

March 19, 1957

J. F. RYAN, JR., ET AL.
FILLING APPARATUS AND METHOD

2,785,707

Filed July 17, 1953

4 Sheets-Sheet 1

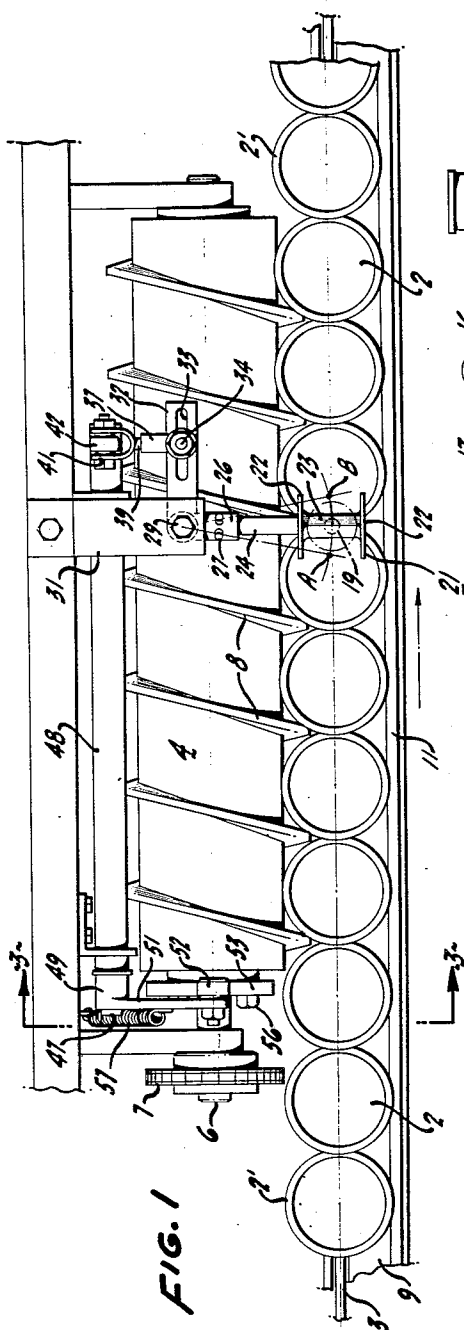


FIG. 1

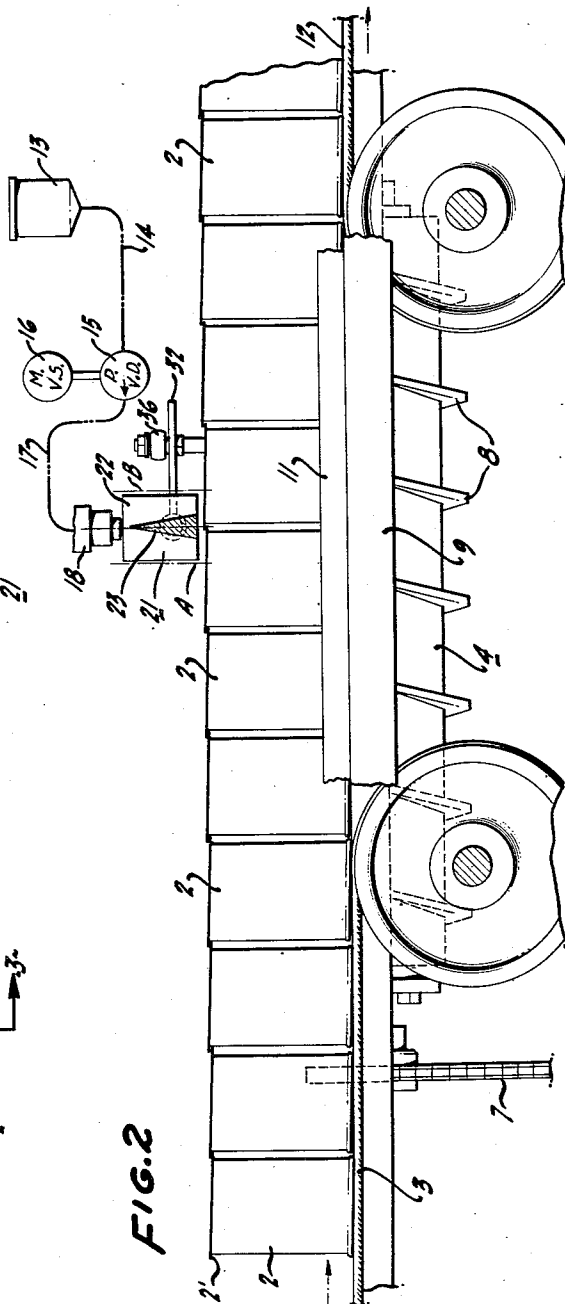


FIG. 2

