Feb. 13, 1962 A. M. DONOFRIO 3,020,939

CONTAINER HANDLING MEANS

Filed Oct. 16, 1959 3 Sheets-Sheet 1

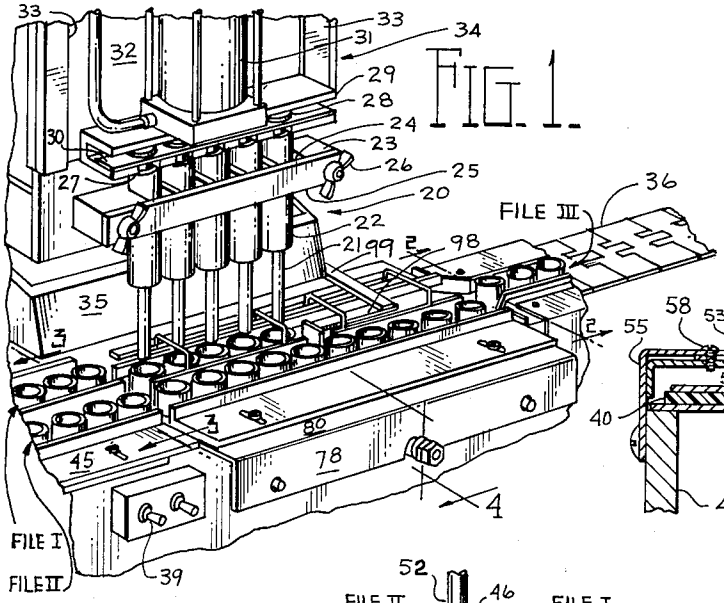

FIG. 1.

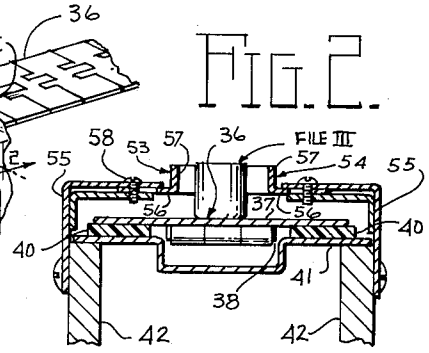

FIG. 2.

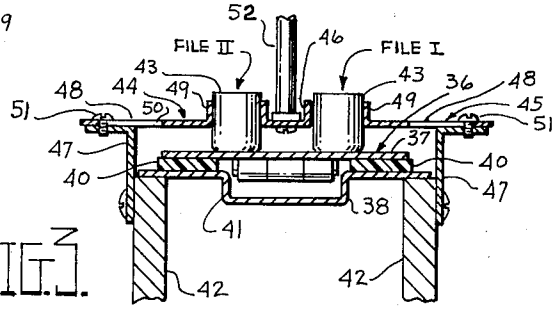

FIG. 3.

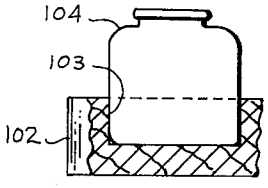

FIG. 11.

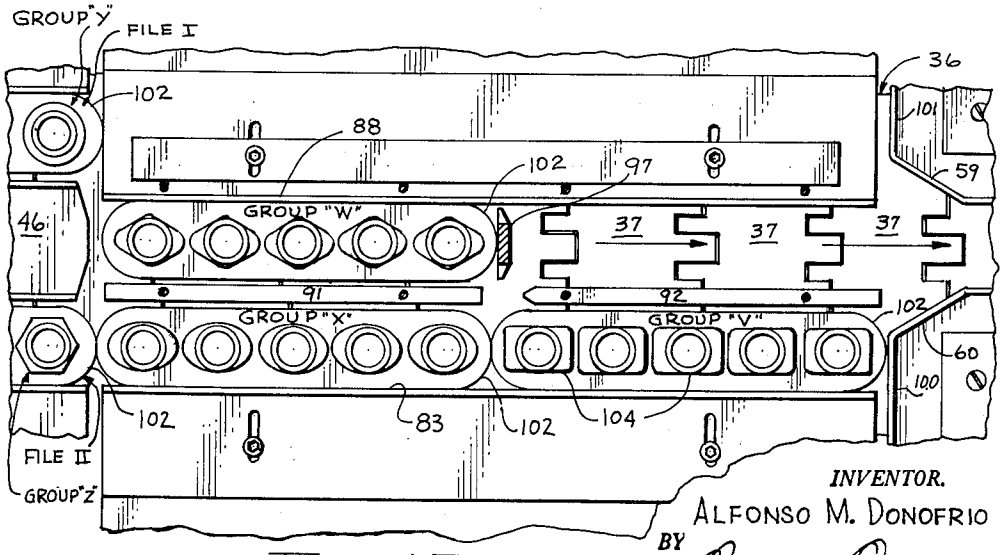

FIG. 10.

