Sept. 25, 1951 L. T. COOKSON 2,568,949

CONTAINER CLEANING MACHINE

Filed June 28, 1948 8 Sheets-Sheet 1

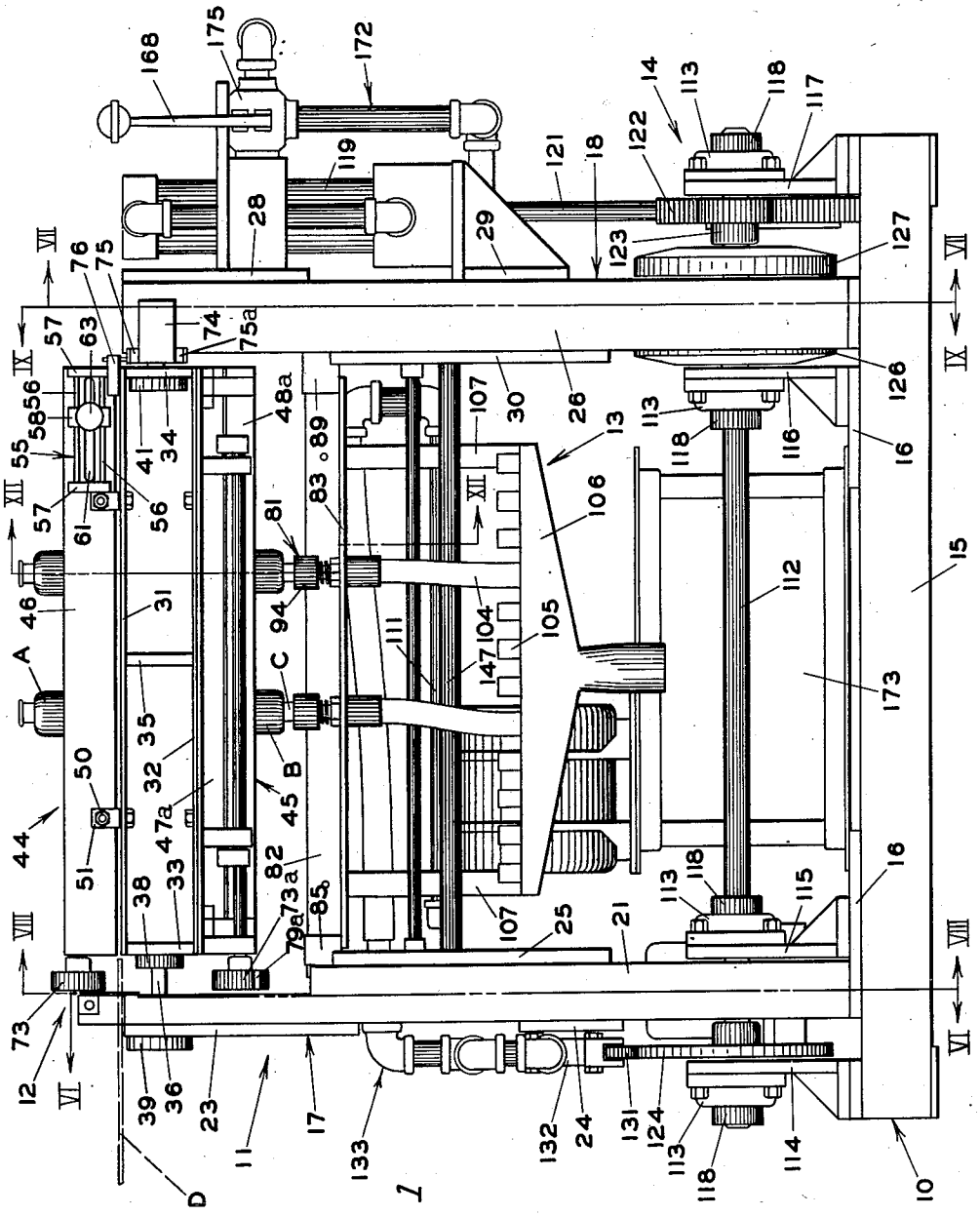


FIG. 1

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CONTAINER CLEANING MACHINE

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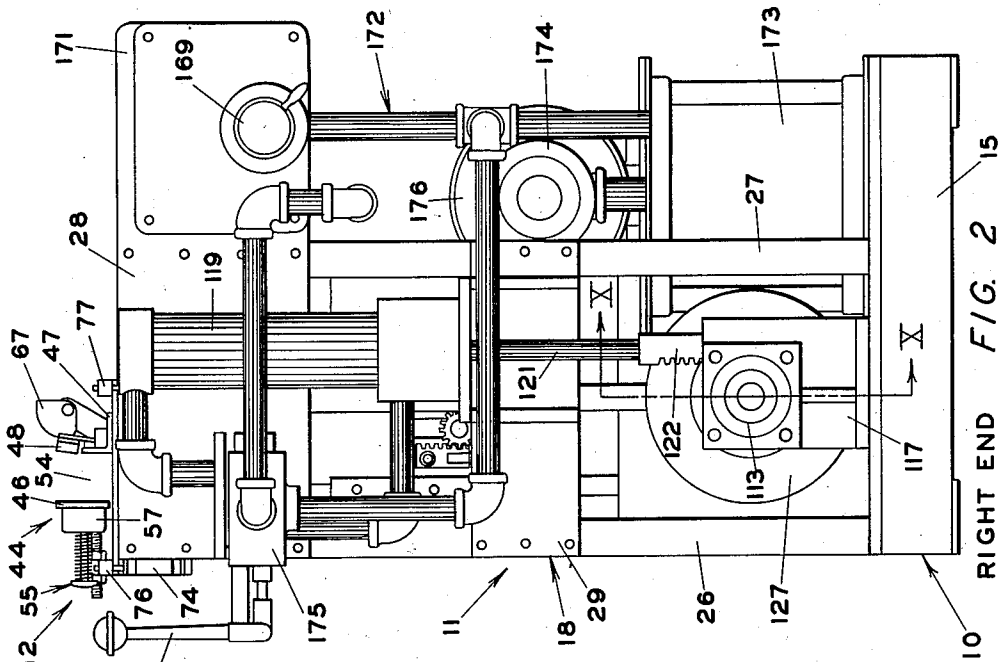


