Nov. 24, 1953 E. F. ROWEKAMP 2,660,356

FILLING MACHINE FOR CONTAINERS

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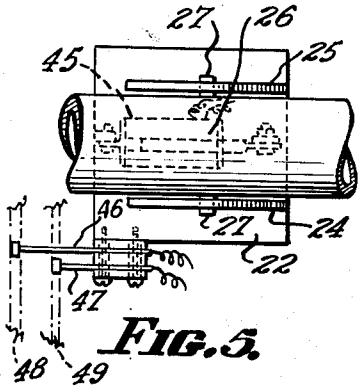



FIG. 5.

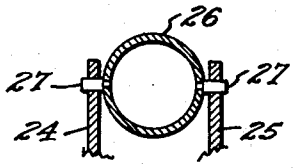



FIG. 4.

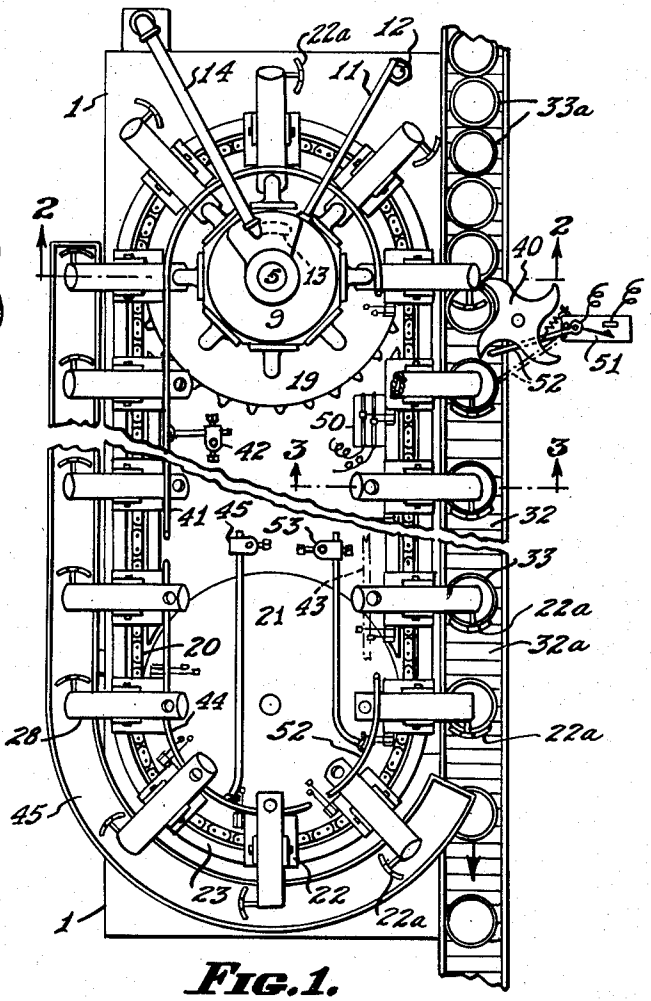



FIG. 1.

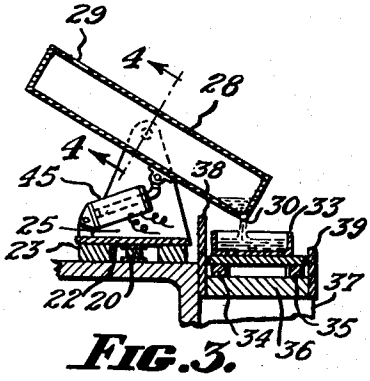



FIG. 3.

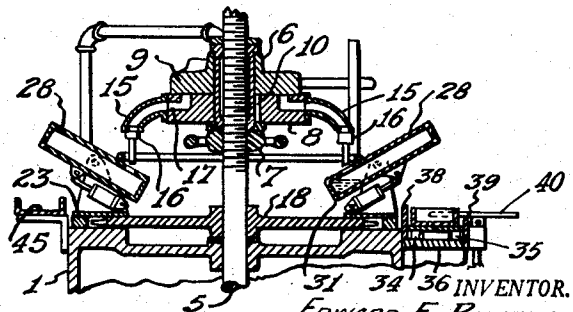



FIG. 2.

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## FILLING MACHINE FOR CONTAINERS

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10 Claims. (Cl. 226—95)

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My invention relates to filling containers in general and more particularly to the provision of filling machines for various types of containers wherein rapidity of operation coupled with accuracy of fill is desirable.