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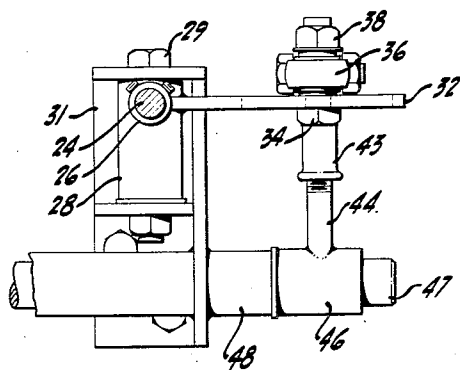
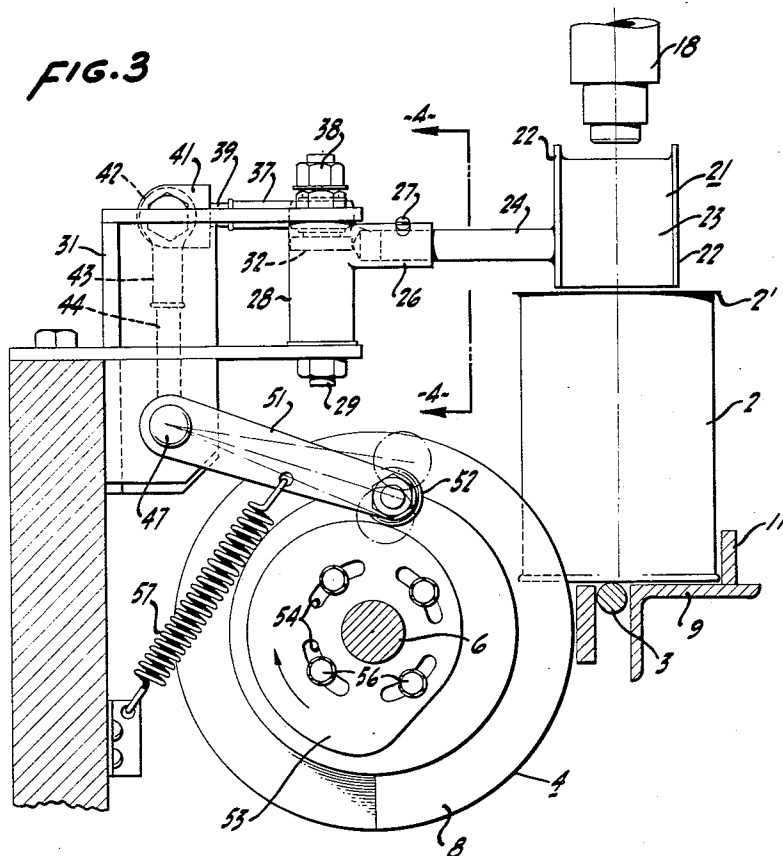
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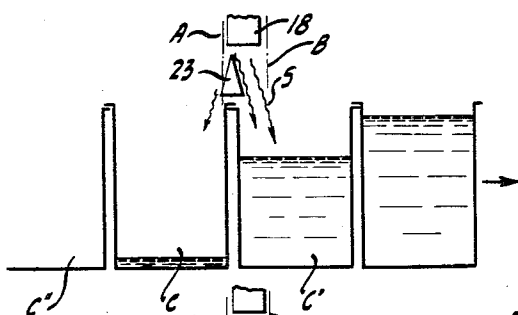