FIG. 2

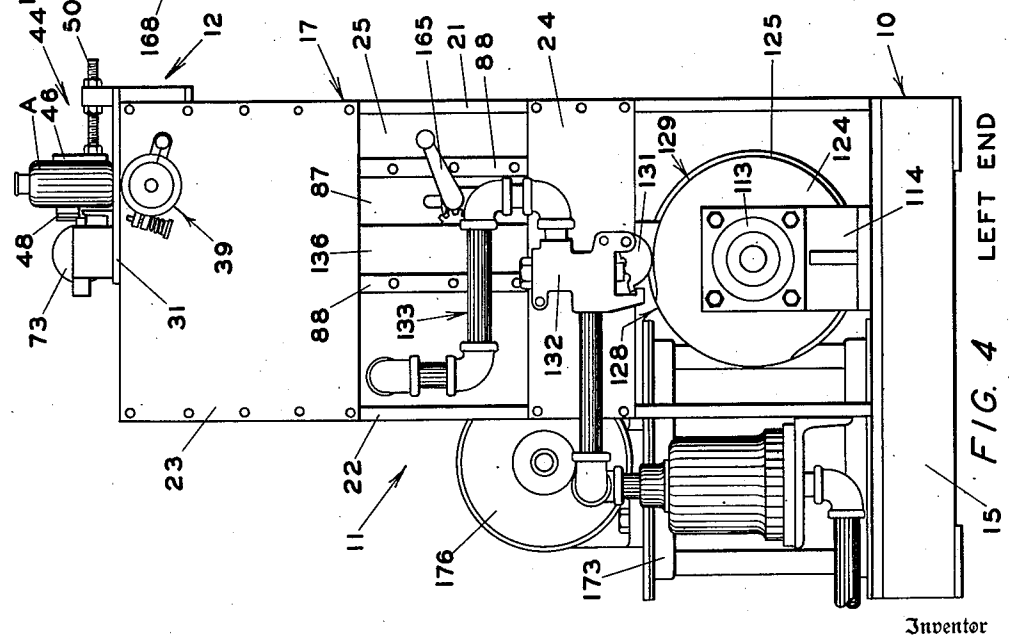


FIG. 4

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CONTAINER CLEANING MACHINE

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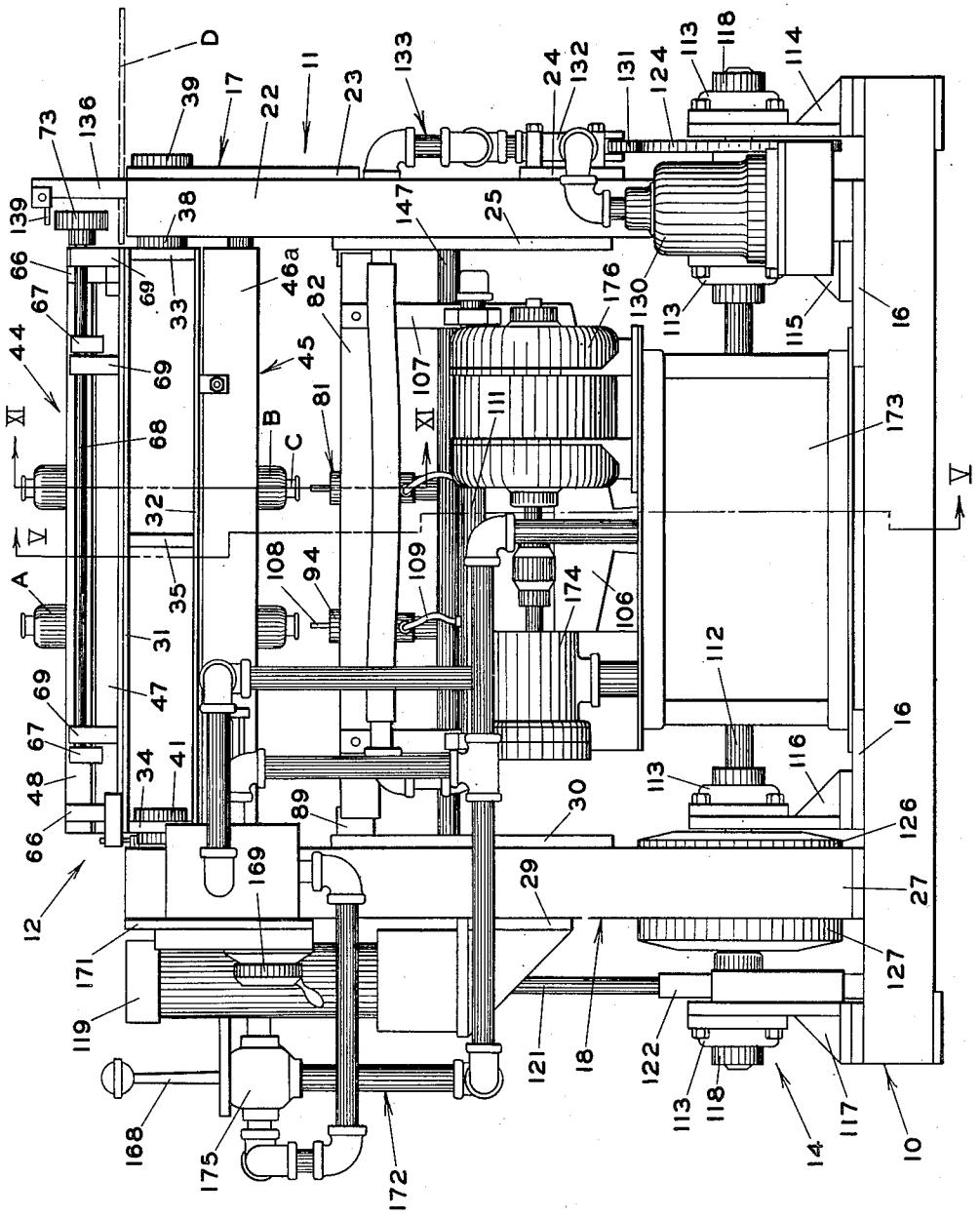


FIG. 3

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CONTAINER CLEANING MACHINE

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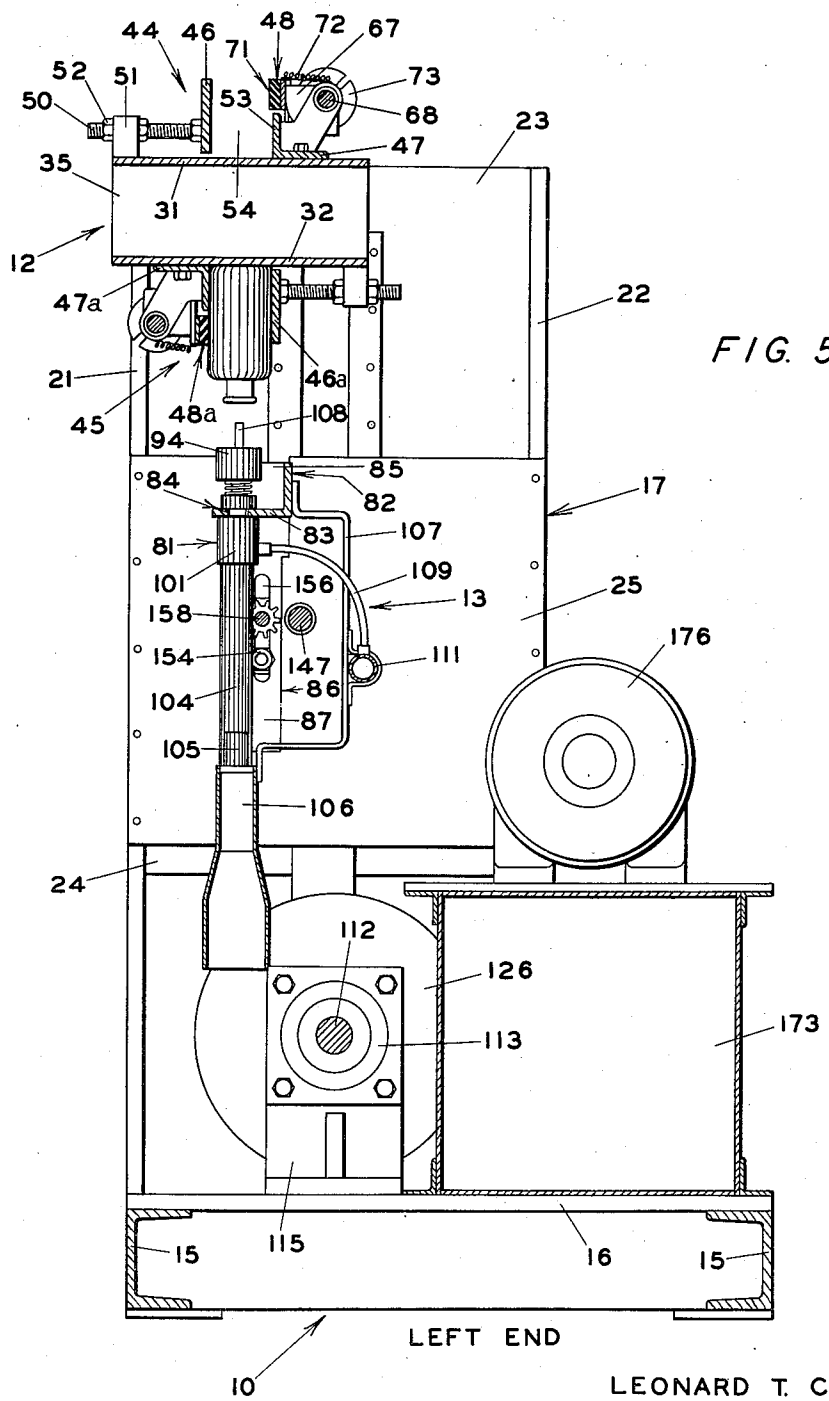


FIG. 5

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CONTAINER CLEANING MACHINE

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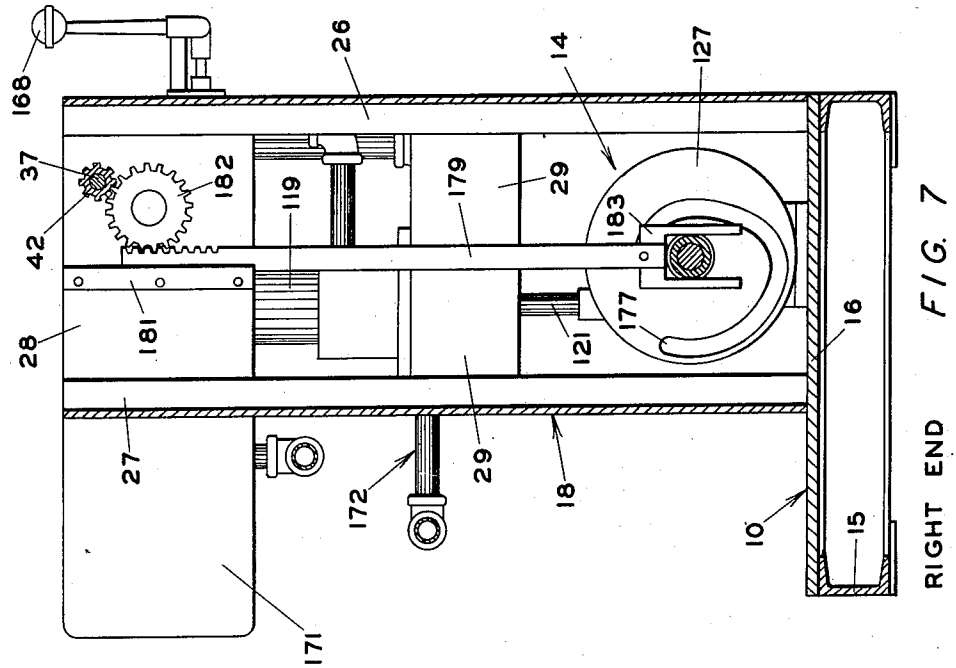