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CONTAINER HANDLING MEANS

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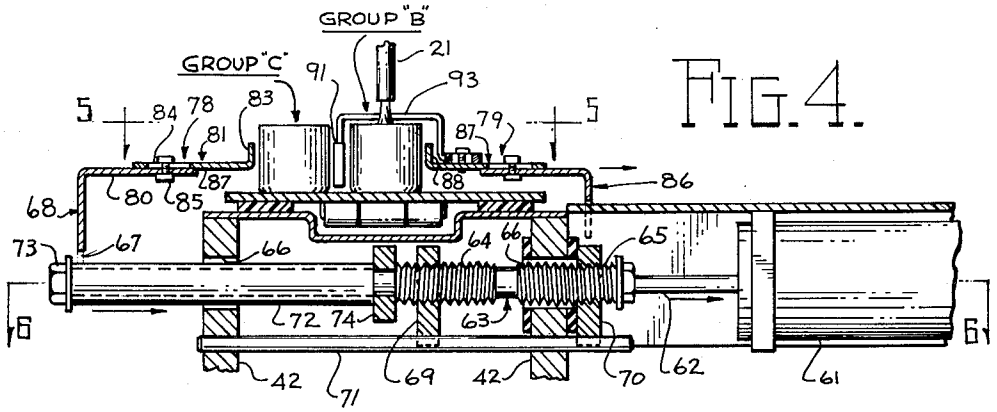

FIG. 4.

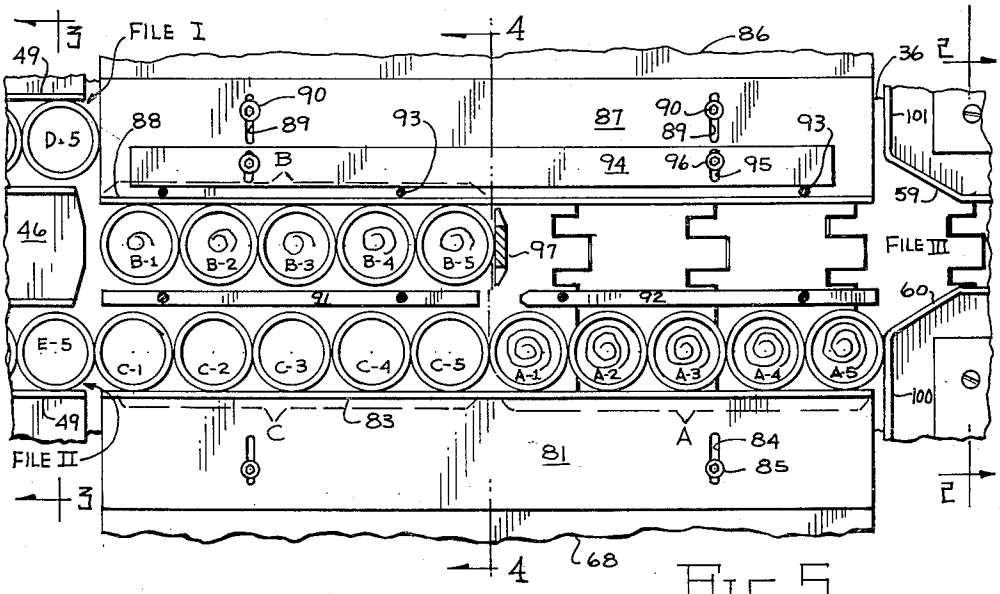

FIG. 5.

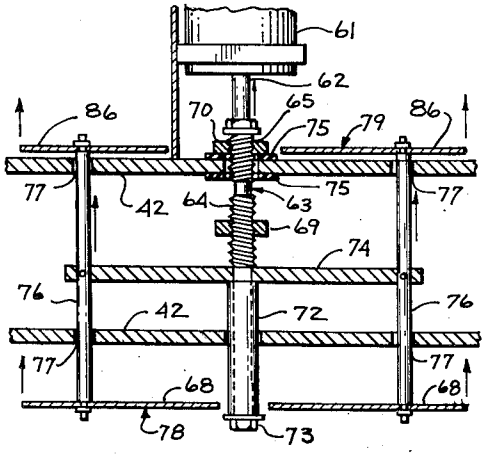

FIG. 6.