FIG. 5

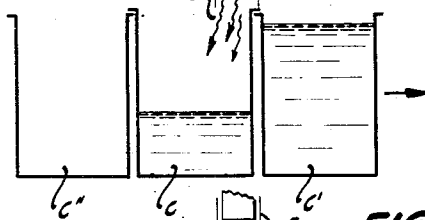


FIG. 6

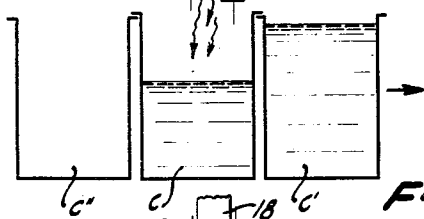


FIG. 7

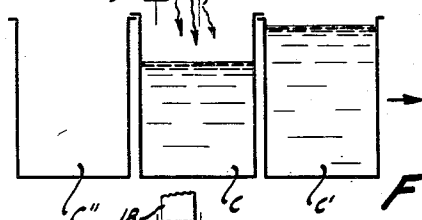


FIG. 8

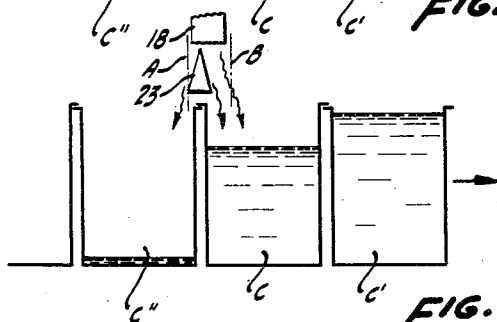


FIG. 9

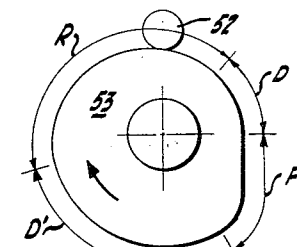


FIG. 5A

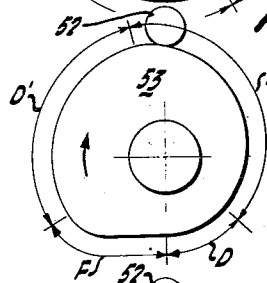


FIG. 6A

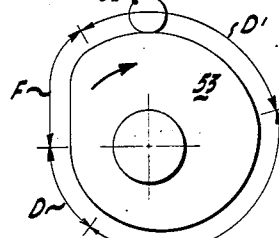


FIG. 7A

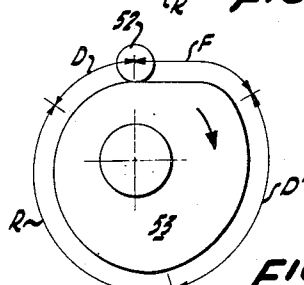


FIG. 8A

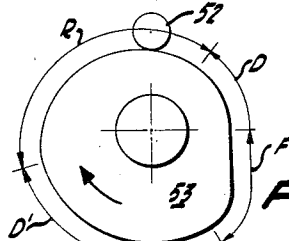


FIG. 9A

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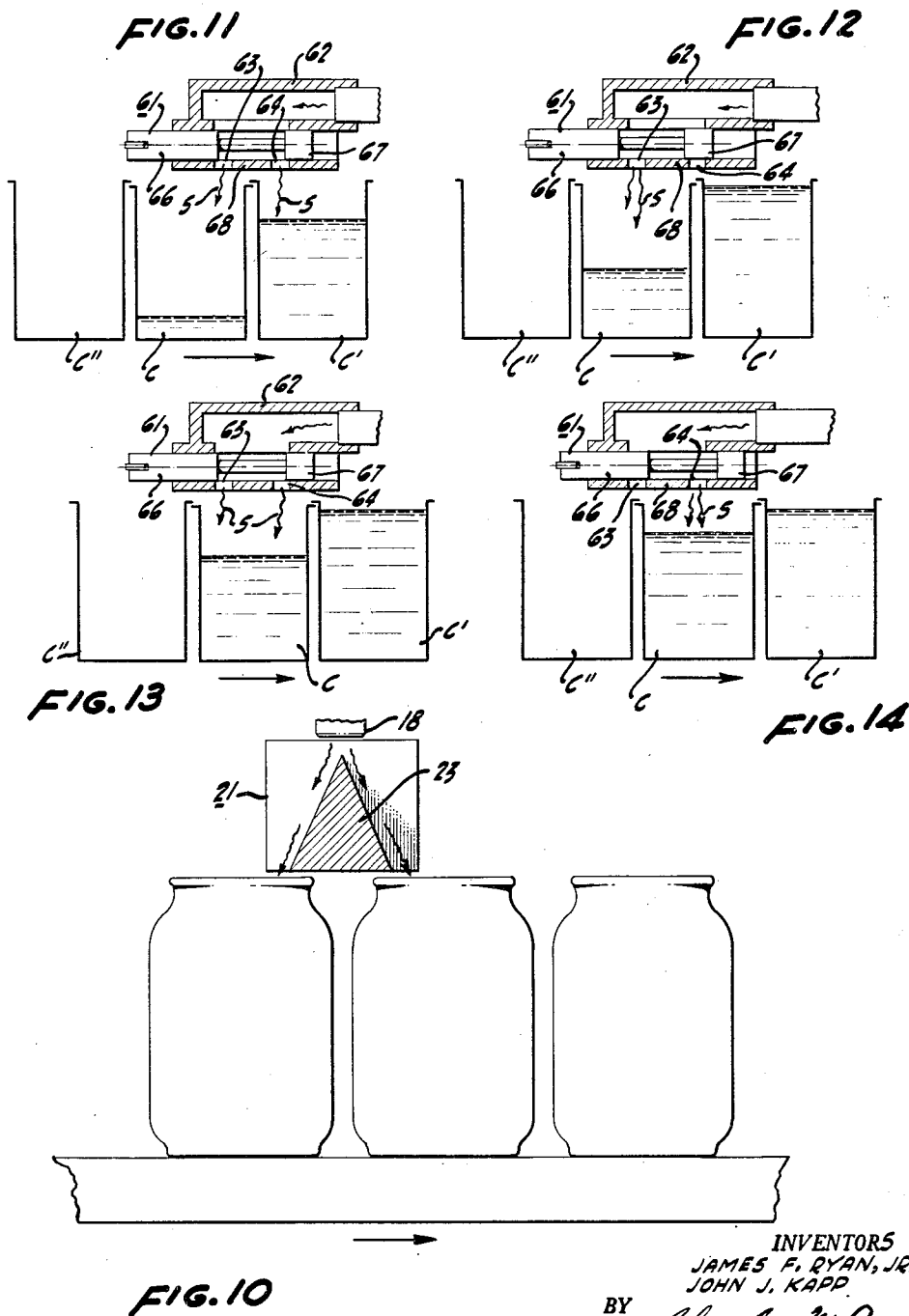
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FILLING APPARATUS AND METHOD