FIG. 7 RIGHT END

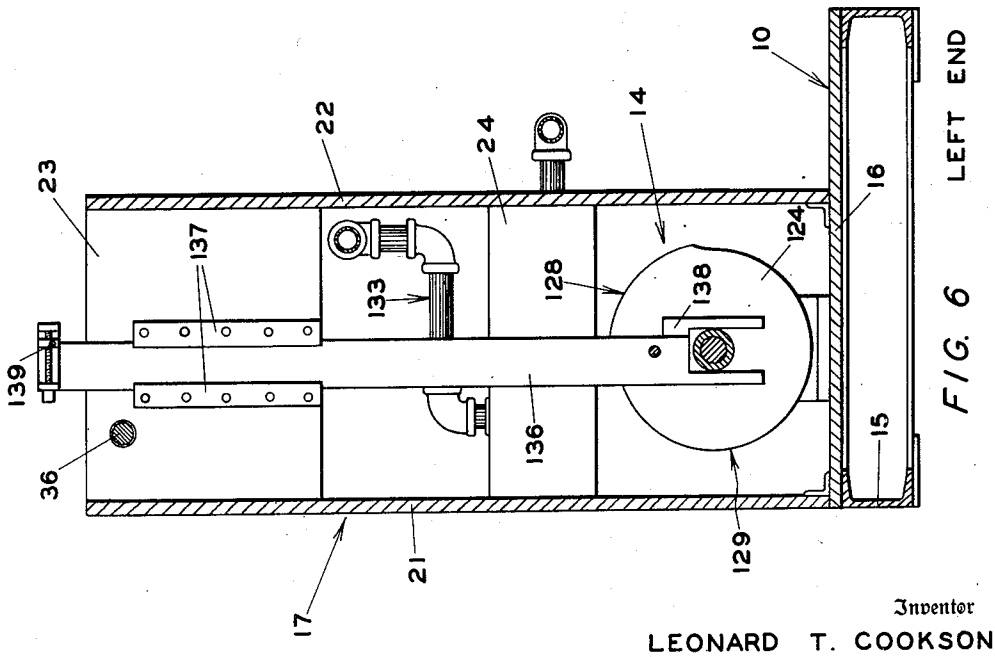


FIG. 6 LEFT END

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CONTAINER CLEANING MACHINE

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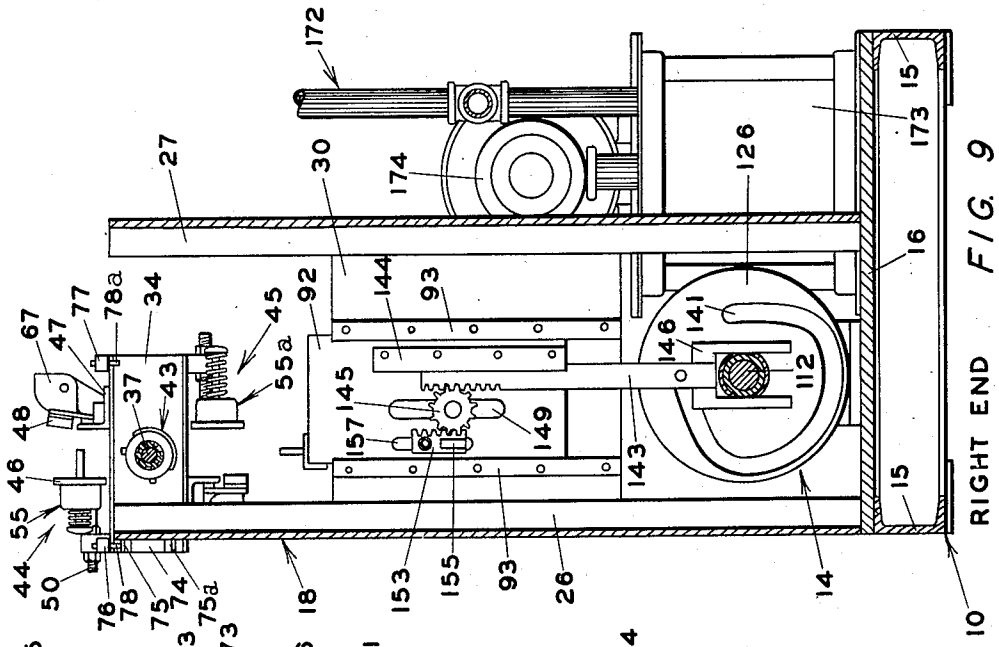


FIG. 9

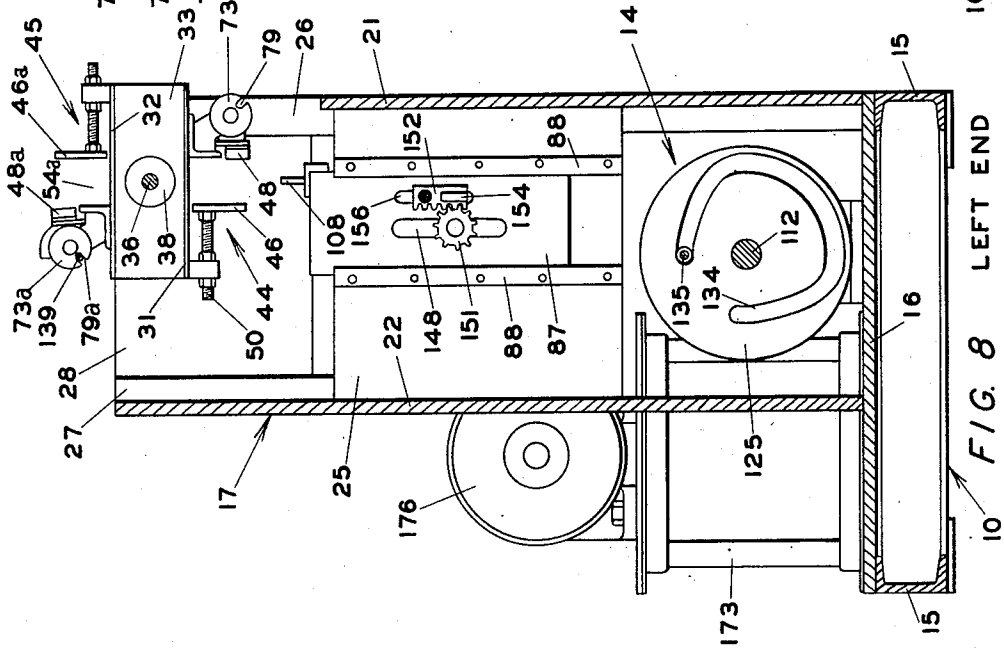


FIG. 8

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CONTAINER CLEANING MACHINE

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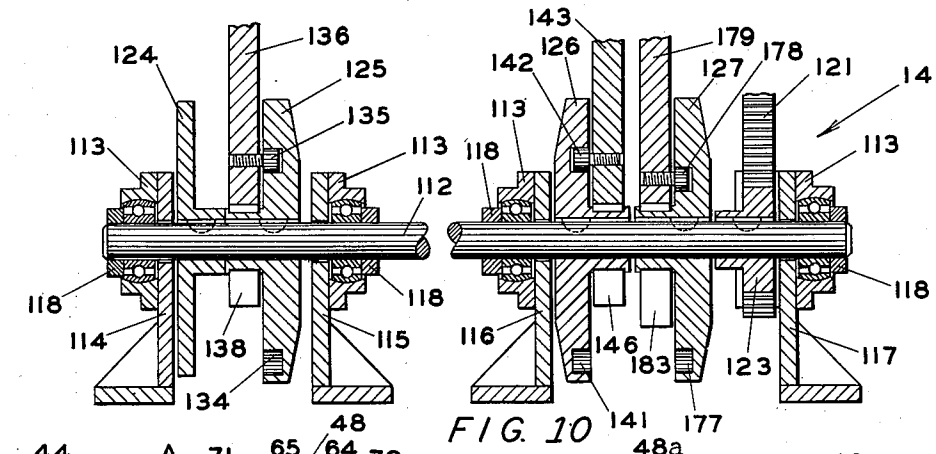