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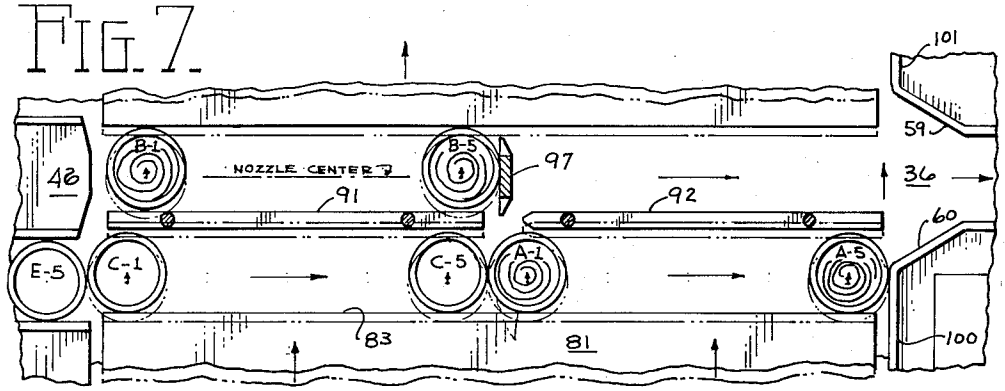
FIG. 7



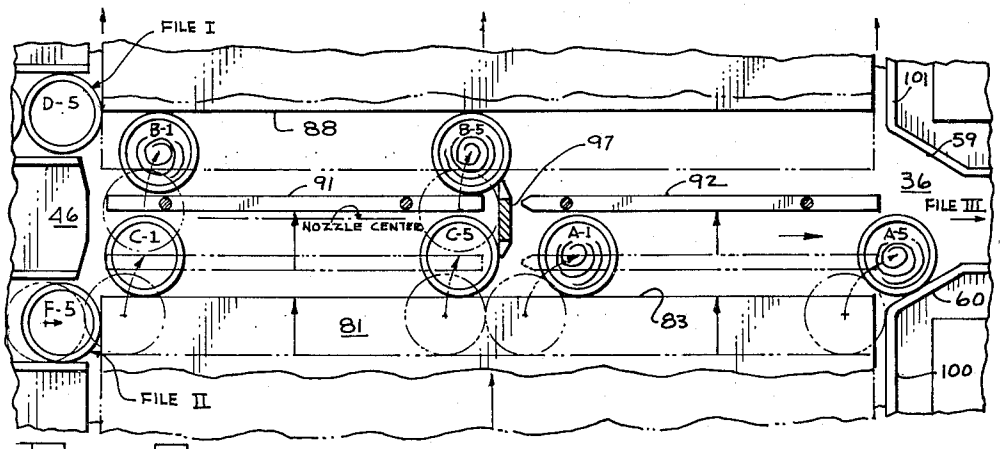


FIG. 8

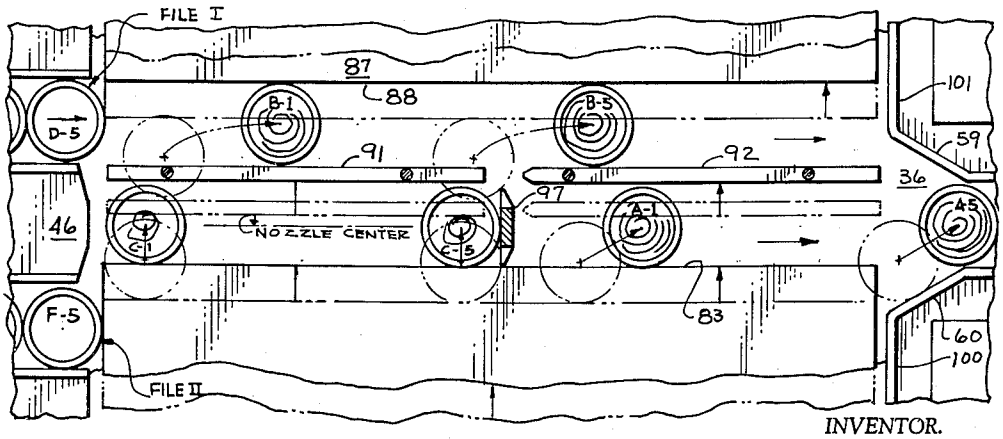


FIG. 9

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United States Patent Office 3,020,939
Patented Feb. 13, 1962

3,020,939

CONTAINER HANDLING MEANS

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Filed Oct. 16, 1959, Ser. No. 846,986
6 Claims. (Cl. 141—169)

This invention relates to container handling means for an apparatus for the high speed filling of open topped containers such as are disclosed in copending Donofrio applications Serial No. 658,048 filed May 7, 1957, now Patent 2,932,330, April 12, 1960, and Serial No. 839,523, filed September 11, 1959.

Apparatus embodying the instant invention is intended for use on a machine having a bank of downwardly extending filling nozzles grouped in an aligned series of any desired number, the mechanism of the invention functioning to deliver similar groups of open topped containers to a position beneath the nozzles and to remove the containers in groups from such position. The apparatus of the invention feeds groups of containers alternately from a pair of parallel files of containers and discharges the filled containers to a single discharge file leading to subsequent apparatus for capping or otherwise closing the containers and for subsequent packaging.

