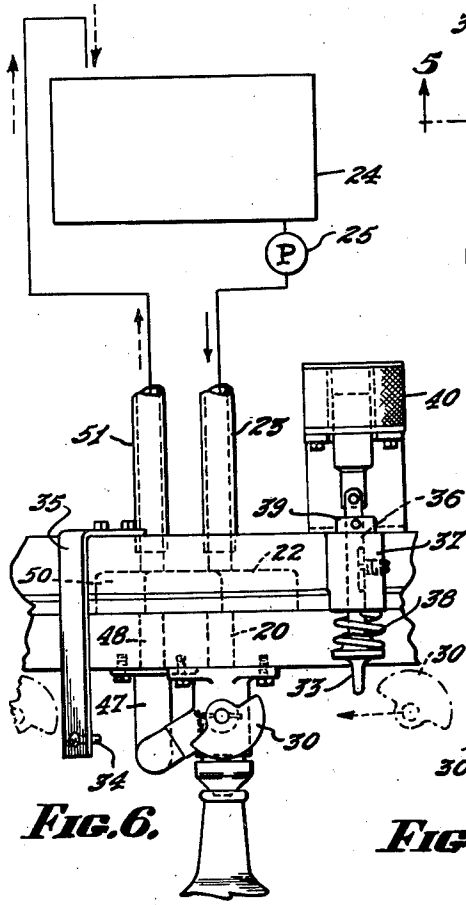


FIG. 6.

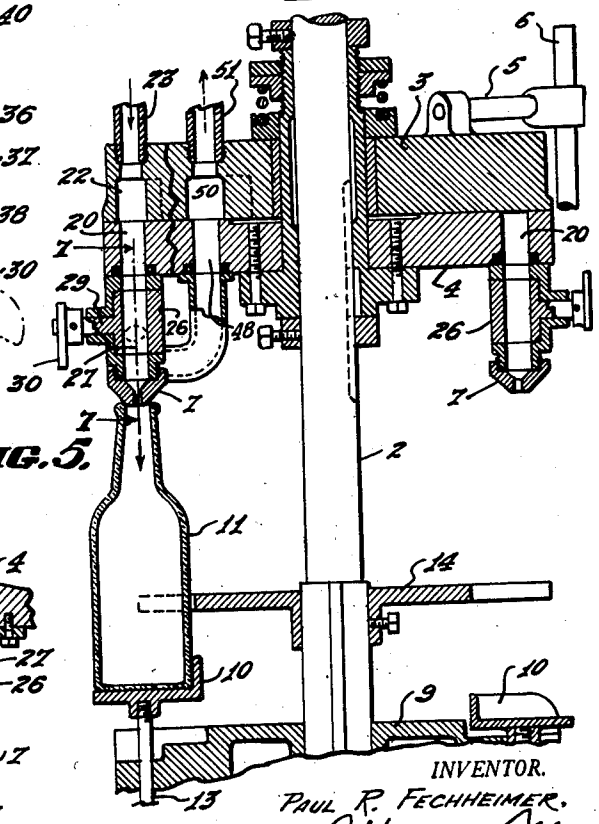


FIG. 5.

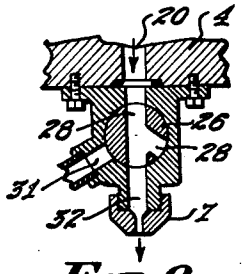


FIG. 8.

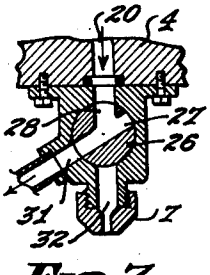


FIG. 7.

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BYPASS SYSTEM FOR FILLING MACHINES

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Application May 23, 1955, Serial No. 510,449

17 Claims. (Cl. 141—141)

My invention has to do with filling machines and relates particularly to rotary filling machines in which a plurality of filling spouts are mounted on a rotary head element for delivering measured increments of filling material from the filling head to containers positioned below the filling spouts.