FIG. 10

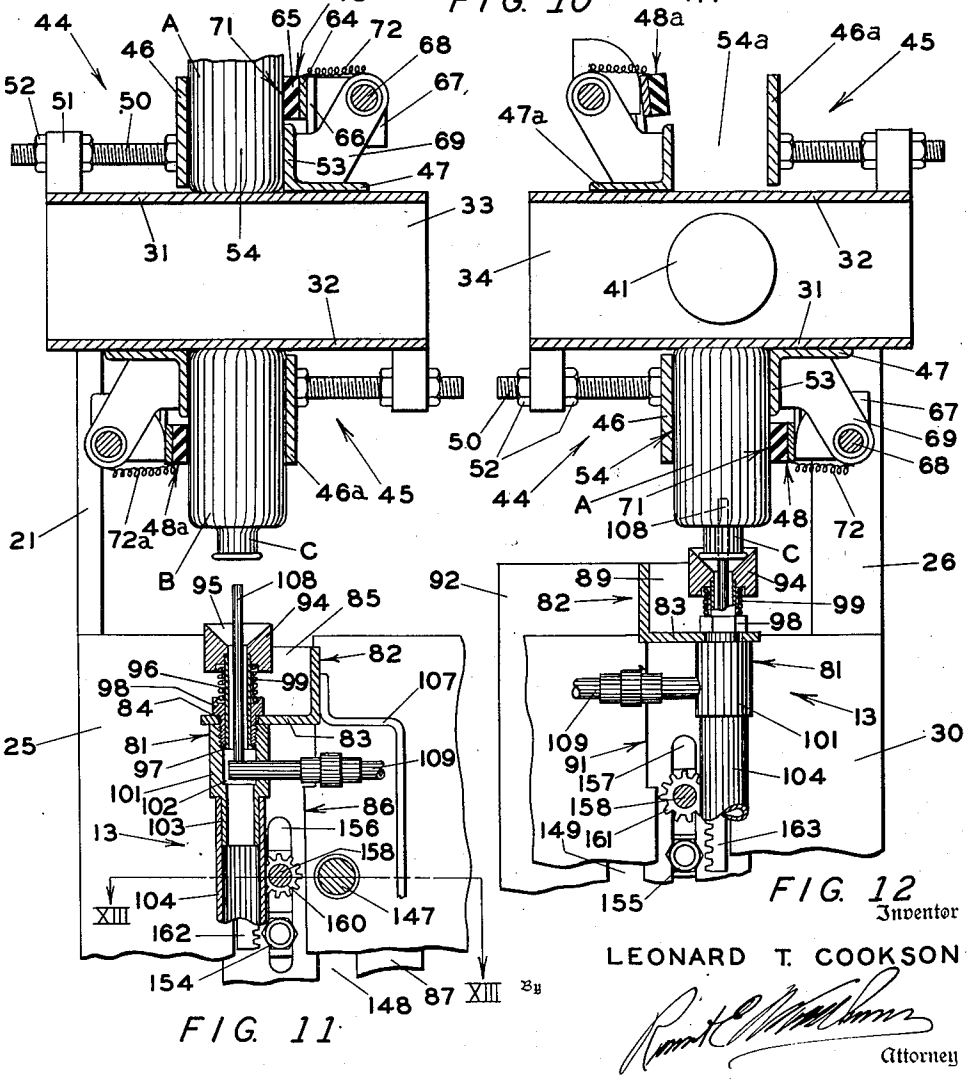


FIG. 11

FIG. 12

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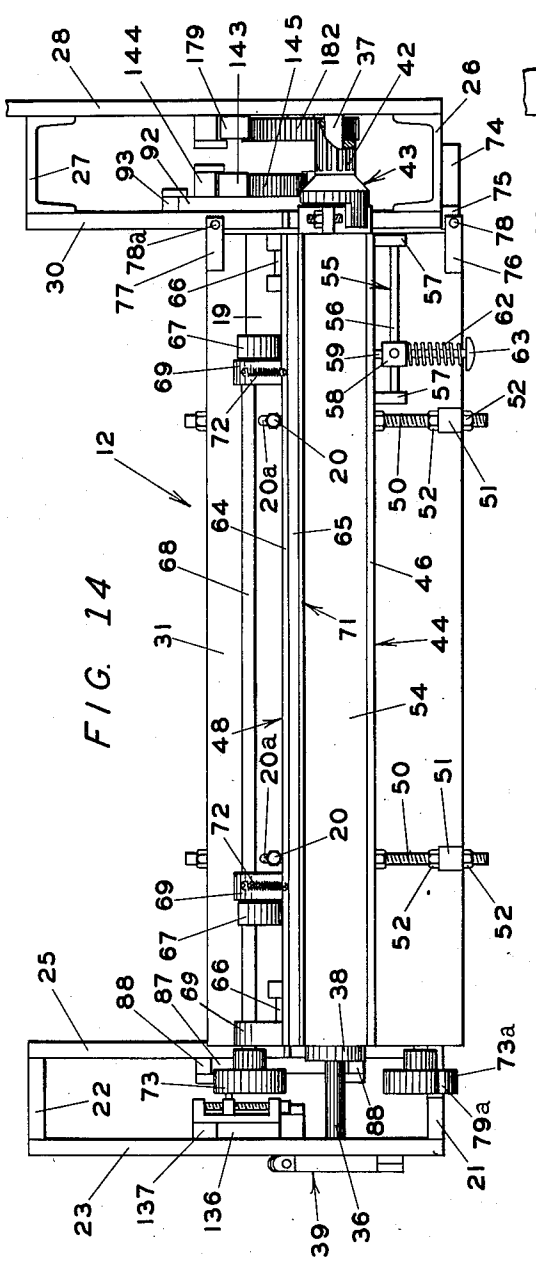


FIG. 14

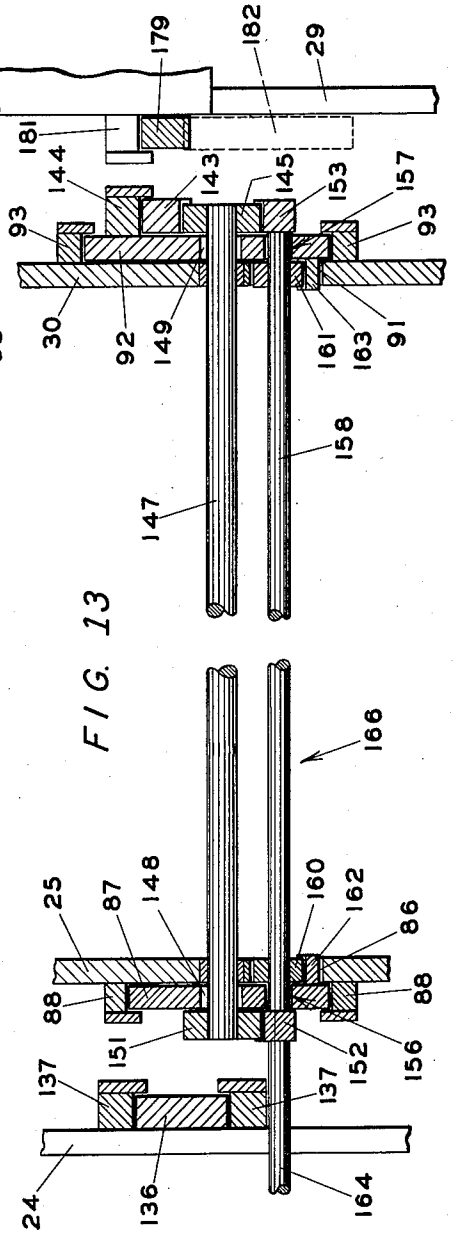


FIG. 13

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Patented Sept. 25, 1951 2,568,949

UNITED STATES PATENT OFFICE

2,568,949

CONTAINER CLEANING MACHINE

Leonard T. Cookson, Kalamazoo, Mich., assignor to The Upjohn Company, Kalamazoo, Mich., a corporation of Michigan

Application June 28, 1948, Serial No. 35,710

8 Claims. (Cl. 15—304)

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This invention relates to a container cleaning machine, and particularly to a type thereof in which the container is cleaned by inverting and directing thereinto a stream of cleaning fluid. This application is a continuation in part of my copending application Serial No. 708,126, filed November 6, 1946.