Apparatus embodying the invention is capable of handling not only containers having circular horizontal cross sections or other symmetrical shapes but also open topped containers having cross sections of odd shapes such as diamonds, rectangles, hexagons, ovals, etc.

It is, therefore, the principal object of the instant invention to provide mechanism for the high speed feeding of open topped containers of various sizes and types to a filling station of a machine for filling the containers with measured charges, for presenting the containers in the filling station in desired groups or arrangements and for discharging the groups of containers from the filling station after they are filled.

Other and more specific objects and advantages of a mechanism embodying the invention will be better understood from the drawings, in which

FIG. 1 is a fragmentary view in perspective of the filling station of a bottle filling apparatus and showing mechanism embodying the invention assembled therewith.

FIG. 2 is a fragmentary vertical sectional view taken generally from the position indicated by the line 2—2 of FIG. 1 and shown on an enlarged scale, a more accurate section line being indicated at 2—2 of FIG. 5.

FIG. 3 is a view similar to FIG. 2 but taken from the position indicated by the line 3—3 of FIG. 1 and along the line 3—3 of FIG. 5.

FIG. 4 is a fragmentary vertical sectional view taken from the position indicated by the line 4—4 of FIG. 1 and shown on an enlarged scale; the section also being indicated by the line 4—4 of FIG. 5.

FIG. 5 is a fragmentary plan view taken from the position indicated by the line 5—5 of FIG. 4.

FIG. 6 is a fragmentary horizontal sectional view taken along the line 6—6 of FIG. 4.

FIGS. 7, 8 and 9 are fragmentary plan views illustrating the successive steps of movement of groups of containers from the feeding files into and out of filling position and to the exit file, all being similar to FIG. 5.

FIG. 10 is a view similar to FIG. 5 but illustrating how groups of odd shaped containers may also be handled by mechanism embodying the invention.

FIG. 11 is a fragmentary detail view, partly in section, of a carrier for odd shaped containers.

A machine for filling open-topped containers with measured charges of liquid or liquid-like materials is disclosed in Donofrio application Serial No. 829,523, filed September 11, 1959, and comprises, among other parts, a bank of filling nozzles generally indicated at 20 in FIG. 1. In the machine as shown in FIG. 1, there are five nozzles 21 in the bank 20 and each of the nozzles 21 is on the end of a pump cylinder 22. The pump cylinders 22 are all mounted in a block 23 and while five cylinders 22 and nozzles 21 are shown as making up the group 20, the number of nozzles and cylinders is not limited, of course, and any number from one to, say, ten or twelve, could be arrayed in a fixed grouping to discharge measured charges of the material into open-topped containers. Each of the cylinders 22 fits into one of a group of vertical slots 24 cut in the block 23 and all of the cylinders 22 are removably clamped in the block 23 by a clamping bar 24 held in place, for example, by wing nuts 26. Each of the cylinders 22 has a piston 27 which has an enlarged head 28. The pistons 27 extend through slots in the lower arm of a horizontally turned U-bar 29 and a notched retaining clip 30 is slid beneath the enlarged heads 28 to retain them in the bar 29. The bar 29 is rigidly attached to an air cylinder 31 which is mounted on a sliding plate 32 by ways 33 on the front of a vertically oscillatable carriage, generally indicated at 34. The cylinder 31 has a piston (not shown) secured to a cross frame of the carriage 33 located thereabove, so that alternate strokes of the piston into and out of the cylinder 31 cause the cylinder to move up and down, raising and lowering the piston rods 27 of the measuring cylinders 22.

A liquid supply pan 35 is slidably mounted on the main machine frame and is reciprocated frontwards and backwards, being pushed forwardly every other time that the carriage 34 is lifted so that upon a subsequent lowering of the cylinders 22, the ends of the nozzles 21 are inserted into a supply of liquid in the pan 35. Upon a subsequent vertical lifting of the carriage 34, the pan 35 is retracted and when the nozzles in the bank 20 are again lowered, the air cylinder 31 is actuated to discharge the liquid material downwardly out of the nozzles 21. A more complete description of the operation of the filling machine itself will be found in the Donofrio application referred to above. For the purpose of the present application, however, it suffices to say that at a point in each filling cycle, it is essential to move a group of open-topped containers into position beneath the nozzles 21 to receive material discharged therefrom just prior to their discharge and to move the filled containers away from that position, replacing a filled group with an empty group in time to receive material discharged from the nozzles 21 during a subsequent cycle.

Mechanism embodying the instant invention is particularly designed for supplying open-topped containers, for sorting such containers into groups equal in number and arrangement to the nozzles 21, for sequentially moving each such group into filling position beneath the nozzles 21 and out of filling position after they are filled, and for discharging each such group of containers after they are filled into a discharge file or path which leads to subsequent machinery such as capping or closing machines.