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Application July 17, 1953, Serial No. 368,608

7 Claims. (Cl. 141-1)

This invention relates to the continuous filling of a product in containers, and more particularly to an improved apparatus and method wherein containers are filled substantially without spillage as the containers are moved in a line past a continuous stream of the product.

In assignee's co-pending application, Serial No. 104,074, filed July 11, 1949 for "Apparatus and Method for Filling Products in Containers," now Patent No. 2,667,424, dated January 26, 1954, is disclosed a continuous filling apparatus which feeds a continuous stream of any suitable liquiform product into containers which are continuously conveyed in a line, which may be arcuate but is preferably straight, along or past the stream at such speed as to cause each container to be substantially completely and uniformly filled as it passes by the stream. The containers are conveyed with a substantially continuous and uninterrupted motion, so that spillage of the contents is obviated which would otherwise result if the containers were held stationary under the stream during the filling operation, and consequently have to be moved after each filling operation, with the result that the entire line of containers would have to be moved with an interrupted motion.

Such apparatus is particularly adapted for the filling of containers provided with flanges at their open mouths because the product can be introduced into the containers without spillage when the containers are moved past the stream with their flanges overlapped. Although the apparatus can fill containers positioned with their mouths spaced apart, this is undesirable because of the spillage of the product which would obtain by virtue of the spaces between the mouths of the containers.

With the container flanges overlapped, some of the product is deposited on the flanges of the containers; and in some instances, should the containers be out of round as happens on occasions during handling thereof, precise uniformity of filling may not obtain. Furthermore, there is a problem in the filling of liquiform products containing discrete particles of material, such as cream style corn adapted for canning.

Summarizing this invention, it also embodies continuous filling of containers that are conveyed in one general direction past a continuous stream of the product with a continuous substantially uninterrupted motion. However, the apparatus is designed to enable filling, with substantially no spillage, of a line of adjacent containers, the top edges of which cannot be positioned in adjacent contacting relationship, for example, a glass jar container in which the mouth is of lesser diameter than the body of the container.

Also, the apparatus embodies means that will enable filling without spillage of metal can type containers having flanges at their open mouths, even though the flanges may not be overlapped, or in other words, are spaced apart. In addition, the apparatus is designed to fill products without depositing the same on the adjacent edges of the containers as they pass by the supply stream of

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the product. It can also readily fill liquiform products containing discrete particles, as well as homogeneous liquiform products. Furthermore, with respect to metal can containers, the accuracy of the fill is not dependent on the containers being all perfectly round as they pass by the stream of the product.