It has hitherto been proposed to provide a filling machine having a filling head comprising a rotary head element and a fixed head element in face-to-face contact, with the rotary head element carrying the filling spouts to which the containers to be filled are juxtaposed, the containers being carried on platforms rotating with the filling spouts, the platforms in turn being arranged to be raised and lowered so as to lift the containers into conact with the filling spouts for filling and remove them therefrom when they have been filled. Filling material is supplied to the filling spouts through passageways extending through the rotary head element, the passageways terminating at their inner ends in inlet ports in the face of the head element which are adapted to be serially brought into communication with an outlet port in the fixed head element to which the filling material is supplied under pressure from a source of supply. By means of this arrangement, the seriatim connection of the inlet ports to the outlet port provides a metered flow of filling material to each filling spout.

It has also been suggested in conjunction with rotary filling machines of the type described to provide valve means in each filling spout effective, when no container is presented therebeneath, to prevent the discharge of filling material through the spout. Such means have, for example, taken the form of normally closed valves in the filling spouts which are opened by the containers themselves as they are juxtaposed to the filling spout by the lifting platforms. While such valve means are effective to prevent the flow of filling material through the spouts when containers are not present therebeneath, the closed spout causes the build-up of pressure in the filling head due to the fact that the pump supplying the filling material to the head continues to operate. This condition is undesirable in that it causes the pump to work against a closed system and the increased pressure under which the filling material is placed creates difficulties in the filling of subsequent containers.

It is a principal object of the instant invention to provide a bypass system when, when no container is in position beneath the filling spout, will cause the filling material to be diverted through a bypass valve and returned to the filling head through a secondary port, from whence the filling material is passed to a storage receptacle or returned to the source of supply.

It is a further object of my invention to provide a filling spout incorporating a valve means which is normally in the bypass position and valve tripping means for moving the valve to a container fill position during the time the inlet port for the filling spout is passing beneath the outlet or filling port.

A further object of my invention is the provision of sensing means, such as a limit switch or photoelectric cell means, effective to detect the absence of a container beneath the filling spout, whereupon means are actuated to prevent movement of the valve means from the bypass to the filling position, thereby causing the filling material to pass through the bypass portion of the valve for return to the source of supply.

Yet a further object of my invention is the provision of valve tripping means normally lying in the position to trip the valve mechanism, there being means provided to remove the valve tripping mechanism from the path of the valve actuating means in instances where no container is present beneath the filling spout.

These and other objects of my invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading these specifications, I accomplish by that construction and arrangement of parts of which I shall now describe an exemplary embodiment.

Reference is made to the accompanying drawings wherein:

Figure 1 is a side elevational view with parts broken away illustrating an exemplary machine in accordance with my invention.

Figure 2 is a sectional view taken along the line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a plan view of the filling machine.

Figure 5 is a vertical sectional view taken along the line 5—5 of Figure 4.

Figure 6 is an enlarged partial elevational view looking at the left side of the device illustrated in Figure 5.

Figure 7 is a vertical sectional view taken along the line 7—7 of Figure 5.

Figure 8 is a sectional view similar to Figure 7 illustrating the parts in their alternate position of use.

Referring now to Figure 1 of the drawings, I have therein illustrated an exemplary filling machine comprising a base 1 on which is mounted a vertically disposed rotatable shaft 2 on which is mounted a filling head comprising a fixed head element 3 and a rotary head element 4. The fixed head element 3 is held against movement by means of an arm 5 fixedly secured to a supporting member 6 extending upwardly from the machine base. The rotary head element 4, on the other hand, is keyed to the shaft 2 for movement therewith and mounts a plurality of filling spouts 7 arranged about its periphery.

The base also mounts a table 8 which supports a rotatable platform 9 carrying a plurality of lifts 10 positioned beneath the filling spouts 7, the lifts being adapted to receive containers 11 and juxtapose them to the filling spouts as the platform 9 is rotated, the platform being keyed to the shaft 2. The lifts may be conveniently raised and lowered by means of a cam track 12 along which the legs 13 of the lifts are adapted to travel. A star wheel 14 fixed to the shaft 2 may also be provided to assist in positioning the containers 11. It will be understood that the container lifting means is exemplary only and does not constitute a limitation on my invention. Various alternative platform lifts may be employed, and reference is made to my own Patent No. 2,660,357 entitled Pressure and Vacuum Filling Machine, dated November 24, 1953, wherein a specific form of platform lifts is set forth in detail.