The apparatus embodying the invention comprises a continuously running conveyor 36 which extends across the front of the apparatus, travelling in a horizontal plane. In the drawings, the conveyor 36 is illustrated as being fabricated from a group of individual plates which are articulated together by suitable pins and ears, generally indicated at 38. It is intended that the conveyor 36 runs constantly at a constant speed and a switch 39 (FIG. 1) is provided by which the operator can energize the motor for driving the conveyor 36 when the machine is to be operated. The conveyor slides across the machine on a pair of spaced horizontal strips 40 which are sup-

ported by the wings of a flat channel 41, the channel 41 being in turn carried by a pair of horizontally spaced vertical bars 42. The bars 42 are rigidly mounted on suitable structural members (not shown).

In the embodiment of the invention illustrated in the drawings, containers are fed to the filling station beneath the nozzles 21 from two parallel files indicated in the drawings as "File I" and "File II." The two files of containers, for example generally cylindrical, open-topped jars 43, shown being handled in FIGS. 1–9, are parallel to each other, extending horizontally across the machine and being formed and maintained by stationary adjustable guides. The guides for Files I and II include a pair of outer guides 44 and 45 (FIG. 3) and a center guide 46, the guides 44 and 45 being supported by angle brackets 47 which are in turn affixed to the bars 42. Each of the guides 44 and 45 has a main horizontal web 48 and a turned-over lip 49. The horizontal web 48 of each of the guides 44 and 45 has several transverse slots 50 along its length. Each of the slots 50 receives a machine screw 51 which is threaded into one arm of the corresponding angle bracket 47. By loosening the several machine screws 51, the guides 44 and 45 may be slid inwardly and outwardly or may be removed and turned over so that their lips 49 are turned upwardly, as in FIG. 3, to guide tall containers, or turned downwardly, to guide short containers.

The center guide 46 is U-shaped in cross-section and is removably supported on the lower ends of a plurality of downwardly directed posts 52 which are carried by overhead arms (not shown). Like the side guides 44 and 45, the center guide 46 may be removed from the posts 50 and inverted from the position shown in FIG. 3, so that its arms extend downwardly rather than upwardly.

Containers are fed into the files maintained and established by the guides 44, 45 and 46 from an appropriate mechanism (not shown) and rest upon the span of the conveyor 36 which constantly urges them along Files I and II (left to right) in FIGS. 1, 5, 7–10.

Files I and II lead up to the left side of container shifting mechanism which alternately admits groups of the containers from the two Files I and II into the area of the filling station, shifts each group from its admitted position to filling position beneath the bank of nozzles 20, shifts each group of filed containers out of filling position and then discharges each group of containers out of the shifting mechanism and into a discharge file indicated in the drawings as "File III."

File III is formed by a pair of side guides 53 which are supported above the conveyor 36 by angles 55 (FIG. 2), the angles 55 having downwardly directed arms which are secured to the main bars 42. The guides 53 and 54 have horizontal webs 56 and vertical lips 57, the webs 56 being transversely slotted to receive machine screws 58 in order to permit both adjustment of the guides toward and away from each other and their removal and inversion to accommodate narrower and wider containers as well as taller and shorter containers. The front ends of the guides 53 and 54 are bent outwardly from each other, their vertical lips 57 diverging to form cam surfaces 59 and 60 respectively (FIGS. 5, 7–9).

The center lines of the Files I and II are parallel to each other and equally spaced, respectively, in front of and behind the center line of File III which is coincident with the center line of the bank of nozzles 20.

Apparatus embodying the invention includes container shifting mechanism illustrated in detail in FIGS. 4, 5 and 6 and shown in operation to shift groups of containers in FIGS. 5 and 7–9, inclusive. The container shifting mechanism comprises an air cylinder 61 (FIG. 4) rigidly mounted beneath the main framework of the machine and behind the two laterally extending main bars 42. Cylinder 61 has a piston rod 62 which is attached at its end to a shift rod 63. The shift rod 63 has two threaded sections 64 and 65. The outer end of the shift rod 63 extends through aligned openings 66 in the bars 42 and protrudes forwardly extending out of an opening 67 in a shifter guide bracket 68. Two stop lugs 69 and 70 are threaded on the two sections 64 and 65 of the shift rod 63 on opposite sides of the rear one of the two bars 42. The lower ends of the lugs 69 and 70 are slotted and engage with a guide pin 71 (FIG. 4) extending horizontally across, between and beyond the two bars 42. Engagement of the lugs 69 and 70 with the guide pin 71 prevents rotational movement of the lugs 69 and 70 relative to the shifting rod 63 when the shifting rod is reciprocated horizontally by the air cylinder 61. A spacing sleeve 72 extends over the outer end of the shifting rod 63, being located betwen a hex head on the outermost end of the rod 63 and a cross bar 74 (see FIG. 6). By rotating the rod 63, the two lugs 69 and 70 may be moved closer to or farther from each other. Impact cushions 75 are adhered or otherwise secured to the opposite sides of the rear bar 42 around the opening 66 therein to cushion the shock of the two lugs 69 and 70 striking the bar 42 at the limits of the stroke of the piston rod 62 of the cylinder 61. Movement of the two lugs 69 and 70 toward and away from each other thus determines the limits of the stroke of the shifting rod 63 and of mechanism supported therefrom by the cross bar 74 which includes shifting guides for shifting groups of containers to and from filling position.