The apparatus of this invention comprises a simple nozzle or valve at a predetermined location to which is supplied a continuous stream of the product which flows into the containers as they are continuously moved past the stream by suitable conveying means, with an uninterrupted motion and in predetermined relationship. Stream dividing means including a movable control element is provided. Also, means is provided which correlates the movement of the control element with the movement of the containers to divide or divert the stream at the filling location, past adjacent upper edges of adjacent containers while simultaneously shielding such adjacent edges from the stream. As a result, the adjacent edges, whether they are in contact or spaced uniformly apart, are not hit by the stream of the product.

Referring to the drawings:

Fig. 1 is a more or less schematic plan view of the apparatus.

Fig. 2 is a side elevational view of the structure shown in Fig. 1 with parts shown broken away and other parts shown in section to illustrate more clearly the construction. The view also illustrates schematically the manner of feeding the product to the filling valve.

Fig. 3 is an end vertical sectional elevation taken in a plane indicated by line 3-3 in Fig. 1.

Fig. 4 is a sectional elevation taken in a plane indicated by line 4-4 in Fig. 3.

Fig. 5 is a schematic view illustrating the position of the shield or stream diverting means of the apparatus, with respect to the stream, at one stage in its cycle of operation.

Fig. 5a is a schematic view illustrating the position of a timing cam embodied in the apparatus, corresponding to the position of the shield in Fig. 5.

Figs. 6, 6a, 7, 7a, 8, 8a, 9 and 9a are views similar, respectively, to Figs. 5 and 5a illustrating further stages of the cycle of operation of the parts illustrated in Figs. 5 and 5a.

Fig. 10 is a schematic elevational view illustrating filling of containers, such as glass jars, in which the adjacent edges at the mouths of adjacent containers are uniformly spaced apart.

Figs. 11, 12, 13 and 14 are all similar schematic views of another embodiment of the invention employing a reciprocating valve member, and illustrating various stages in the cycle of operation of such valve member.

Referring particularly to Figs. 1 through 4, the containers 2 illustrated are conventional can type containers of metal having flanges 2' at their open mouths. They are fed to the filling apparatus by means of an endless conveyor cable 3 continuously driven by any suitable means (not shown). The cable merely frictionally engages the containers so that as they pile up adjacent the filling apparatus, the cable can slip under the containers.

A continuously driven worm 4 carried by a shaft 6 journaled in the frame of the apparatus and which is continuously rotated by any suitable means including drive chain 7, is provided in the filling apparatus for continuously conveying the containers therethrough with a substantially uninterrupted motion. Worm 4 has a helix 8 about the periphery thereof to which a continuous supply of the containers are fed by endless cable 3. In this connection, it is to be understood that an adequate supply of containers is always provided by cable 3, so that the worm will always be full of containers. A stationary

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support 9 is provided adjacent worm 4 over which the containers can slide as they are conveyed by the worm; the support being provided with a side guide flange 11 for the containers.

The pitch of helix 8 is constant so as to maintain the containers in predetermined relationship; and in the embodiment of the invention illustrated, the pitch is such as to effect overlapping of the container flanges 2' as they are conveyed. However, it is to be understood that the container flanges need not be overlapped as long as the helix maintains all of the containers in the same predetermined spaced apart relationship. From the discharge end of the worm, the containers are conveyed by any suitable means, such as continuously driven endless cable 12, to suitable cover applying mechanism (not shown).

Means is provided for supplying a substantially continuous stream S of the product at a fixed predetermined location past which the containers are continuously moved by the worm. Such means comprises product supply tank 13 (Fig. 2) connected by piping 14 to the intake side of a so-called constant volumetric discharge pump 15 which provides means for supplying a fixed predetermined quantity or volume of the product per unit of time; this quantity being regulatable at will by means of a variable speed motor 16 connected to drive the pump. The discharge side of pump 15 is connected by piping 17 to a simple valve or nozzle 18 having a single discharge orifice 19 which is always open to supply the continuous stream of the product and which, as can be seen more clearly from Fig. 1, is centered over the center line of the line of containers being conveyed by worm 4.

Any suitable liquiform product, such as a relatively non-viscous product, for example milk, or a relatively viscous product, for example, cream style corn, can be supplied. The product need not be a food product but may be of a non-food product such as lubricating oil or paint to be packaged in containers. In the case of food products to be aseptically canned in a manner disclosed in assignee's Patent No. 2,549,216, the filling apparatus hereof may be employed as the filling mechanism. By supplying a predetermined fixed quantity of product per unit of time to valve 18 in relation to the speed of movement of the containers by the worm, all the containers can be uniformly filled as they pass by stream S of product being continuously fed into the containers.