In the art of filling containers, such as bottles, under highly antiseptic conditions it is often desirable to direct a stream of fluid, such as air, into the container immediately prior to filling to insure the removal therefrom of dust particles, or other foreign material, which might have become lodged therein. It is desirable that a machine provided for this purpose work rapidly and efficiently and with a minimum of attention from the operator.

However, in cases where there may not be more than a few hundred of such bottles handled at any given time, or where there may not be more than a few hundred bottles of a particular size and capacity handled at a given time, the expense incident to using a fully automatic machine is not justified. Even if the expense of original purchase or construction might be accepted, it is often not desirable in the case of a few hundred bottles to expend the set-up and adjustment time incident to placing a fully automatic machine into operation.

Accordingly, it is desirable to provide a machine which will be sufficiently automatic to provide substantial economy in both time and labor over hand methods of directing a stream of fluid, such as air, into a container. On the other hand, such a machine must be sufficiently simple in construction that it can be readily and quickly adjusted for a given size of bottle within a substantial range and placed into operating condition with a sufficiently small expenditure of time and labor to make its use practicable with small quantities of containers.

It is further desirable that said machine be subject to sufficient manual control that it can be stopped and started as desired without otherwise interfering with the adjustments of the machine.

Accordingly, a major object of this invention is to provide a semi-automatic machine for directing a stream of cleaning fluid into a plurality of containers.

A further object of the invention is to provide a machine as aforesaid in which the containers will be held in an inverted position while said fluid is being directed thereinto.

A further object of the invention is to provide

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a machine as aforesaid which can be readily adjusted to receive bottles within a substantial range of varying sizes.

A further object of the invention is to provide a machine as aforesaid in which all necessary adjustments can be quickly and accurately made, whereby the machine may be placed into operation in a minimum amount of time.

A further object of the invention is to provide a machine as aforesaid from which the fluid used for cleaning the containers, as well as any dirt entrained thereby, is removed and disposed of.

A further object of the invention is to provide a machine as aforesaid which may be constructed and maintained economically.

Other objects and purposes of the invention will be apparent to persons acquainted with equipment of this type upon reading the following disclosure and inspecting the accompanying drawings.

In constructing a mechanism meeting the objects and puposes above set forth as well as others incidental thereto and associated therewith, I have provided in general a machine having a pair of substantially parallel, spaced platforms which are rotatable about a horizontal axis, and which are both fitted with means upon their remote surfaces for gripping a plurality of containers. Positioned below said platforms are a plurality of nozzles for ejecting cleaning fluid into said containers. Said nozzles are adjustably supported upon a vertically reciprocable bar. This nozzle support bar is so reciprocated that, immediately following the inverting of said containers, the nozzles are moved upwardly to extend into said containers, and a stream of cleaning fluid, such as compressed air, is ejected from each nozzle under sufficient force to remove all dust and other foreign material from the interior of each of said containers.

Suitable means is provided for automatically gripping a group of containers upon the upwardly facing platform, rotating said platforms approximately 180 degrees about a horizontal axis, actuating said nozzles upwardly into operable engagement with said containers, and releasing a gas under pressure into said containers from said nozzle by a single movement of a manual control. The next movement of said manual control turns off said gas, moves said nozzles downwardly away from said containers, rotates said platforms back through the said 180 degrees and releases the grip of said means upon said containers.

For illustrations of a preferred embodiment of

my invention, attention is directed to the accompanying drawings in which:

Figure 1 is a side elevation view of a particular machine embodying my invention.

Figure 2 is an end elevation of said machine viewed from the rightward end thereof as it appears in Figure 1.

Figure 3 is a side elevation of said machine viewed from the side thereof opposite to that shown in Figure 1.

Figure 4 is an end elevation of said machine viewed from the leftward end thereof as it appears in Figure 1.

Figure 5 is a sectional view taken along the line V—V of Figure 3.

Figure 6 is a sectional view taken along the line VI—VI of Figure 1.

Figure 7 is a sectional view taken along the line VII—VII of Figure 1.

Figure 8 is a sectional view taken along the line VIII—VIII of Figure 1 showing the platform assembly inverted with respect to its position in Figure 1.

Figure 9 is a sectional view taken along the line IX—IX of Figure 1.

Figure 10 is a fragmentary sectional view taken along the line X—X of Figure 2.

Figure 11 is a fragmentary sectional view taken along the line XI—XI of Figure 3.

Figure 12 is a fragmentary sectional view taken along the line XII—XII of Figure 1 showing the platform assembly inverted with respect to its position in Figure 1.

Figure 13 is a sectional view of the said machine taken substantially along the line XIII—XIII of Figure 11.

Figure 14 is a top plan view of a portion of the cleaning machine including the platform assembly.

The above mentioned drawings and the following description disclose a container cleaning machine which is specifically designed to clean bottles in a variety of sizes ranging from about 3½ inches to about 6 inches in height. However, it should be understood that many of the details of this machine, particularly as to its size, the number of bottles which it will handle, details of its frame, bearings, gears, and similar parts may be freely and widely varied without departing from the scope of the invention. Since this machine is designed to clean bottles intended for pharmaceutical use, terminology appropriate thereto is employed in this application, but such terminology including that referring to the containers is used for illustration only and is not intended to limit the invention.

General construction

As shown in Figures 1 and 2, the container cleaning machine to which this invention relates, is comprised of a base **10**, a frame structure **11**, a rotatable platform assembly **12**, a nozzle assembly **13** and a cam assembly **14**.

The base **10** (Figures 1, 5, 6 and 7), which may be fabricated in any conventional manner from sturdy members, such as structural steel base channels **15** and base plates **16**, is rectangular in shape and supports the entire frame structure **11**.

The frame structure **11**, as appearing in Figure 1, has a leftward end structure **17** (Figures 4, 6 and 8), and a rightward end structure **18** (Figures 2, 7 and 9). The leftward end structure **17** is comprised of a pair of parallel, spaced, vertical bars **21** and **22** which are supported and secured at their lower ends upon the base **10** near the leftward end thereof (Figure 1). The vertical bars **21** and **22** are mutually engaged near their upper ends by an upper mounting plate **23**, and intermediate their upper and lower ends by an outer mounting plate **24** and an inner mounting plate **25**.

The rightward end structure **18** (Figures 2, 7 and 9) is comprised of a pair of parallel, spaced, vertical channels **26** and **27** which are supported and secured at their lower ends upon the base **10** near the rightward end thereof and remote from said leftward end structure **17**. The vertical channels **26** and **27** are mutually engaged near their upper ends by an upper mounting plate **28**, and intermediate their upper and lower ends by the outer mounting plate **29** and the inner mounting plate **30**. The mounting plates **23**, **24**, **25**, **28**, **29** and **30** may be secured to the bars **21** and **22** and the channels **26** and **27**, respectively, in any appropriate manner, such as by means of bolts.

Platform assembly

The platform assembly **12** (Figures 1, 3, 5, 11 and 12) which extends between the upper portions of the leftward and rightward end structures **17** and **18**, respectively, may be comprised of a pair of parallel, flat, elongated rectangular platforms **31** and **32** which are spaced from each other by means of the platform end spacers **33** and **34**, and the center spacer **35**. Said platform assembly **12** is rotatably supported upon the upper, outer mounting plates **23** and **28** by means of the platform stub shafts **36** and **27**, respectively (Figures 6, 7 and 14). The stub shaft **36** is secured to the end spacer **33** by any suitable means, such as the lock collar **38**, and is slidably received through, and rotatably supported within, a suitable bushed opening in the mounting plate **23** (Figures 1, 6 and 8). The end of the stub shaft **36** remote from the end spacer **33** extends through the plate **23** and is engaged by a frictional drag device **39** of any conventional form which is secured to the outside surface of the mounting plate **23** and prevents backlash of the platform assembly when its rotation is arrested suddenly.

The stub shaft **37** is secured to the end spacer **34** by any suitable means, such as the lock collar **41**, and is slidably received through, and rotatably supported within, a suitable bushed opening in the mounting plate **28**. A splined sleeve **42** (Figures 7, 9 and 14), is rotatably supported upon the stub shaft **37** between the end spacer **34** and the mounting plate **28**. An adjustable clutching device **43**, part of which is secured to the sleeve **42** and part of which is secured to the end spacer **34**, is provided for rotating the platform assembly **12** through 180 degrees in either direction when the splined sleeve **42** is rotated by means and in a manner hereinafter disclosed.

The platforms **31** and **32** are both provided with identical bottle guide and gripping mechanisms **44** and **45**, respectively (Figures 1, 3, 9, 11 and 14). Therefore, a detailed description will be given of the guide mechanism **44** on the platform **31**, only.