The shaft 2 may be conveniently driven by means of bevel gears 15 and 16 the latter of which is secured to a shaft 17 driven through sprocket 18 and chain 19 by a prime mover (not shown). The containers 11 will be positioned on the lifts 10 at substantially the point

A, as seen in Figure 2, and removed from the lifts at substantially the point B, it being understood that suitable conveying means will be provided to present the containers to the lifts and to remove them therefrom. As the lifts move between the points A and B, it will be understood that they will be raised and lowered by the cam track **12** so as to present the containers to the filling spouts for filling and lower them away after they have been filled to the desired level.

Referring now to Figures 4 and 5 of the drawings, each of the filling spouts **7** is connected to a passageway **20** extending through the rotary head **4**, the passageways terminating in inlet ports **21** arranged to be presented sequentially to an elongated outlet or filling port **22** in the stationary head **3**. Filling material is supplied to the filling port through a conduit **23** leading to a source of supply **24** from which the filling material is pumped through the conduit by means of a pump **25** (Figure 6). Each of the filling spouts **7** is provided with a valve plug **26** having a main passageway **27** extending therethrough and a branch passageway **28** opening into the main passageway. Extending outwardly from the valve plug is a shaft **29** carrying an operating cam **30** on its outer end, the arrangement of parts being such that the movement of the valve plug will be controlled by movement of the operating cam. The valve plug is moveable from a first position, illustrated in Figure 7, wherein the passageway **20** in the rotary head is connected through the branch passageway **28** and the passageway **27** to a bypass passageway **31** projecting laterally from the filling spout, to a second position, illustrated in Figure 8, wherein the passageway **20** is connected through the passageway **28** to a filling passageway **32** opening downwardly through the nozzle of the filling spout.

The plug valve **26** normally lies in the bypass position (Figure 7) and is adapted to be tripped to the filling position by means of a stop **33** (Figure 6) arranged to trip the operating cam **30** and move the valve plug to the filling position just as the inlet port for the filling spout comes into registry with the elongated filling port in the fixed head, thereby moving the valve plug to filling position in synchronism with the metered flow of filling material to the filling spout. A second stop **34** is positioned to be contacted by the operating cam **30** at the conclusion of the passage of the filling spout beneath the elongated filling port, the second stop acting to return the valve plug to the bypass position. The stop **34** may be conveniently mounted on a bracket **35** suspended from the fixed head element **3**.

In accordance with my invention the stop **33**, which serves to trip the valve plug to the filling position, is arranged to be withdrawn from the path of the advancing operating cam in the event no container is in position beneath the filling spout. To this end the stop **33** is mounted on a rod **36** journaled for axial movement in a sleeve **37** which may be conveniently secured to the fixed head element. The rod **36** and stop carried thereby are normally biased to the cam contacting position by means of a spring **38**, the biasing movement of the spring being limited by a collar **39** secured to the rod and adapted to contact the upper surface of the sleeve in the manner illustrated in Figure 6. The stop is retracted by means of a solenoid **40** connected to the upper end of the rod **36**, the solenoid acting when energized to move the rod and the stop upwardly against the compression of the spring **38**. When deenergized, the solenoid will release the rod for return movement under the influence of the spring.

The solenoid **40** is adapted to be energized by sensing means which will detect the absence of a container beneath the filling spout as the filling spout moves toward the filling station. In the embodiment illustrated in Figures 1 and 2, the sensing means comprises a photo-electric cell **41** adapted to be energized by a light source **42** arranged to direct a beam of light **43** at the photo-

electric cell in synchronism with the normal movement of a container into the path of the beam of light. Thus, as seen in Figure 2, the light source **42** is adapted to be energized when a container reaches the position illustrated in dotted lines at **11***a*, the light source remaining energized until the container has traveled to substantially the position **11***b*, at which time the light source will be deenergized. With this arrangement the container will effectively prevent the beam of light from energizing the photo-electric cell and the electronic apparatus, indicated generally at **44**, will remain dormant and the solenoid **40** will not be energized. Consequently, the stop **33** will remain in the path of travel of the operating cam **30**. If, however, no container is present beneath the filling spout, there will be nothing to interrupt the beam of light and it will energize the photo-electric cell **41** which acts through the electronic apparatus **44** to energize the solenoid and raise the stop **33**. This prevents the operating cam from being tripped and the valve plug remains in the bypass position so that the filling material metered to the filling spout through the filling port will flow through the bypass passageway rather than through the filling passageway.