As the containers are moved past valve 18, means movable with the movement of line of containers is provided, to divert or divide stream S past the adjacent upper edges of adjacent containers while simultaneously shielding such edges from the stream. Such means comprises shield member 21 positioned over the center line of the path of movement of the line of containers, and which is free of contact or engagement with the containers. Shield 21 comprises spaced apart end plates 22 between which is fixedly secured a triangularly or wedge shaped stream divider element 23 with an apex of the triangle positioned uppermost so as to divide the stream sharply when the shield member is moved underneath the valve orifice 19.

Secured to shield member 21 is a rod 24 fixedly secured in a sleeve 26 by means of screws 27; sleeve 26 being carried by a sleeve 28 journaled for pivotal movement on an upright axis about pivot shaft 29 mounted on frame part 31 of the apparatus. Also secured to sleeve 28 is a link 32 having an elongated slot 33 therein. The described structure forms a pivotally mounted bell crank structure, one arm of which includes link 32 and the other arm of which includes rod 24.

Fixedly secured in a predetermined position in slot 33 is a cap screw 34 to which is connected a spherical rod end bearing 36 providing a pivotal ball joint connection; the bearing 36 being connected to an internally threaded sleeve 37. Rod end bearing 36 is fixedly held in adjusted position by a lock nut 38. Sleeve 37 is connected in adjusted position to an externally threaded rod 39 con-

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nected to a clevis 41 which in turn is connected to another spherical rod end bearing 42 providing a ball joint pivotal connection, and which is also connected to an internally threaded sleeve 43 in turn adjustably secured on a rod 44.

Rod 44 is connected to a collar 46 fixedly secured to one end of a pivot or rock shaft 47 journaled for rocking movement in an elongated sleeve 48 extending along worm 4. At its opposite end, rock shaft 47 has secured thereto a collar 49 at one end of cam follower arm 51; the opposite end of arm 51 having journaled thereon a cam follower roller 52. A timing cam 53 is secured in fixed adjusted position to the feed end of worm 4 for rotation with the worm. For adjustment of the cam, it is provided with arcuate slots 54 enabling turning of the cam to a predetermined position when securing cap screws 56 passing through the slots 54 are tightened. Cam follower roller 52 is held against the periphery or profile of the cam by a spring 57 connected to cam follower arm 51 and to a fixed part of the frame of the machine.

Since cam 53 is fixed for rotation with the worm, it will make one complete revolution per revolution of the worm. Hence, the cam will make one complete revolution per movement of each container equal to a distance that the container is moved per revolution of the worm. When the containers are adjacent each other with their flanges 2' overlapping, this distance will be substantially equal to the diameter of the container. If the containers are spaced apart so that their flanges are not overlapped, this distance will be equal to the diameter of the container plus the distance of the space between adjacent containers.

Also, by reason of the pivotally mounted bell crank structure including rod 24 and link 32, the above described linkage connection between link 32 and pivot shaft 47, and the profile of cam 53 which is so shaped as to raise and lower cam follower arm 51 continuously as the cam rotates with the worm, shield member 21 will be continuously moved back and forth along the line of movement of the containers. In this connection, the cam profile is such as to effect movement of shield 21 between a position A (Fig. 1) ahead of the center line of the stream supplied through valve orifice 19 and a position B beyond such center line, with a dwell period at each of such positions A and B.

As is illustrated in Figs. 5 through 9a, wherein direction arrows depict the direction of movement of the parts, cam 53 is provided with a constant radius dwell portion D of about 60° which corresponds to the position at which shield 21 remains stationary at position A ahead of the stream. It is also provided with a longer constant radius dwell portion D' of substantially 115° which corresponds to the position where the shield member remains stationary beyond the stream at B. Between dwell portions D and D', is a gradual rise R of about 135° which is formed by a gradually increasing radius. During this rise, shield member 21 moves at the same speed as the containers from position A to position B. Also, between dwell portions D' and D is a relatively sharp drop or fall portion F of about 50° which determines return of the shield from position B to position A.

A typical cam profile for all sizes of cans from 2½" in diameter to 4¼" in diameter (known in the trade as sizes No. 202, through No. 404) is as follows. Short dwell portion D is of substantially constant radius of about 1⅜". Rise R is of gradually increasing radius from approximately 1⅜" to 2". The relatively long dwell D' is of substantially constant 2" radius whereas drop portion F decreases sharply from 2" radius back to approximately 1⅜" radius.