While it is not limited thereto I shall describe my invention in an exemplary embodiment for the filling of relatively shallow cans with material such as shoe polish, it being understood, however, that the embodiment is exemplary only and that the principles of the invention can be adapted to the filling of substantially any kind of container irrespective of considerations of dimensions and material.

It is an object of the invention to provide an apparatus of simple construction and operation which is inexpensive to construct and in which the handling of the containers is greatly simplified.

It is a primary object of my invention to provide a construction and mode of operation in which the time required to introduce a given increment of material into a container to be filled is rendered wholly independent of the rotary speed of moving parts of the machine and in which the same machine can readily be adapted to varying times required for the introduction of filling material whether the variations be due to the nature of the filling material or to the capacities of the individual containers.

It is an object of my invention to provide a mechanism in which the containers move at all times in a straight line and are not required to be transferred from one moving mechanism to another in the machine itself.

It is an object of my invention to provide a mechanism wherein provision is made for the introduction of measured increments of filling material into receptacles or reservoirs and the discharge therefrom into containers, in which the rates of introduction and discharge not only may differ widely from each other but are mutually independent.

It is an object of my invention to provide a mechanism having the advantages set forth above in which no movement of the containers being filled is required otherwise than movement in a straight line, and in which container movements toward and away from filling orifices in directions other than the direction of general movement of the containers are eliminated.

It is also an object of my invention to provide means in connection with mechanism having the functions and advantages described which will prevent loss of material and fouling of the mechanism if the machine fails to position the containers properly with respect to filling devices hereinafter to be described.

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These and other objects of my invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that construction and arrangement of parts and in that mode of operation of which I shall now describe an exemplary embodiment. Reference is made to the accompanying drawings wherein:

Figure 1 is a partial plan view of my exemplary mechanism with certain parts broken either to prevent undue elongation of the figure or to show interior construction.

Figure 2 is a transverse vertical sectional view of the apparatus taken along the section line 2—2 of Figure 1.

Figure 3 is a partial vertical section taken along the section line 3—3 of Figure 1.

Figure 4 is a transverse sectional view taken through a reservoir and its supports along the section line 4—4 of Figure 3.

Figure 5 is a partial plan view of a reservoir and carriage with attendant apparatus.

I have illustrated a machine having a base 1 upon which near one end there is mounted a vertical shaft 5. A sleeve 6 is splined to this shaft; and the height of the sleeve may be adjusted by a hand wheel 7 having interior threads engaging threads on the upper end of the shaft. A pair of head members 8 and 9 are mounted on the sleeve and held together by flanges at the ends of the sleeve. The head member 8 is splined to the sleeve as at 10 so as to rotate therewith. The shaft 5 is driven by a suitable prime mover and motion transmitting connections (not shown); and the head member 9 is held against rotation by an arm 11 affixed thereto and engaging a post or standard 12 on the base 1.

A port or chamber 13 in Figure 1 is formed in the head member 9 and is open through the lower surface thereof. This port is connected by a conduit 14 to a source of supply of filling material for the machine. The source (not illustrated) may comprise a tank adapted to supply the filling material under gravity, or a pump; but in any event, the filling material will be supplied to the port in the head 9 under constant pressure.

The head member 8 is, in the embodiment shown, provided with downwardly curved radially positioned tubular arms 15 terminating downwardly in hollow nozzles 16. Passageways 17 are formed in the head 8 in communication with the

hollow arms 15 and opening upwardly through the top surface of the head member 8 at radial distances from the axis of the shaft 5 which are the same as the radial distance of the port 13 from the same axis.

It will now be evident that as the head 8 is rotated with respect to the stationary head 9, the several radial arms 15 will be brought successively into communication with the port 13 so that if filling material under constant pressure is supplied to the head 9 through the conduit 14 equal measured increments of the filling material will be discharged through the spouts 16 during a portion of the travel of the radial arms. The quantity so discharged will depend upon the viscosity of the filling material, the pressure under which it is supplied, and the circumferential extent of the port 13 which determines the length of time it will remain in connection with any one of the radial arms. The dimensions of the port 13 may thus be changed to vary the time of connection and hence the liquid measurement of the filling material increments; and as will be evident from the ensuing description, the radial arms 15 can be arranged to remain in communication with the port 13 for as much as a full half of their path of circular travel, in which event two or more of the radial arms may be in communication with the port at any given time. Under conditions of constant pressure, however, equal increments of the filling material will be discharged from the nozzles so long as the nozzles present equal resistances to the flow of the filling material. Moreover, a plurality of the ports 13 may be arranged in the stationary head 9 and connected by conduits to the same or to different sources of supply of the same or different filling materials. Features such as those hereinabove described have hitherto been known in filling machines and do not require further elaboration here.