The shifting guide mechanism comprises a pair of struts 76 (FIG. 6) which are pinned in and supported by the cross bar 74. The struts 76 extend through aligned holes 77 in the main support bars 42 and, at their front and rear ends, carry a set of two shifting guides, a front guide 78 and a rear guide 79. The front guide 78 comprises the angular bracket 68, the vertical web of which is actually secured to the front ends of the struts 76, and a rearwardly turned horizontal web 80. The web 80 supports an adjustable and invertable guide angle 81 having a slotted horizontal web 82 and a turned-over lip 83. Transverse slots 84 are cut in the web 82 and clamping screws 85 extend therethrough and through the web 80 of the bracket 68. The guide angle 81 may thus be moved inwardly and outwardly or inverted to accommodate containers of different widths and heights in the same manner as the file guides 44, 45 and 53, 54.

The rear guide 79 is similar to the front guide 78, similarly comprising a main bracket 86 and a guide angle 87. The guide angle 87 has a guide lip 88 and slots 89 through which screws 90 extend to provide for fore-and-aft adjustment or inversion of the guide lip 88 to accommodate containers of different widths and heights. The bracket 86 is secured to the rear ends of the struts 76.

Two longitudinally extending center guide bars 91 and 92 are supported equidistantly between and parallel to the guide lips 83 and 88 by overhead arms 93, all of the arms 93 being fixed in a horizontal bar 94. The bar 94 extends parallelly along and is secured to the guide angle bar 87 of the rear guide 79. The guide bar 94 has slots 95 through which machine screws 96 extend into the guide angle 87 in order to provide for adjustment of the spacing between the guide lip 88 and the center guide bars 91 and 92. The overhead arms 93 are spaced to extend between adjacent ones of the nozzles 21 and are arched upwardly a sufficient height so that the tallest containers to be filled can be moved along beneath them.

A stop 97 (FIGS. 5, 7–9) extends downwardly from a bar 98 (FIG. 1) which is secured to a strut 99 that is mounted upon a stationary portion of the machine, so that the stop 97 does not move with either the conveyor 36 or the container shifting mechanism comprising the various guides 83, 88, 91 and 92. The stop 97 is spaced so as to engage the front end of a container group while in central filling position and just prior to and after movement of a container group into and from container filling position.

Operation

FIGURE 5 shows apparatus embodying the invention with a group of previously filled containers, indicated by the bracket "A," a group of containers which have just been filled, indicated by the bracket "B," and a group of containers ready to be moved into filling position, which are indicated by the bracket "C." Each of the five containers in each of the three groups A, B and C is individually lettered as A–1–A–5, B–1–B–5 and C–1–C–5, respectively. Containers D–5, shown at the head of File I and E–5 at the head of File II are also to be considered in the sequence of actions depicted in FIGS. 7, 8 and 9.

Just prior to the position indicated in FIG. 5 of the drawings, an unnumbered group of containers has been moved out of the space above the center spacing bar **92** at the right side of the container shifting mechanism and out through the exit File III. The container shifting mechanism is at its forward or front position in FIG. 5, i.e., the piston rod **62** of the cylinder **61** is fully extended and in the position indicated in FIGURE 4.

After the filling of the containers in "Group B," air connections to the cylinders **61** are reversed and its piston rod **62** started inwardly, i.e., to the right in FIG. 4, to move the container shifting means to the rear, i.e., upwardly in FIGS. 5 and 7–9. At the beginning of the rearward movement of the container shifting mechanism (from the position of FIG. 5 to the position of FIG. 7), the lip **83** of the guide angle **81** pushes against all of the containers in "Group A" and "Group B" and the guide bar **91** pushes against the containers in "Group B." Although the conveyor **36** is constantly running to the right, the containers in "Group A" are held back by the engagement of container A–5 with a transverse extension **100** (FIGS. 5 and 7) of the cam surface **60** and the containers in "Groups A and C," as well as the containers in File II, the first of which is indicated as E–5, are all in contact with each other and all held back by the engagement of container A–5 with the surface **100**. At this same time the containers in "Group B" are held in position by the engagement of container B–5 with the stationary center stop **97**.

