March 19, 1957 J. F. RYAN, JR., ET AL 2,785,706

FILLING APPARATUS AND METHOD

Original Filed July 17, 1953 4 Sheets-Sheet 1

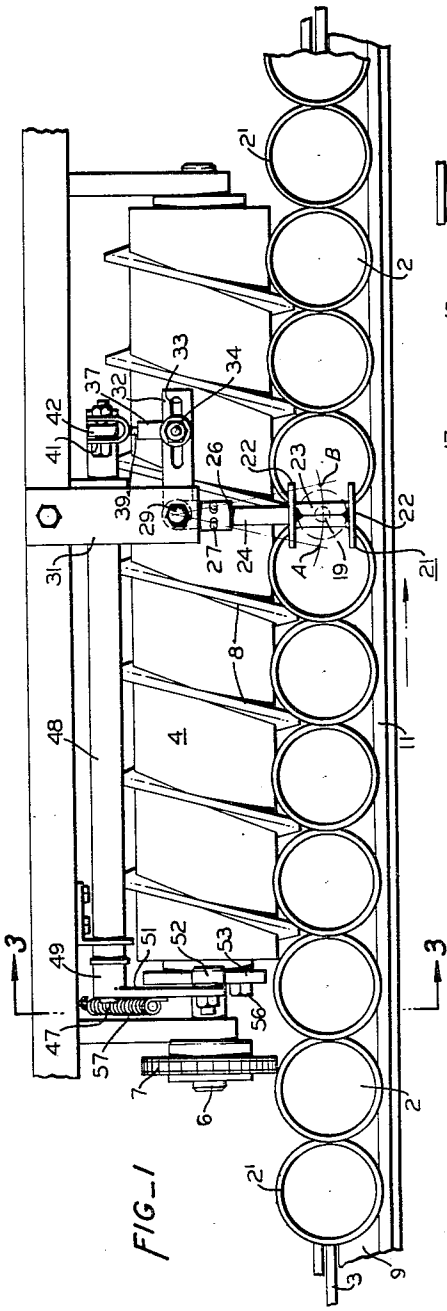


FIG_1

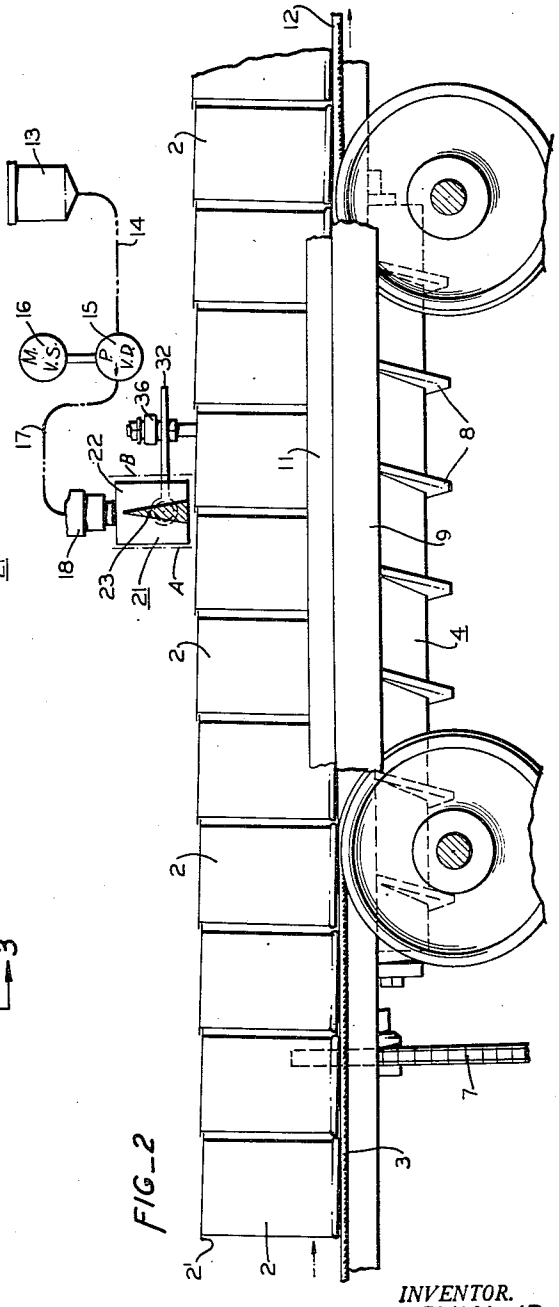


FIG_2

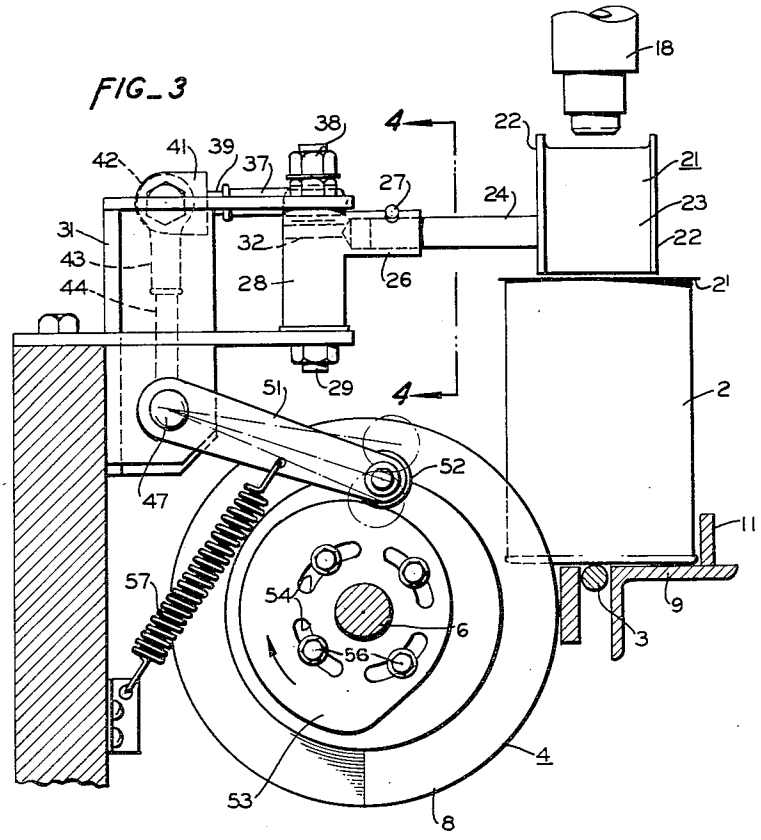
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FILLING APPARATUS AND METHOD

Original Filed July 17, 1953 4 Sheets-Sheet 2

FIG_3



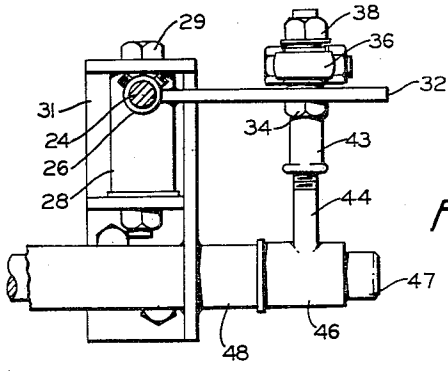


FIG_4

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FILLING APPARATUS AND METHOD