As previously mentioned, the described actuating mechanism effects movement of shield 21 between positions A and B ahead and beyond the center line of the stream S of product, respectively, with stationary periods at both A and B during a portion of the cycle of operation. The mechanism is so timed that at position A ahead

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of the stream, shield 21 commences to move at the same speed as the line of movement of the conveyors when each pair of upper edges of adjacent containers moves under the shield. Fig. 5 depicts the position of the shield just after it has commenced to move over a pair of adjacent edges of adjacent containers C and C', and has entered the stream flowing from valve 18. It will be noted that the stream is divided or diverted so as to flow past the adjacent edges covered by the shield and flow into both containers C and C'.

Fig. 6 depicts the position of the shield just at the time it has reached position B where it remains stationary. In this position, all of the stream is diverted into the container C to the left while container C' to the right is substantially completely filled and container C becomes filled as it moves past the stream.

Fig. 7 illustrates shield 21 still stationary with container C filled to a greater extent since it is being moved with the line of containers. In this connection, the return movement of shield 21 from position B to position A is so timed as to occur approximately when the center line of container C is under the center line of the stream whereby when the stream is divided during such return movement, both branches will flow into container C.

Fig. 8 depicts the position of the shield after commencement of its rapid return movement resulting from the sharp fall F of the cam but before the shield has reached position A. At position A, it will remain stationary to meet the oncoming adjacent edges between container C and a new oncoming adjacent container C'.

When the adjacent edges of adjacent container C and C' pass under shield 21, the shield commences to move while over such edges, from position A toward position B to divert the stream into both containers C and C' as is depicted in Fig. 9. It will be noted that some of the stream is still flowing into container C which is not yet completely filled, and some of the stream has commenced to flow into container C'.

Figs. 5a through 9a show the position of the cam and cam follower for the various respective positions of the shield in Figs. 5 through 9.

Timing of the mechanism for coordination in the manner described may be readily effected by adjusting the linkage connected to shield 21, so that movement of the shield on both sides of the center line of valve orifice 19 is substantially equal and the extent of such movement is preadjusted in accordance with the size of containers being conveyed. Next, with containers in position to be conveyed by worm 4, the worm is moved so that adjacent edges of a pair of adjacent containers are centered substantially under the center line of the valve orifice. Finally, the cam is so adjusted by means of its adjusting means to cause the shield to be centered substantially under the center line of the nozzle orifice. This automatically results in the cam follower roller 52 being substantially at the middle of long dwell portion D' of the cam.

As previously mentioned, the described cam profile can be employed for sizes of containers varying from No. 202 through 404. With larger size containers, the cam profile can be changed to provide the above described result. In this connection, it is understood that worms with various pitches may be interchangeably employed in the apparatus in accordance with the size of containers being handled by the apparatus.

Fig. 10 illustrates more or less schematically a line of adjacent containers, such as glass jars, which are being filled with spaces between the adjacent upper edges of adjacent containers. The divider element 23 is made wide enough to span the adjacent edges to preclude product from flowing between such edges as the stream is being diverted. Metal containers which are spaced apart can also be filled in the same manner.

Figs. 11 through 14 depict schematically another embodiment of the invention wherein a valve member 61 provides the control element which is movable back and

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forth to divert the stream in the manner described. Such control valve member 61 is connected for back and forth reciprocation through the previously described bell crank mechanism timed by the previously mentioned type of cam. It is mounted for slidable movement in a filler means in the form of a valve housing 62 connected to the source of product supply, and having two spaced apart discharge ports 63 and 64; the valve member 61 being provided with cylindrical sealing and shield portions 66 and 67 for cooperation with the respective ports 63 and 64. The sealing portions 66 and 67 are connected together by a reduced stem portion, which provides a space in the valve housing intermediate elements 66 and 67. This space serves as a port means to permit a stream of product to pass into the valve housing and through discharge ports 63 and 64 selectively in individual stream branches depending upon the position of said port means in relation to these discharge ports 63 and 64. In this connection, the stream branches are bodily fixed with respect to the line of movement of the containers because they do not move axially along the length of the filler.

The portion 68 of the valve housing between ports 63 and 64 cooperates to serve as a shield when the adjacent edges of adjacent containers C and C' are underneath. As is depicted in Fig. 11, the stream is divided to flow through the respective ports 63 and 64 into both containers C and C', and container C' is just about filled.

Fig. 12 shows the valve member substantially at the end of its return stroke, with port 64 closed by shield portion 67. The stream only flows into container C through port 63, while container C' is completely filled.