As the container shifting mechanism continues to move rearwardly from the position indicated in FIG. 7 to the position indicated in FIG. 8, the left side of the guide angle **81** moves up in front of File II. At the same time the lip **83** has shoved the containers in "Group A" rearwardly and the guide bar **92** has moved rearwardly, a distance sufficient so that container A–5 may escape into File III around the corner of the cam surface **60** and its transverse extension **100**. This rearward and onward movement of the containers in "Group A" allows the containers in "Group C" to move slightly to the right as the lip **83** moves them rearwardly and container C–5 of "Group C" engages the left front corner of the center stop **97**. Rearward and onward movement of the containers in "Group C" allows the containers in File II to move slightly inwardly until container E–5 at the head of File II engages the straight edge of the guide angle **81** which has moved back into position across the end of File III. At the same time the guide bar **91** has moved the containers in "Group B" rearwardly, opening the space between the rear edge of the stop **97** and the lip **88**.

Continued rearward movement of the lip **83**, guide bars **91** and **92** and lip **88**, from the position of FIG. 8 to the position of FIG. 9, completely releases the containers in "Group A" and in "Group B" so they can be moved by the conveyor **36** to their next stations. This rearward movement finally completely opens the space at the rear of the stop **97** which disengages container B–5 from the stop, "Group B" being moved rearwardly by guide bars **91** so that the constantly running conveyor belt **36** can transfer all of the containers in "Group B" to the right, behind guide bar **92** and until they engage a transverse extension **101** of the angle **59**. Of course, at this same time the left edge of guide angle **87** has been moved rearwardly away from across File I so that container D–5 and four following containers of "Group D" are moved in the space behind guide bar **91** as this space is vacated by "Group B." The containers in "Group B," five containers in "Group D" from File I, and all of the remaining containers in File I are all held back by the engagement of container B–5 with the transverse extension **101**.

At this same time, by reason of the rearward movement of the guide bar **92**, the space in front of the guide bar **92** and to the rear of the lip **83** is completely opened, to discharge all of the containers in "Group A" into File III whence they move to subsequent container handling machinery such as capping or packing machines.

Continued movement of the conveyor **36** urges all of the containers in "Group C" against the center face of the stop **97** and when the shifting mechanism comprising lip **83**, guide angle **87**, guide bars **91** and **92** reaches the rear position of FIG. 9, "Group C" of containers has been substituted in filling position for the just previously filled "Group B." The center line of the nozzles **21** is indicated in FIGS. 7, 8 and 9 by the legend "Nozzle C.L." and a comparison of the center lines of the containers in "Group B" and "Group C" with the "Nozzle C.L." illustrates how these two groups of containers are shifted as just described.

After the containers have completed the movement made possible by the shift from position of FIG. 5 to the position of FIG. 9, the containers in "Group A" have been completely discharged from the filling mechanism into the discharge File III; the containers in "Group B" are positioned at the right rear side of the mechanism against the extension **101**; the containers in "Group C" are in filling position beneath the nozzles **21** and held there by the center stop **97**; the containers in "Group D" have moved into the space behind the guide bar **91** and at the left side of the container shifting mechanism. The containers in "Group D" are thus in position to be filled next after the containers in "Group C"; the containers in "Group B" are in position to be discharged into File III upon the occasion of the next movement of the shifting mechanism from the position of FIG 9 to the position of FIG. 5. In this movement from position of FIG. 5 to the position of FIG. 9, the containers in "Group B" will be discharged into File III; the containers in "Group D" will be moved into filling position; the containers in "Group C" will be moved into the front right side of the container shifting mechanism (the position of "Group A" in FIG. 5), and the containers in "Group E" will be moved into the left front side of the shifting mechanism (the position of "Group C" in FIG. 5).

Thus, during each shift from front to back or back to front of the shifting mechanism, a group of empty containers from one of Files I or II is moved into a waiting position; the next preceding group of containers which originated in the other one of Files I or II is moved into filling position; the just filled group of containers is moved from filling positon to a position preceding release and the group of containers which was filled two cycles previously, is released into File III.

Mechanism embodying the invention thus selects groups of containers alternately from the two feeding Files I and II, fills them in the order of their selection and discharges them in the order of their filling into the discharge File III. Each group of containers is moved into filling position in exactly the same arrangement as the arrangement of the nozzles **21** by which the containers are filled. Each group of containers is held in place and each group is positively and selectively delivered from filling position to filled storage position and then to discharge File III.