Original Filed July 17, 1953 4 Sheets-Sheet 3

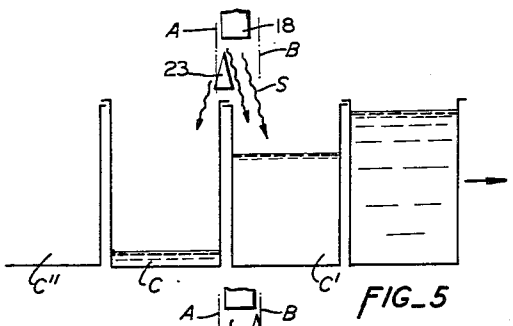


FIG_5

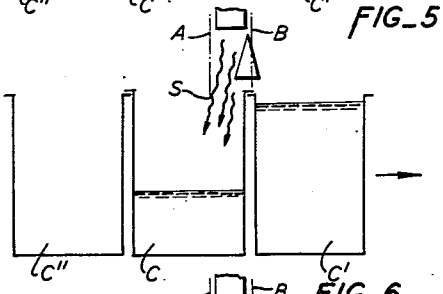


FIG_6

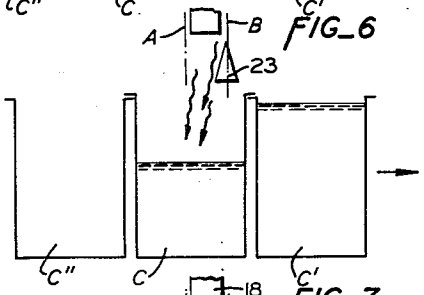


FIG_7

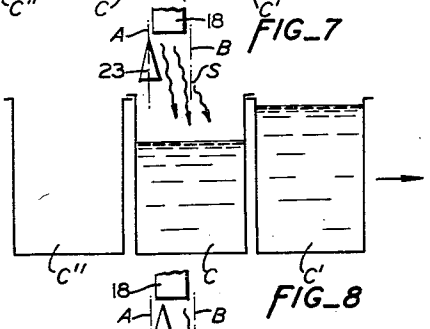


FIG_8

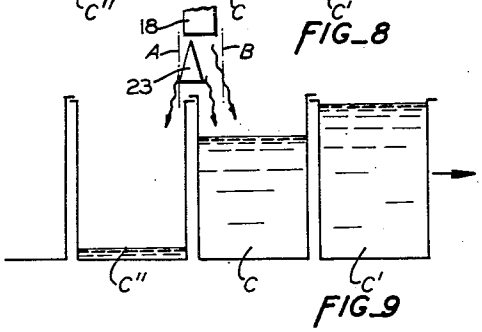


FIG_9

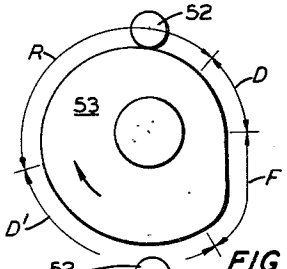


FIG_5A

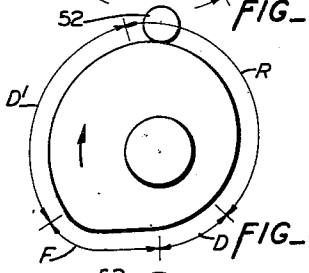


FIG_6A

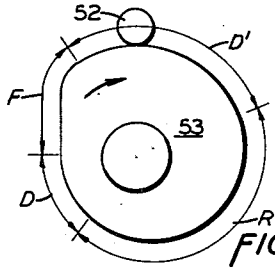


FIG_7A

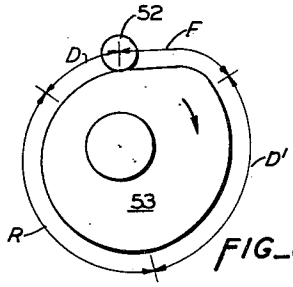


FIG_8A

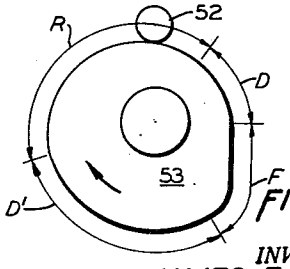


FIG_9A

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FILLING APPARATUS AND METHOD

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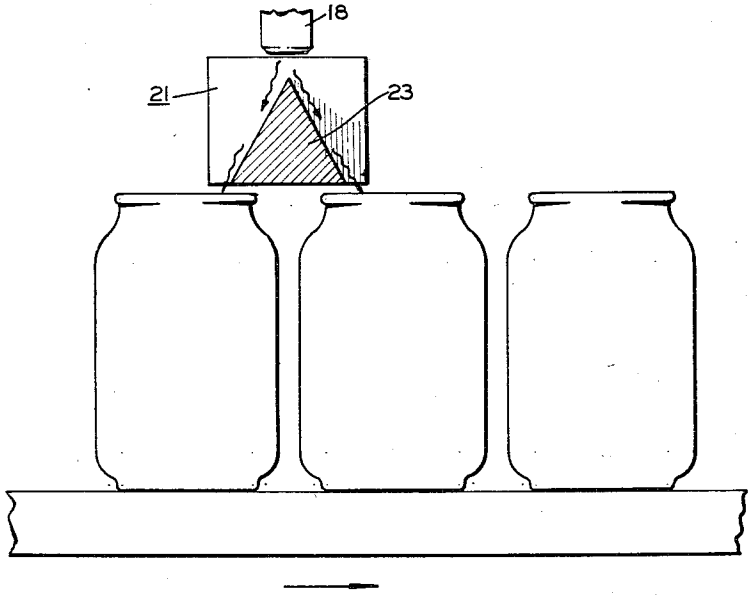


FIG_10

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United States Patent Office 2,785,706 Patented Mar. 19, 1957

2,785,706

FILLING APPARATUS AND METHOD

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Original application July 17, 1953, Serial No. 368,608. Divided and this application February 24, 1955, Serial No. 490,322

11 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.

This application comprises a divisional application of applicants' co-pending application, Serial No. 368,608, filed July 17, 1953.

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, 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, 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 can not 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 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 simuitaneously 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. 5*a* 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, 6*a*, 7, 7*a*, 8, 8*a*, 9 and 9*a* are views similar, respectively, to Figs. 5 and 5*a* illustrating further stages of the cycle of operation of the parts illustrated in Figs. 5 and 5*a*.

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.

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 journalled 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 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 the 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 with its base at an elevation above the upper edges of the container 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 journalled 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 connected 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 journalled 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 journalled 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 9*a*, 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 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 containers 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. 5*a* through 9*a* 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.

We claim:

1. Apparatus for filling a product in containers comprising supply means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said location, a shield mounted below said orifice for dividing said stream as it flows from said supply means, means for moving said shield back and forth along the line of said containers, and means correlating movement of said shield with the movement of said containers to divert said stream at said location past adjacent upper edges of adjacent containers while simultaneously shielding said adjacent edges from said stream.