The guide mechanism **44** is comprised of an adjustable guide **46**, which is parallel with and opposed by a fixed guide **47** and a gripper bar **48**. The adjustable guide **46**, which may be fabricated from a flat metal strip, extends the entire length of the platform and is adjustably supported thereon with its flat surface substantially perpendicular thereto by means of a

plurality, here two, of adjustment bolts 50 and adjustment lugs 51. The said bolts and lugs are secured to the flat outer side of the guide 46 and to the top of the platform 31, respectively, as by welding. The bolts 50 slidingly extend through suitable openings in the lugs 51 and are held in adjusted position by the lock nuts 52. By suitable manipulation of said lock nuts 52, the guide 46 can be adjusted within a substantial range transversely of the platform 31 to accommodate the guide mechanism 44 to various bottle widths.

The gripping guide 47 (Figure 11), which may be fabricated from a structural angle, is secured to the platform 31, for adjustment transversely thereof, by means of bolts 20 which extend through the slots 20*a* in the horizontal flange 19 of said angle and threadedly engage the platform 31. Said gripping guide, which extends the length of the platform 31 and is preferably opposite and parallel with the lower portion of said adjustable guide, thus is enabled to cooperate with the adjustable guide to hold bottles of various diameters along the centerline of said platform. The gripping guide vertical flange 53 and the adjustable guide 46 constitute the walls of a bottle trough 54 which extends the full length of the platform.

A bottle positioning device 55 (Figures 1 and 14) is secured to and supported upon the outside face of the adjustable guide 46 adjacent to the rightward end thereof. The positioning device is comprised of a pair of parallel, horizontal slide rods 56 supported at their extremities upon a pair of slide support blocks 57 which are secured, as by welding, to said adjustable guide 46. A slider 58, which is adjustably supported upon the slide rods 57, slidably supports a plunger rod 59 which extends through a suitable opening in said slider 58 and may be urged into the bottle trough 54 through an appropriate slot 61 in the adjustable guide 46. A plunger spring 62, which is sleeved upon the plunger rod between its head 63 and the opposing face of the slider 58, tends to resist the extending of the rod 59 through the slot 61.

The gripper bar 48 (Figures 3, 11, 12 and 14) extends the length of the platform 31 and is comprised of a metal strip 64 to which is bonded a resilient strip 65 made of any suitable material, such as sponge rubber. The metal strip 64 is secured, as by welding, to the upper ends of a pair of pivot arms 66 which are pivotally supported upon the gripping guide 47 so that the resilient strip 65 is above the upper edge of the fixed guide vertical flange and its exposed face 71 is directly opposite the upper portion of the adjustable guide 46.

The metal strip 64 of the gripper bar 48 is engaged by a pair of bar cams 67 which are supported upon and rotatable with a cam shaft 68. The cam shaft 68 is rotatably supported upon three cam shaft support brackets 69 (Figures 3 and 14) which are secured, as by welding, to the gripping guide 47. Gripper bar springs 72, which are secured at one end to the upper edge of the metal strip 64 and at the other end to the top of a support bracket 69, hold the metal strip 64 in continuous engagement with the cams 67. Said springs and cams cooperate to produce positive means by which the gripper bar 48 may be actuated toward the adjustable guide 46 into bottle clamping position and away from the adjustable guide 46 into bottle releasing position.

A cam shaft actuator 73 is supported upon and secured to the leftward end, as appearing in Figures 1 and 14, of the cam shaft 68, which end extends beyond the corresponding end of the platform 31. The actuator 73 has a large disk provided with a slot 79 (Figure 8) in its outer edge which slot extends toward and is aligned with the axis of the disk.

The guide mechanism 45 (Figures 1, 5, 8, 9 and 11) which is supported upon and secured to the platform 32 and which, in general, is comprised of an adjustable guide 46*a*, a gripping guide 47*a*, a gripper bar 48*a*, a bottle trough 54*a*, a bottle positioning device 55*a*, and a cam shaft actuator 73*a* having a slot 79*a*, is substantially identical to the guide mechanism 44, as hereinabove described in detail. Hence, detailed description thereof may be omitted.

In order to prevent overtravel of the platform assembly 12 when it is rotated and cushion the stopping of such rotation, which of necessity is rapid, a rotational limit block 74 (Figures 1 and 2), is secured to the upper end of the vertical channel 26 so that it extends away therefrom toward the platform assembly 12. Resilient pads 75 and 75*a* are secured to the upper and lower faces, respectively, of the said extended portion of said block 74. A pair of overtravel adjustment bars 76 and 77 (Figures 1, 9 and 14) are secured to the rightward end (as in Figures 1 and 14) of the platform 31 so that they extend away therefrom toward the rightward end structure 18. Adjustment screws 78 and 78*a* are threadedly supported in a vertical position through the extended portions of the adjustment bars 76 and 77. Said adjustment bars are so positioned upon the platform 31 that the screw 78 in the bar 76 engages the upper pad 75 when the platform 31 is in the top horizontal position, and so that the screw 78*a* in the bar 77 engages the lower pad 75*a* when the platform 31 is in the inverted or bottom horizontal position. By appropriate adjustment of the screws 78 and 78*a*, the platform assembly can be caused to stop rotating when the platforms 31 and 32 are level and horizontal.

The nozzle assembly

After a plurality of upright bottles A have been gripped within the trough 54 or 54*a* of the platform assembly 12 (Figure 11) and said assembly has been rotated 180 degrees so that the bottles are inverted (Figure 12), said bottles are each entered by a cleaning nozzle 81 of the vertically reciprocable nozzle assembly 13.

The nozzle assembly 13 (Figures 1, 5, 11 and 12) is comprised of a metal nozzle support angle 82 having a horizontal flange 83 provided with a nozzle slot 84. The support angle 82 extends between the leftward and rightward end structures 17 and 18, respectively. The leftward end of the angle 82 (Figure 1) is secured, as by welding, to the left connector 85 which connector extends through a vertical slot 86 in the inner mounting plate 25 and is in turn secured to the left reciprocation plate 87 (Figures 4, 8, 11 and 13), which plate is slidably supported upon the mounting plate 25 between the guides 88.

The rightward end of the angle 82 (Figure 1) is secured, as by welding, to the right connector 89 which connector extends through a vertical slot 91 in the inner mounting plate 39 and is in turn secured to the right reciprocation plate 92 (Figures 2, 9, 12 and 13), which plate is slidably supported upon the mounting plate 30 between

the guides 93. Accordingly, the angle 82 is moved upwardly or downwardly with respect to the platform assembly when, but only when, the reciprocation plates 87 and 92 are moved a corresponding distance. Said reciprocation plates are prevented from moving accidentally by means hereinafter disclosed.

A plurality of cleaning nozzles 81 are adjustably held within the slot 84 in the horizontal flange 83 of the angle 82 at intervals spaced to correspond with the spacing of the inverted bottles and aligned with the openings in the necks C thereof. The slot 84 allows for longitudinal adjustment of said nozzles along the angle 82. Vertical adjustment of the nozzles 81 and the nozzle assembly 13 is effected by means disclosed hereinafter.

Although the nozzles 81 may be of any convenient, conventional type, they are herein illustratively shown (Figures 5, 11 and 12) as having a cylindrical nozzle head 94, whose upper surface is provided with a suitable recess 95 for reception of an inverted bottle neck C. Said nozzle head has a coaxial opening, extending downwardly from said recess 95, into which opening the upper end of a tube 96 is inserted and secured. The lower end of said tube 96 is provided with an outwardly extending flange 97. A locking collar 98, having an enlarged upper portion and an externally threaded lower portion, is slidably sleeved upon said tube 96 between said head and the flange 97. The collar 98 is urged against said flange by a nozzle spring 99 which is also sleeved upon the tube 96 and is held under compression between the upper end of the collar 98 and the lower end of the head 94.

The cylindrical nozzle body 101 has a coaxial cylindrical chamber 102 whose upper end is internally threaded for cooperation with the threaded lower portion of the collar 98. The lower end of the nozzle body 101 is provided with an exhaust nipple 103 communicating with the chamber 102. A suitable, flexible exhaust conduit 104 engages the exhaust nipple 103 and connects it to an inlet nipple 105 on an appropriate exhaust header 106, which header is supported upon the nozzle support angle 82 by means of the exhaust header support straps 107.

A suitable fluid discharge pipe 108 passes coaxially through, but preferably does not engage, the opening in the nozzle head and the tube 96, and extends into the chamber 102. The upper end of the pipe 108 extends substantially above the head recess 95, and the lower end of the pipe engages, and communicates with, a flexible supply conduit 109, which conduit is connected to a fluid supply header 111, supported upon the exhaust header support straps 107.