In my machine I fix to the shaft 5 a sprocket 18. An endless chain element 20 engages this sprocket and a spaced sprocket or sheave 21 suitably journaled on the base 1 and driven or not, as desired. The endless chain element 20 thus forms a chain conveyor having two parallel elongated opposite flights at its sides and circular flights at its ends; and the length of the elongated parallel flights may be made of any value dependent upon the spacing of the axes of the sprockets or sheaves 18 and 21. Adjustment in this regard may be had by rotatively mounting the sheave 21 adjustably on the table or base 1 so that it may be moved toward or away from the sprocket 18, and by appropriately lengthening or shortening the endless chain element 20.

At appropriate intervals I mount upon the chain 20 carriage elements 22 for reservoirs hereinafter described. Trackways 23 are preferably provided on the table for these carriages. The intervals between carriages on the chain are chosen so that end portions of reservoir elements on the carriages will lie beneath the spouts 16 in the circular flight of the conveyor about the sprocket 19, as will be clear from Figure 1.

The carriages have upstanding ears or brackets 24, 25 upon which reservoir elements 26 are tiltably mounted as by means of trunnions 27 in Figure 4. The reservoir elements are elongated hollow bodies 28 closed at their ends but having adjacent one end an opening 29 through which filling material can be introduced into them and adjacent their other end an opening 30 from



which the filling material may be discharged. On the trunnions the reservoir elements 28 are tiltable from the position illustrated in Figure 2 to the position illustrated in Figure 3. The first mentioned position is one in which the end having the filling opening 29 is inclined downwardly so that when the reservoir elements come beneath the spouts 16 increments of filling material may be introduced into them and will remain therein as shown at 31 in Figure 2. Since the reservoirs are pivoted near their centers of gravity when empty, the introduction of the filling material into them will tend to maintain the position shown in Figure 2. If, however, the reservoir elements are tilted to the position shown in Figure 3, the filling material contained in them will flow to their opposite ends and will issue by gravity from the openings 30.

The machine, therefore, is provided with means for positioning containers to receive the filling material issuing from the openings 30. To this end a conveyor 32 for cans or other containers 33 to be filled is arranged along one lateral edge of the base or table 1. This conveyor may be a belt conveyor with its upper flight suitably supported or it may comprise slat-like elements 32*a* affixed in juxtaposition on chain elements 34 and 35 riding upon or in trackways on a base or support 36 held at a suitable height by brackets 37 on the table 1. Side guides may be provided as at 38 and 39. It will be understood that the conveyor returns over sprockets at its ends, one or both of which will be driven in timed relationship to the drive of the shaft 5.

The relationship may be such that the linear speed of travel of the conveyor is the same as that of the carriage elements 22 in the adjacent, elongated, straight flight of the chain element 20. It is possible, however, to have the conveyor 32 moving at a higher speed than the reservoirs and carriages 22 providing a projection 22*a* overlying the conveyor is fastened to each of the reservoirs or carriages to serve as a stop for the container being filled from the reservoir on each such carriage. A common drive for the chain 20 and the conveyor 32 is in this event unnecessary; and the conveyor may be made as long as may be required, for example, for cooling purposes.

I next provide means for positioning the cans or other container elements 33 on the conveyor 32 in such a way that they can be brought to underlie the ends of the reservoir elements 28. The cans or other containers will be placed on the conveyor either manually or by some preceding apparatus such as a container cleaning machine; and they will ordinarily lie closely adjacent as at 33*a* in Figure 1, or at irregular intervals. The positioning of the containers on the conveyor 32 is readily accomplished through the use of a driven star wheel element 40, in Figure 1, having arms which engage the containers individually, and which moves at such a rate that a container will be either accurately or substantially positioned under the outer end of each of the reservoirs, depending upon the speed relationship of the conveyors and whether or not the stops 22*a* are used. When released by the star wheel, the cans or other containers retain their positions on the conveyor 32 since there are no forces tending to displace them, if the conveyor and carriages are driven at the same linear speeds, or are held opposite each carriage by the arms 22*a*.