2. Apparatus for filling a product in containers comprising means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said location with a substantially uninterrupted motion, a shield mounted below said orifice for covering adjacent upper edges of adjacent containers, means for movably supporting said shield, and means for moving said shield past said stream while maintained in shielding position over said edges to divert said stream past said edges at said location.

3. Apparatus for filling a product in containers comprising means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said location with a substantially uninterrupted motion, a shield mounted below said orifice for covering adjacent upper edges of adjacent containers, a pivotally mounted bell crank structure for movably supporting said shield for back and forth movement along said line, means interconnecting said bell crank structure for movement with said conveying means, and timing means included in said interconnecting means for pivoting said bell crank to move said shield back and forth between positions ahead of and beyond said stream.

4. Apparatus for filling a product in containers comprising means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said location with a substantially uninterrupted motion, a shield mounted below said orifice for covering adjacent upper edges of adjacent containers, means for movably supporting said shield, means for moving said shield past said stream while maintained in shielding position over said edges to divert said stream past said edges at said location, said conveying means including means for maintaining adjacent containers in said line in substantially the same predetermined relationship, and means for supplying a predetermined fixed quantity of product to said stream supplying means per unit of time.

5. The apparatus of claim 3 in which a first link is pivotally connected to said bell crank structure, a second link is pivotally connected to said first link and is secured to a pivot shaft, said timing means includes a timing cam driven with said conveying means, and a spring pressed arm is connected to said pivot shaft and carries a cam follower engaging said cam.

6. The method of filling a product in containers which comprising supplying a single substantially continuous stream of the product at a predetermined location, continuously conveying a line of said containers past said location, providing a movable element to divide said stream, and moving said element in time with movement of said containers while maintaining said element free of engagement with said containers to divert said stream at said location past adjacent upper edges of adjacent containers while simultaneously moving said element to shield said adjacent edges from said stream.

7. The method of filling a product in containers comprising supplying a single substantially continuous stream of the product at a predetermined location and at a fixed predetermined quantity per unit of time, continuously moving a line of said containers past said location with a substantially uninterrupted motion and with adjacent

containers in said line maintained in substantially the same predetermined relationship, providing a shield for covering adjacent upper edges of adjacent containers while maintaining said shield free of engagement with said containers, and moving said shield in time with the movement of said edges to shield said edges as they pass said stream and divert said stream past said edges at said location.

8. The method of filling a product in containers comprising supplying a single substantially continuous stream of the product at a predetermined location and at a fixed predetermined quantity per unit of time, continuously moving a line of said containers past said location with a substantially uninterrupted motion and with adjacent containers in said line maintained in substantially the same predetermined relationship, providing a shield for covering adjacent upper edges of adjacent containers while maintaining said shield free of engagement with said containers, moving said shield in time with the movement of said edges to shield said edges as they pass said stream and divert said stream past said edges at said location, and after said shield is moved beyond said stream moving said shield back to a position ahead of said stream for subsequent shielding of the next pair of oncoming adjacent edges.

9. Apparatus for filling a product in containers comprising means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said orifice with a substantially uninterrupted motion, shield means mounted below said orifice for covering upper edges of adjacent containers moving past said orifice, said shield means including a wedge-shaped element having its apex positioned uppermost and its base above the upper edges of such containers; means for movably supporting said shield means, and means for moving said shield means including said wedge-shaped element past said orifice while maintaining the base of said element in shielding position above said upper edges as they move past said orifice to thereby divert said stream past said upper edges during their movement past the orifice.

10. Apparatus for filling a product in containers comprising means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said location with a substantially uninterrupted motion, a shield mounted below said orifice for covering upper edges of containers moving past said location, said shield including a wedge-shaped element having its apex positioned uppermost and its base above the upper edges of such containers, means for movably supporting said shield, means for moving said shield past said orifice to a position beyond the same while maintaining the base of said wedge-shaped element in shielding position above said upper edges as they move past said location to thereby divert the stream past said upper edges during such movement, and means for rapidly returning said shield from said position beyond the orifice to a position ahead of the orifice.

11. Apparatus for filling a product in containers comprising means having a single discharge orifice for supplying a substantially continuous stream of the product at a predetermined location, means for continuously moving a line of said containers past said location with a substantially uninterrupted motion, a shield mounted below said orifice for covering adjacent upper edges of containers during movement past said location, a pivotally mounted bell crank structure movably supporting said shield for back and forth movement along said line, means interconnecting said bell crank structure for movement with said conveying means, timing means included in said interconnecting means for pivoting said bell crank to move said shield in correlation to movement of said containers from a position ahead of said orifice to a position beyond said orifice to shield a first pair of adjacent upper edges of adjacent containers as they move past said location, and means for rapidly returning said shield to a position ahead of said orifice to shield the next pair of oncoming upper edges before said edges pass under the orifice.

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