Each cleaning nozzle 81 is assembled along the nozzle angle horizontal flange 83 by inserting the externally threaded portion of the collar 98 through the nozzle slot 84 and then screwing it into the internally threaded upper portion of the nozzle body 101 until the flange 83 is gripped firmly between the collar enlarged upper portion and said nozzle body.

In this particular embodiment, compressed air is admitted to the supply header and thence through a plurality of the supply conduits 109 to their respective discharge pipes 108 when the inverted bottles are properly seated within the recesses 95 of the nozzle heads 94. The compressed air and entrained dust particles are then exhausted through the tube 96, the chamber 102, the exhaust nipple 103, the exhaust conduit 104, the inlet nipple 105 and into the exhaust header 106 for collection by any suitable means not shown.

Cam assembly

The cam assembly 14 (Figures 1, 6, 7, 8, 9 and 10) is centered about the cam line shaft 112 which is supported for rotational oscillatory motion at four positions intermediate its extremities within conventional bearings 113 of any convenient type. The said bearings are mounted upon the bearing supports 114, 115, 116 and 117 which are in turn supported upon and secured to the base 10 with the axis of the cam shaft, the axes of the nozzles and the axis of rotation of the platform all in the same vertical plane.

The bearing supports 114 and 115 (Figures 1 and 10) are at the leftward end of the line shaft 112 and are positioned on either side of the leftward end structure 17. The bearing supports 116 and 117 are at the rightward end of the line shaft 112 and are positioned on either side of the rightward end structure 18. The line shaft 112 is held in place with respect to the bearing supports and bearings by means of the locking collars 118.

A reciprocable, hydraulic actuating cylinder 119 of any appropriate type, which is supported upon the outer mounting plate 29 (Figures 1, 2 and 3) by any suitable mounting bracket, has a dependent actuating arm 121 with a rack 122 at its lower end for engaging a line shaft pinion 123, which pinion is secured to and rotatable with the line shaft 112. The line shaft is rotated approximately 295 degrees in one direction when the actuating arm 121 is urged downwardly by the cylinder 119, which may be termed a forward cycle, and is rotated back again 295 degrees in the opposite direction when the arm 121 is urged upwardly, which may be termed a reverse cycle. Accordingly, the fluid control cam 124, the gripper cam 125, the nozzle cam 126 and the platform cam 127, which cams are secured to and rotatable with the line shaft 112 in any convenient manner, also have a rotational motion when the line shaft 112 is actuated by the actuating cylinder 119.

The actuating arm 121 of the hydraulic actuating cylinder 119 is urged upwardly or downwardly in a conventional manner when the selector handle 168 is placed in a particular position. The selector handle 168 directs the flow of hydraulic fluid into the cylinder 119. A hydraulic flow mechanism, including the flow control 169 supported upon an extension 171 of the outer mounting plate 28 (Figures 2 and 3) and conventional piping 172, move the hydraulic fluid from the reservoir 173 through the hydraulic pump 174, through the flow control 169, through the selector 175 and into the actuating cylinder 119. Suitable return means is provided for returning the hydraulic fluid to the reservoir 173. The pump 174 may be directly driven by a suitable motor 176.

The fluid control cam 124 (Figures 1, 3, 4, 6 and 10), which is positioned between the bearing supports 114 and 115, has a high dwell 128 of approximately 80 degrees, a low dwell 129 of approximately 270 degrees, and a rise and fall of about 5 degrees each between the dwells 128 and 129 along the perimeter of the cam. The cam follower 131, which is pivotally supported upon the fluid control valve 132, opens said valve when the follower is on the high dwell 128 and closes said valve when the follower is on the low dwell,

The valve 132, which may be any one of many known to the art, is supported upon the outer mounting plate 24. At the beginning of either the forward or reverse operating cycle of the cam assembly 14, the cam follower 131 is on the high dwell 128 adjacent to a said rise or fall. However, since the low dwell is 270 degrees long, almost the entire cycle is run with the cam follower on the low dwell and, consequently, with the valve closed.

It will be recognized that a rise occurring when the cam is rotated in one direction becomes a fall when the cam is rotated in the opposite direction. This also applies in substance to rises and falls of the cams 125, 126 and 127, hereinafter described.

When the valve 132 is opened, the cleaning fluid, here compressed air, is permitted to flow from a suitable supply (not shown) through an air filter 130 to said valve 132 and thence through the conduit 133 into the supply header 111 (Figures 3 and 5) for appropriate distribution to the cleaning nozzles 61 as hereinbefore disclosed.

The gripper cam 125 (Figures 8 and 10), which is positioned between the cam 124 and the bearing support 115, has a cam track 134 with a low dwell of 16.5 degrees, a rise of 75 degrees, a high dwell of 112 degrees, a fall of 75 degrees, and another low dwell of 16.5 degrees. The cam follower 135, which cooperates with the cam track 134, is secured to the lower end of the vertically reciprocable, gripping mechanism actuation post 136 (Figures 6, 13 and 14), which post is slidably supported, near its upper end, upon the upper mounting plate 23 between the post slides 137. A yoke 138, which is secured to the lower end of the post 136, slidably straddles the line shaft 112 between the cam 124 and 125 for the purpose of guiding the lower end of said post during its vertical reciprocation.

At the beginning of the cam assembly's operating cycle, the cam follower 135 is in one of the low dwell positions at either end of the cam track 134. The rise moves the post 136 upwardly where it remains during the high dwell and is then moved downwardly by the fall. In the reverse rotation of the cam assembly's next cycle, the said fall becomes a rise and the said rise becomes a fall.

The upper end of the post 136, which may extend above the top of the leftward end structure 17 and is adjacent to the leftward end (Figures 1, 3 and 8) of the platform assembly 12, is provided with an adjustable cam actuator engaging pin 139, which pin may be adjusted so that it engages the slot 79 (Figure 8) in the cam shaft actuator 73. When the gripper cam 125 moves the actuation post 136 upwardly during the first portion of the cycle, the pin 139 rotates the cam shaft actuator 73 and the cam shaft 68 so that the bar cams 67, secured thereto, urge the gripper bar 48 into bottle clamping position (Figure 11). When said gripper cam moves said post downwardly, during the last portion of the cycle, the pin 139 rotates said actuator 73 and shaft 68 so that the bar cam 67 permit the gripper bar 48 to return to bottle releasing position (Figure 12). It will be recognized that the pin 139 can and will engage a slot 79*a* in the actuator 73*a*, in a manner similar to its engagement of the slot 79, when the platform 32 is in the top position (Figure 8).

The nozzle cam 126 (Figures 9 and 10), which is positioned between the bearing support 116 and the shaft pinion 123, has a cam track 141 which is preferably identical in contour to the cam track 134 in the gripper cam 125. The cam follower 142, which cooperates with the track 141, is secured to the lower end of the vertically reciprocable nozzle raising rack 143, which rack is guided along one edge, near its upper end, by a rack slide 144. The teeth of said rack 143, which are on the opposite edge thereof from said guided edge, engage a nozzle raising pinion 145 (Figures 13 and 14). Thus the upper end of the rack 143 is held between the pinion 145 and the slide 144, which slide is secured, as by bolting, to the right reciprocation plate 92. A yoke 146, which is secured to the lower end of the rack 143, slidably straddles the line shaft 112 between the nozzle cam 126 and the shaft pinion 123 (Figure 10) to guide the lower end of the rack during its vertical reciprocation.

The pinion 145 (Figures 8, 9 and 13) is supported upon and rotatable with one end of the nozzle raising shaft 147, which shaft is rotatably supported within suitable bushed openings in the inner mounting plates 25 and 30. The shaft 147 extends through the vertical shaft slots 148 and 149 in the reciprocation plates 87 and 92, respectively, which slots permit said reciprocation plates to be moved upwardly and downwardly with respect to said inner mounting plates, as required, without interference from the shaft 147.

That end of the shaft 147 extending through the plate 87 supports and is rotatable with another nozzle raising pinion 151, which is preferably identical to the pinion 145. The nozzle raising pinions 145 and 151 engage a pair of adjustment racks 152 and 153 (Figures 8, 9 and 13), respectively, which racks are vertically adjustably supported upon the reciprocation plates 87 and 92 by means of the rack locking bolts 154 and 155, respectively (Figures 9, 10, 11 and 12).

The rack bolts 154 and 155 extend through their respective racks 152 and 153 and thence through vertical adjustment shaft slots 156 and 157 in the reciprocation plates 87 and 92, respectively. The ends of the bolts 154 and 155 extending through the slots 156 and 157 on the opposite sides of said reciprocation plates are engaged by appropriate nuts whereby the racks 152 and 153 may be adjustably secured to their respective reciprocation plates.