The reservoirs may be operated by purely mechanical means. Thus, in Figure 1, I have indicated at 41 a rod or sweep, supported as at 42

by a post on the table 1, and so shaped as to tilt the inner or receiving ends of the reservoirs 28 downwardly so as to bring them to that relationship to the filling spouts 16 which is illustrated in Figure 2. Adjacent the right hand elongated flight of the chain element 20 in Figure 1 I may provide another rod, a portion of which is illustrated in dotted lines at 43 which is similarly shaped and which is positioned to tilt the reservoirs to the discharging position illustrated in Figure 3 as soon as a container element is positioned with respect to a reservoir so as to receive its contents. Other rods such as that illustrated at 44, supported as at 45, may be provided to maintain the discharging position of the reservoirs; and beyond the conveyor 32 an elongated trough element 45 may be provided following the path of the outer ends of the reservoir element and serving to catch and retain or deliver to a suitable receptacle or conduit any filling material which may drip from the discharge orifices of the reservoirs.

It is an advantage of my construction that the flight of the chain element 20 in which the reservoirs are juxtaposed to containers to receive their contents and are tilted to discharging position may be made as long as desired to insure a complete discharge of the contents from the reservoirs and into the respective containers. The rate of discharge will be affected by the viscosity of the filling material, the size of the orifice 30, and, of course, by the quantity of filling material introduced as hereinabove described into each reservoir. The discharge of the filling material, will, however, be under the influence of gravity, and therefore is likely to be much slower than the pressure injection of the measured increments of filling materials into the reservoirs as they pass around the sprocket 19. The time required for the discharge of the filling material from the reservoirs may thus be rendered entirely independent of the reservoir filling time, which solves a hitherto troublesome problem in filling machines in general. Thus, in my machine, containers to be filled may be sent through it at a rate as rapid as that which may be attained in introducing measured increments of filling material into the respective reservoirs, and thus the productive capacity of the machine may often be very greatly increased. It is frequently necessary for various reasons to introduce filling material rather slowly into containers, as, for example, in instances where foaming is to be expected, or where the mouths of containers are relatively small. While I have illustrated the containers as shallow cans 33, it will be understood that my machine is effective in filling all types of containers, and further that while I have simply illustrated discharge orifices 30 at the outer ends of the reservoir elements 28, the reservoir elements may be provided with any form of nozzle structure known in the art and appropriate for the introduction of filling material into any specific type of container, even including the so-called "shaker top" type of bottle. In the particular exemplary embodiment the shoe polish is handled in a warmed and hence liquid condition, and remains liquid in the reservoirs 28, although it is capable of congealing later in the cans 33 to a pasty consistency. With other materials foaming is minimized by the comparatively slow rate of introduction of the filling material into the containers; but it is an advantage of my apparatus that a slow rate of introduction of the filling material into the ultimate containers does not in any way affect the filling capacity of the machine.



Inasmuch as devices for moving and positioning containers are subject to occasional failure, it has been found desirable in filling mechanisms to provide factors of safety such as a means to prevent the discharge of filling material if a container is not in position to receive it so as to avoid fouling of the machine parts. It is quite possible to accomplish this on a machine having the tilting reservoirs hereinabove described. By way of example, instead of having the reservoirs tilted by a common operating rod such as the rod 43, the tilting of each reservoir may be made responsive to the presence of a container to receive its contents. One way of accomplishing this is shown in Figures 1, 3 and 5 wherein a solenoid operating means 45 is connected between each carriage and the reservoir mounted on trunnions thereon in such a way that when the solenoid is energized, it will operate to tilt the reservoir from the receiving to the discharging position. A pair of contactors 46 and 47 most clearly shown in Figure 5, is mounted on each carriage; and the contactors are arranged to engage bus bars 48 and 49 mounted on an insulative base 50 (Figure 1). The bus bars need not be greatly elongated and are required to be only of such a length, in the light of the linear speed of travel of the carriages, as will permit energization of each solenoid and the tilting of its reservoir. Power is to be supplied to each solenoid through the bus bars and contactors, as will be readily understood; but in the circuit by which this power is supplied I locate a switch 51 operated by an arm 52 lying in the path of the containers on the conveyor 32 so that as each container passes a given point it will produce actuation of the solenoid for the tilting of the appropriate reservoir. The arm 52 is preferably located to be moved by a container as the container is finally positioned on the conveyor by the star wheel 40, but at a time when the star wheel is still in contact with the container so that any displacing force exerted on the container by the arm will be overcome by the power of the star wheel. It has been explained above how the reservoirs when tilted in either direction tend to retain their positions gravitationally. Hence when a solenoid has tilted its reservoir to the discharging position, it will remain in discharging relationship to its container, and prolonged energization of the solenoid is thus not required.