The light source **42** may be conveniently energized in synchronism with the movement of the containers by means of a commutator mounted on the drive shaft **17** and moving in timed relation therewith, the conductive segment **46** being arranged to connect the contacts **47** and **48** of the light source circuit in synchronism with the movement of the containers through the path of the beam of light.

Each of the bypass passageways **31** is connected by a tube **47** to a secondary passageway opening upwardly in a secondary port **49** adapted to communicate with an elongated bypass port **50** in the fixed head element, the secondary ports **49** and the bypass port **50** lying on a different radius than the inlet ports **21** and filling port **22**. The filling material pumped through the bypass passageways in the filling spouts will thus be returned to the filling head and from the head may be passed through a conduit **51** to a storage tank or returned to the source of supply **24** in the manner diagrammatically illustrated in Figure 6. It will be apparent that any time a container is missing beneath any of the filling spouts, the filling material will be diverted through the bypass passageway in the spout and returned to the filling head for storage or reuse. In this way the pump supplying filling material to the filling head will at no time be pumping against a closed system and the metering of the filling material by the filling head will be carried out at a constant pressure irrespective of whether or not the filling spouts are opened for filling.

It is also within the spirit of my invention to provide automatically acting means effective to energize the solenoid and prevent the opening of the filling spouts during such times as the machine is being started up or slowed down preparatory to being stopped. To this end I provide a normally open centrifugal switch **52** adapted to be driven from the drive shaft **17** by means of gears **53** and **54** the latter of which is operatively connected to the centrifugal switch. A circuit connects the centrifugal switch to the solenoid **40**, the arrangement being such that the switch will energize the solenoid only when it is closed; and this will occur only when the machine drive is operating at other than normal speed, as during starting and stopping.

Modifications may be made in my invention without departing from the spirit of it and I do not intend to be limited other than as set forth in the claims forming a part hereof. For example, while in the embodiment illustrated the sensing means for detecting the absence of containers beneath the filling spouts is in the form of a photo-electric cell, other sensing means may be employed. Limit switches could be associated either with the lifts **10** or with the nozzles of the filling spouts which would detect

the presence or absence of a container and thereby control the operation of the electronic apparatus **44** and the solenoid **40**. Similarly, while the solenoid is energized to retract the stop **33**, the action could be reversed and the solenoid utilized, when energized, to maintain the stop in cam contacting position, the solenoid being deenergized only at such times as no container is present beneath the spout.

Having described my invention in an exemplary embodiment, what I desire to secure and protect by Letters Patent is:

1. In a filling machine for containers, a filling spout movable in a path of travel, said filling spout having a filling passageway and a bypass passageway, means for supplying filling material to said filling spout during the travel of said filling spout through a predetermined zone in its path of travel, a valve in said filling spout movable from a bypass position to a filling position, means for moving said valve to the filling position as said spout enters said predetermined zone and means for returning said valve to the bypass position as said spout leaves said predetermined zone, and means for rendering said first named valve moving means inoperative in the absence of a container beneath said filling spout.

2. In a filling machine for containers, a filling spout movable in a path of travel, said filling spout having a filling passageway and a bypass passageway, means for supplying a metered increment of filling material to said filling spout during the travel of said filling spout through a predetermined filling zone in its path of travel, a valve in said filling spout movable from a bypass position to a filling position, cams means for moving said valve from one position to the other, a first cam actuating means for moving said valve from the bypass to the filling position as said spout enters said filling zone, a second cam actuating means for returning said valve to the bypass position as said spout leaves said filling zone, and means for rendering said first cam actuating means inoperative in the absence of a container beneath said filling spout.

3. The device claimed in claim 2 wherein the means for rendering said first cam actuating means inoperative includes sensing means for detecting the absence of a container beneath said filling spout.

4. The device claimed in claim 3 wherein said first cam actuating means is moveable from an operative to an inoperative position, wherein a solenoid is provided to move the first cam actuating means from the operative to the inoperative position, and wherein the movement of the solenoid is controlled by said sensing means.

5. The device claimed in claim 4 wherein said sensing means comprises a photo-electric cell arranged to be energized when no container is present beneath the filling spout.