Odd shaped containers

In the above description of the operation of mechanism embodying the invention, it has been assumed that all of

the containers being handled are circular in horizontal cross section. If, however, this is not so, and instead the containers are of other than circular cross section so that they cannot be handled in the manner just described, they may be handled in apparatus embodying the invention by the use of auxiliary means illustrated in FIG. 10. FIG. 10 shows the filling of rectangular, diamond, oval and hexagonal containers as well as circular containers which are smaller than the size for which the machine happens to be set up. In order to handle containers containing such configurations or circular containers of small diameter, such as slim vials, the apparatus of the invention provides for the use of group blocks **102**. The group blocks **102** are of the same exterior dimensions and configurations regardless of the particular shapes of the containers and each of them is of the same length and lateral dimensions as a group of five circular containers for which the machine may be set at that time. Each of the group blocks **102** has five recesses **103** (FIG. 11) in its upper face, each of the recesses **103** being shaped to receive an individual container **104** of the shape being filled with the containers so spaced that their center lines are spaced and aligned in agreement with the center lines of the nozzles **21**.

Except for the presence of the group blocks **102** with their odd shaped containers in FIG. 10, the mechanism is shown in FIG. 10 as being in exactly the same position as that of FIG. 5. A group block **102** for "Group V" in shown in the right front section of the shifting mechanism, i.e., in front of the guide bar **92**, and as being urged against the extension **100** of the cam surface **60**. A group of containers **102** for "Group W" is illustrated as being in filling position urged against the center stop **97** and ready to receive material from nozzles **21**. The group block **102** for the next group of containers to be filled, i.e., "Group X," is shown at the left front section of the shifting mechanism and as being urged against the left end of the group container **102** for "Group V." The next group container **102** to be fed into the shifting mechanism, upon the occasion of its arrival at rear position (as in FIG. 9) is shown as containing "Group Y" at the head of File I, and the next group container **102** for "Group Z" is shown at the head of File II. The sequence of operations of apparatus embodying the invention is the same when handling containers in group blocks **102** as it is when handling groups of containers such as the groups A–E, inclusive, described with respect to FIGS. 5 and 7–9.

What I claim is:

1. Container handling mechanism in a machine for filling open top containers in groups, said machine having an aligned bank of downwardly extending discharge nozzles, said mechanism comprising, a constantly running horizontal conveyor belt extending across said machine beneath and parallel to said bank of nozzles, container shifting means overlying said conveyor and comprising a center guide and two parallel sidge guides spaced equidistantly therefrom and on opposite sides thereof a distance equal to the lateral dimension of a container group, said guides forming two open-ended, parallel container group ways, means for laterally shifting said container shifting means between positions with said ways alternately centered beneath said nozzles, a stationary stop extending across and above said conveyor and positioned to obstruct movement of a container group out of each of said container group ways from beneath said nozzles, and means for serially feeding container groups alternately into the container group ways of said shifting means.

2. Mechanism according to claim 1 including at least one open ended on-guide extending to the edge of the container shifting means and the container shifting means having an element for closing the end of said on-guide when shifting means is shifted toward the other of its two positions.

3. Mechanism according to claim 1 including a pair of open-ended on-guides extending over said conveyor to the edge of said container shifting means, each of the open ends of said on-guides aligning with the open end of one of the container group ways at alternate positions of said shifting means and said shifting means has a pair of elements, each of said elements closing the end of one of said on-guides when said shifting means is shifted toward the other of its two positions.

4. Mechanism according to claim 3 in which the container group ways are two container groups long and including a single container off-guide aligned with the bank of nozzles and leading from the discharge ends of the container group ways.

5. Mechanism for handling groups of open top containers for a filling machine of the type having a group of downwardly extending discharge nozzles and means for intermittently discharging a measured charge simultaneously from all of said nozzles, said nozzles being aligned across said machine, said mechanism comprising, in combination, a conveyor extending across said machine beneath and aligned with said group of nozzles, a pair of parallel on-guides spaced from each other transversely of said conveyor a distance approximately equal to the width of a container group and equidistantly on opposite sides of the line of said nozzles, said on-guides being open at their ends and terminating along a plane normal to the line of said nozzles, a container group shifting means having three parallel guides forming two parallel ways that are parallel to said on-guides and to the line of alignment of said nozzles and parallel to the direction of movement of said conveyor, said ways being two container groups long and each way being one container group wide, mechanism for moving said shifting means alternately between a front position with the front one of said ways aligned with the front one of said on-guides and the rear one of said ways centered beneath said nozzles and a rear position with the rear one of said ways aligned with the rear one of said on-guides and the front one of said ways centered beneath said nozzles, a cross stop positioned above said conveyor and extending across that one of said ways centered beneath said nozzles and spaced from the ends of said on-guides a distance equal to the length of one container group, an off-guide leading from the discharge side of said shifting means and aligned with that one of said ways centered beneath said nozzles, and mechanism for energizing said moving mechanism following each discharge from said nozzles.

6. Mechanism according to claim 5 in which said shifting means has elements at its side for closing off the rear one of said on-guides when in front position and the front one of said on-guides when in rear position.

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