Fig. 13 depicts the position of the control valve member after it has moved in the direction of movement of the line of containers. All of the stream flows through ports 63 and 64 into container C.

Fig. 14 discloses another stage of the cycle of operation at which the portion 66 of the valve member closes port 63 to shield the adjacent edges of adjacent containers C and C'; all of the product flowing into container C through port 64.

We claim:

1. Apparatus for filling a product in containers comprising filler means including a valve housing having a plurality of spaced discharge ports disposed therein, means for supplying said product into said housing valve means movably mounted within said housing and including fixedly connected valve sealing portions movable in unison and cooperable with said ports for controlling flow of the product through said discharge ports in separate bodily fixed streams, and means for continuously conveying said containers past said discharge ports in timed relation with the movement of said valve means and with a substantially uninterrupted motion with adjacent containers maintained in substantially the same predetermined relationship to effect uniform filling of the containers in their travel past said filler means.

2. Apparatus for filling a product in containers comprising filler means including an enclosed valve housing having a plurality of spaced discharge ports disposed therein, means for supplying said product into said housing, a valve member movably positioned in said housing, said valve member having fixedly connected valve sealing portions movable in unison and port means to cooperate with said discharge ports to selectively control the supply of the product through said discharge ports in separate bodily fixed streams, and means for continuously conveying said containers past said discharge ports in timed relation with the movement of said valve member and with a substantially uninterrupted motion with adjacent containers maintained in substantially the same predetermined relationship to effect uniform filling of the containers in their travel past said filler means.

3. Apparatus for filling a product in containers comprising filler means including an enclosed valve housing having a plurality of spaced apart ports for discharge

of the product therethrough, means for supplying a predetermined fixed quantity of said product into said housing per unit of time, a valve member movably mounted in said housing, said valve member having port means therein and spaced apart fixedly connected sealing portions movable in unison co-operable with said discharge ports for selectively sealing said discharge ports to selectively control discharge of the product through said discharge ports in separate bodily fixed streams, means for continuously moving a line of said containers past said filler means with a substantially uninterrupted motion, means for positioning said containers in predetermined relationship with respect to each other, and means for timing the movement of said valve member with said container moving means to effect uniform filling of the containers in their travel past said filler means.

4. The apparatus of claim 3 in which the spacing of said valve housing discharge ports and said valve member sealing portions are so related as to effect selectively separate and simultaneous flow of the product through said discharge ports.

5. Apparatus for filling a product in containers comprising filler means including an enclosed valve housing having a plurality of spaced discharge ports disposed therein, means for supplying said product into said housing, a reciprocating valve member movably positioned in said housing, said valve member having fixedly connected valve sealing portions, movable in unison for selectively controlling the supply of the product through said discharge ports in separate bodily fixed streams, and means for continuously conveying said containers past said discharge ports in timed relation with the movement of said valve member and with a substantially uninterrupted motion with adjacent containers maintained in substantially the same predetermined relationship to effect uniform filling of the containers in their travel past said filler means.

6. Apparatus for filling a product in containers comprising filler means including an elongated enclosed valve housing which is horizontally positioned, said housing having a plurality of spaced discharge ports in its lower wall portion positioned along a line extending parallel to the longitudinal axis of the housing, means for supplying said product into said housing, a valve structure

mounted for movement within said housing and having spaced apart fixedly connected sealing portions movable in unison cooperable with said ports upon movement of the valve structure for selectively controlling flow of the product through said ports in separate bodily fixed streams which are immovable in a longitudinal direction with reference to said housing, the spaced apart relationship of said sealing portions effecting sequential flow of said fixed streams through said ports as the valve is moved, means for continuously moving said valve structure, means for continuously conveying a line of said containers underneath and past said ports with a substantially uninterrupted motion and with adjacent containers positioned in substantially the same predetermined relationship, and means for timing the movement of said valve structure with said container conveying means to effect uniform filling of the containers in their travel past said ports.

7. A method of filling a product in containers comprising continuously introducing a substantially continuous stream of the product into an enclosed elongated and fixedly positioned filler zone having spaced discharge openings in its lower portion positioned along a line extending parallel to the longitudinal axis of said zone, continuously moving a line of said conveyors underneath and past said openings with a substantially uninterrupted motion and with adjacent containers positioned in substantially the same predetermined relationship, and effecting sequential flow of separate bodily fixed streams through said openings and which are immovable in a longitudinal direction with reference to said zone by sequentially opening and closing said openings from within said zone and in timed relationship with the movement of said containers to thereby effect uniform filling of the containers in their movement past said openings.

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