Nor need the solenoids be employed to return the reservoirs from the discharging to the receiving positions since this may be accomplished by means acting on all reservoirs. Thus in Figure 1, I have shown a rod means 52 suitably supported as at 53 which will serve to tilt any reservoirs which have been in discharging position sufficiently to enable their outer ends to ride above the trough 45. The rod 44 will not only maintain the discharging position of the reservoirs but will also serve to tilt into discharging position any reservoir which has remained in the opposite position by reason of the failure of the star wheel to position a container on the conveyor 32 to receive the contents of the reservoir. The contents of such a previously unemptied reservoir will therefore be discharged into the trough 45; and this will prevent overfilling when that reservoir again comes under a filling spout on the filling head. The rod 41, as before, tilts all reservoirs back into the receiving position.

Modifications may be made in my invention

without departing from the spirit of it. Having thus described my invention in an exemplary embodiment, what I claim as new and desire to secure by Letters Patent is:

1. In a filling machine, spaced sheaves and a substantially horizontal conveyor element passing over said sheaves so as to provide spaced, substantially straight-line flights, a straight-line conveyor for containers juxtaposed to one of said flights, carriages mounted at intervals on the first mentioned conveyor and moved thereby, positioning means for positioning containers with respect to the second mentioned conveyor in such a way that a container lies opposite a carriage, and reservoir means on the carriages for receiving and introducing into the containers opposite them measured increments of filling material, and filling means moving in timed relation to said reservoir means for delivering metered quantities of filling material to said reservoir means for subsequent introduction into said containers.

2. The structure claimed in claim 1 wherein the reservoirs are pivotally mounted on the carriages and are tiltable from a receiving to a discharging position, and means adjacent the juxtaposed flight portions of the first and second mentioned conveyors for tilting the said reservoirs.

3. The structure claimed in claim 1 wherein the reservoirs are pivotally mounted on the carriages and are tiltable from a receiving to a discharging position, and means adjacent the juxtaposed flight portions of the first and second mentioned conveyors for tilting the said reservoirs, in combination with means for returning the reservoirs to receiving position at another part of the first mentioned conveyor.

4. The structure claimed in claim 3 in which the means for introducing filling material into said reservoirs comprises a rotary filling head with a plurality of spouts, said head being associated with one of said sheaves.

5. The structure claimed in claim 3 in which the means for introducing filling material into said reservoirs comprises a rotary filling head with a plurality of spouts, said head being associated with one of said sheaves, said head arranged to deliver through said spouts measured increments of filling material under pressure at a rate independent of the rate of delivery of said filling material by said reservoirs to said containers.

6. The structure claimed in claim 5 including a means following the juxtaposed flights of the first and second mentioned conveyors acting to retain a discharging position of the reservoirs, and a trough positioned to receive drippage from said reservoirs.

7. The structure claimed in claim 6 wherein said reservoirs are elongated, tubular bodies closed at the ends, having at one end a filling opening and at the other end a discharge opening, and so pivoted as to be capable of gravitationally maintaining both the receiving and the discharging positions.

8. The structure claimed in claim 7 in which the means for tilting the reservoirs from receiving to discharging position is a means actuated in accordance with the positioning of a container for each such reservoir on the second mentioned conveyor.

9. The structure claimed in claim 7 in which the means for tilting the reservoirs from receiving to discharging position is a means actuated in accordance with the positioning of a container for each such reservoir on the second mentioned conveyor, and comprises an electric solenoid on the carriage, circuit means for delivering power to the solenoid and a switch in the said circuit means arranged to be actuated by a container.

10. The structure claimed in claim 9 in which the means for positioning the containers on the second mentioned conveyor is a star wheel and in which the operating means for said switch is arranged to be contacted by a container while the said container is still in contact with the star wheel.

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