6. In a rotary filling machine, a rotating head, filling spouts mounted on said head and movable therewith, container moving means for moving containers to be filled in synchronism with said rotary head, means for supplying filling material through said rotary head to said filling spouts during movement of said filling spouts through a predetermined filling zone, said filling spouts each having a filling passageway and a bypass passageway, valves in said filling spouts movable from a bypass position to a filling position, means for moving said valves from the bypass to the filling positon in synchronism with the movement of each valve into said filling zone, means for moving each valve from the filling to the bypass position in synchronism with the movement of each spout out of said filling zone, and means for rendering said first named valve moving means inoperative in the absence of a container beneath a filling spout, whereby the filling material supplied to the filling spouts during their passage through said filling zone will be diverted through said bypass passageways in the absence of a container therebeneath, and means connected to said bypass passageways for returning diverted filling material to said rotating head.

7. The device claimed in claim 6 wherein movement of each valve from one position to the other is controlled by a cam, wherein the means for moving said valves from the bypass to the filling position comprises a stop normally positioned to be contacted by said cams, said stop being movable from an operative to an inoperative position, and means for moving said stop to the inoperative position in the absence of a container beneath a filling spout.

8. The device claimed in claim 7 wherein the means for moving the stop to the inoperative position includes sensing means for detecting the absence of a container beneath the filling spout.

9. In a filling machine for containers, means for moving containers through a path of travel, a rotating head having filling spouts, means to move said head so as to cause said filling spouts to travel with the containers, a fixed head cooperating with the rotating head, means to supply filling material to said fixed head, cooperating ports in said fixed head and said rotating head to supply filling material to said spouts during a predetermined portion of their paths of travel, said filling spouts each having a filling passageway and a bypass passageway, valves in said filling spouts movable from a bypass position to a filling position, means for moving said valves from the bypass to the filling position in synchronism with the opening of said ports, means for moving said valves from the filling to the bypass position in synchronism with the closing of said ports, and means for rendering said first named valve moving means inoperative when containers are not present beneath the filling spouts, whereby the filling material supplied to the spouts through said cooperating ports will be diverted through said bypass passageways, and means connected to said bypass passageways for returning the filling material to said rotating head.

10. The device claimed in claim 9 wherein the means for returning the filling material from the bypass passageways to the rotating head includes cooperating ports in the rotating head and the fixed head, whereby the bypassed filling material may be returned from the fixed head to the source of supply.

11. The device claimed in claim 10 wherein the valves in said spouts are adapted to be moved from one position to the other by means of operating cams moving with said filling spouts, and wherein the means for moving said valves from the bypass to the filling position comprises a stop positioned to be normally contacted by said operating cams, said stop being movable to an inoperative position.

12. The device claimed in claim 11 including sensing means for moving said stop to the inoperative position when no containers are present beneath said filling spouts.

13. The device claimed in claim 12 wherein said sensing means includes means for activating a solenoid, said solenoid being operatively connected to said stop and effective to move said stop from the operative to the inoperative position.

14. In a filling machine for containers, a stationary plate having a filling port therein, pumping means for supplying filling material to said filling port, a rotating plate cooperating with said fixed plate, filling spouts carried by said rotating plate, inlet ports in said rotating plate for communication with the filling port to provide a metered flow of filling material to each filling spout seriatum, each of said filling spouts having a filling passageway and a bypass passageway, valve means in said filling spouts movable from a bypass to a filling position, means for moving said valves from the bypass to the filling position as the inlet ports come into communication with the filling port, means for moving containers to be filled beneath said filling spouts, and means for rendering said valve moving means inoperative when no container is present beneath a filling spout, whereby the valve will remain in the bypass position when

the ports are in communication and the filling material introduced therein will be bypassed through said bypass passageway.

15. The device claimed in claim 14 wherein the bypass passageways of said filling spouts are connected to secondary port in said rotating head, said secondary ports cooperating with a bypass port in said fixed head to deliver the bypassed filling material to a bypass conduit.

16. The device claimed in claim 15 wherein said valve moving means comprises a stop adapted to be contacted by a valve moving cam carried by each of said filling spouts, wherein said stop is movable from an operative to an inoperative position, and wherein the means for rendering the valve moving means inoperative includes sensing means for detecting the absence of containers beneath the filling spouts.

17. The device claimed in claim 16 wherein said sensing means comprises a photo-electric cell adapted to be energized when no container is present beneath the filling spout.

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