Accordingly, since the racks 152 and 153 are normally fixed with respect to their reciprocation plates 87 and 92 and are engaged by the nozzle raising pinions 145 and 151, any rotation of the nozzle raising shaft 147, which is capable of rotational movement only with respect to the inner mounting plates 25 and 30, will effect a corresponding upward or downward movement of the said reciprocation plates with respect to the said inner mounting plates, and hence with respect to the frame structure 11 of the container cleaning machine to which this invention relates.

The nozzle assembly 13 is supported upon the reciprocation plates 87 and 92 (Figures 11 and 12), and the nozzle raising shaft 147 is actuated by the nozzle cam 126 through the nozzle raising rack 143 (Figures 9 and 13) as hereinbefore mentioned. One operating cycle of the cam assembly 14, which produces a complete rotational movement of the nozzle cam 126 in one direction, causes the rack 143 to move upwardly, remain there for a short period of time and then move downwardly. Therefore, such motion of the rack 143 effects a rotation of the nozzle raising shaft

147 first in one direction and then, after a short pause, in the opposite direction, which rotation effects a downward movement of the nozzle assembly 13 and then, after a short pause to permit the platform to rotate, an upward movement of said nozzle assembly.

The vertical shaft slots 148 and 149 (Figures 8, 9 and 13) in the inner mounting plates 87 and 92, respectively, permit vertical movement of said reciprocation plates without interference from the nozzle raising shaft 147 which does not move vertically with said reciprocation plates.

The adjustment racks 152 and 153 (Figure 13) rotatably support the opposite ends of the nozzle adjustment shaft 158, which shaft slidably extends through the adjustment shaft slots 156 and 157 in the reciprocation plates 87 and 92, respectively, and also slidably extends through the vertical slots 86 and 91 in the inner mounting plates 25 and 30, respectively. The shaft slots 86 and 91 (Figures 11, 12 and 13), the shaft slots 148 and 149 and the shaft slots 156 and 157 are all substantially parallel and vertical. A pair of adjustment pinions 160 and 161 (Figure 13) are supported upon and rotatable with the shaft 158 and are positioned within the vertical shaft slots 86 and 91 adjacent to the reciprocation plates 87 and 92, respectively. The adjustment pinions 160 and 161 engage a pair of vertical, fixed racks 162 and 163 which are attached, as by bolting, to the opposed surfaces of the reciprocation plates 87 and 92, respectively, and also lie within the shaft slots 86 and 91. The end 164 of the adjustment shaft 158 extends beyond the adjustment rack 152 (Figure 3) where it is engaged by an adjustment crank 165 (Figure 4).

The nozzle adjustment mechanism 166 (Figure 13), which includes the above described adjustment shaft 158 and pinions 160 and 161, and the fixed racks 162 and 163, is provided for the purpose of adjusting the position of the nozzle assembly upwardly or downwardly for bottles of different heights. The adjustment mechanism 166 can be actuated only after the locking bolts 154 and 155 have been loosened to permit movement of the adjustment racks 152 and 153 with respect to the reciprocation plates 87 and 92. Then, by turning the crank 165 in one direction, clockwise as appearing in Figure 4, the reciprocation plates 87 and 92, hence the nozzle assembly 13, are moved downwardly with respect to the mounting plates 25 and 30 through the interaction of the adjustment pinions 160 and 161 and the fixed racks 162 and 163, respectively. The adjustment shaft 158 is prevented from moving upwardly or downwardly during the adjustment operation by the adjustment racks 152 and 153 which are held fixed with respect to said inner mounting plates by the locked relationship between the nozzle raising shaft 147, the rack 143 and the cam assembly 14 when said cam assembly is not moving.

If the crank 165 is turned counterclockwise (Figure 4), the adjustment pinions 160 and 161 urge the fixed racks 162 and 163, respectively, and the reciprocation plates secured thereto, upwardly, thereby raising the nozzle assembly 13. After appropriate, vertical adjustment of the nozzle assembly 13 has been accomplished, as described above, the adjustment racks 152 and 153 are again secured to their reciprocation plates by tightening the locking bolts 154 and 155, respectively.

The platform cam 127 (Figures 7 and 10), which is positioned between nozzle cam 126 and the shaft pinion 123, has a cam track 177 with a low dwell of 92 degrees, a rise of 111 degrees and a high dwell of 92 degrees. The cam follower 178, which cooperates with the cam track 177, is secured to the lower end of the vertically reciprocable platform rotating rack 179 (Figures 7, 13 and 14), which rack is slidably guided near its upper end along one edge by the vertical rack slide 181, which is secured, as by bolting, to the upper mounting place 28. The edge of said rack 179, opposite said guided edge, is provided with teeth which engage an idler gear 182, which gear is rotatably supported upon the mounting plate 28 substantially between, and engaging, both said rack 179 and the splined sleeve 42 of the clutching device 43. A yoke 183, which is secured to the lower end of the rack 179, slidably straddles the line shaft 112 between the cam 126 and the cam 127 for the purpose of guiding the lower end of said platform rack during its vertical reciprocation.

At the beginning of the cam assembly's operating cycle the cam follower 178 may be at either end of the cam track 177. If, for example, the cam follower is in the low dwell of the track at the beginning of an operating cycle, a complete rotation of the cam assembly in one direction will cause the cam track to raise the platform rack 179. This elevation of the said platform will take place during the middle portion of the cam's rotation.

The idler gear 182, which is rotated by the said upward motion of the rack 179, rotates the splined sleeve 42, which as aforesaid is preferably integral with a portion of the clutching device 43, and thereby rotates the platform assembly 12 through 180 degrees, as hereinbefore mentioned. The clutching device 43 is preferably designed for overtravel in any conventional manner so that the splined sleeve can be rotated somewhat in excess of 180 degrees by the idler gear 182 and the rack 179 without forcing the platform assembly to rotate more than 180 degrees and thereby damaging the rotational limit block 74 or the adjustment bars 76 and 77. Thus, by permitting the splined sleeve to move slightly more than 180 degrees, but positively holding the platform to movement through 180 degrees only, assurance is had that without unreasonable adjustment problems being encountered, the platform will turn through a full 180 degrees but no more.

When the cam assembly's operating cycle is reversed by appropriate movement of the actuating cylinder arm 121, the said rise in the cam track 177 becomes a fall, the platform rack is lowered by the cam 127, and the direction of rotation of the idler gear 182, the clutch 43 and the platform assembly 12 are reversed from their most recent direction of rotation.

It will be clearly understood that, although certain parts of the cleaning machine to which this invention relates are herein specifically described for illustrative purposes and in the interest of clarity, such specific identification is not necessarily intended to limit the scope of the invention or eliminate mechanical equivalents where their interchangeability would be evident to persons skilled in the art.

Operation

The cleaning machine must first be set up for the particular bottles A and B, or other containers to be cleaned thereby. Suitable adjustment must be made in the relative positions of the

guides 46 and 47, and 46a and 47a on the platforms 31 and 32, respectively, and the vertical position of the nozzle assembly 13 must be adjusted to the bottle height. The cleaning nozzles 81 must be positioned along the horizontal flange 83 of the nozzle angle 82 to properly engage the inverted bottles and the bottle positioning device 55 must be adjusted to correspond therewith. The motor 176 is energized and the air filter 130 is connected to a suitable means (not shown) for supplying compressed air.

The operator, who preferably works from the side of the machine shown in Figure 1, moves the plunger rod 59 into the bottle trough 54 and then slides a line of bottles from a table D, into the trough 54 until the first bottle bears snugly against the said plunger rod. The selector handle 168 is actuated and the cleaning machine immediately commences a cycle of operation, either forward or reverse, depending upon the position of the actuating arm 121 of the cylinder 119.

A single cycle of the cleaning machine's operation includes a single stroke of the actuating arm 121 in one direction and a complete rotational movement of the cam assembly 14 through approximately 295 degrees of arc in one direction. This single cycle, whether forward or reverse, produces a sequence of motions and operations, as follows: The air being emitted from the discharge pipes 108 at the outset of the cycle is shut off as the cam follower 131 moves from high dwell 128 to low dwell 129, thereby closing the control valve 132, within about the first 10 degrees of rotation. The nozzle assembly remains in the raised position for 16.5 degrees of rotation of the nozzle cam 126 and then is lowered during the next 75 degrees of the cam's rotation by an upward movement of the nozzle controlling rack 143 in the manner hereinbefore mentioned. While the nozzle assembly 13 is being lowered, the gripper cam 125 is raising the actuation post 136 which causes the engaging pin 139 to rotate the cam shaft actuator 73 and, therefore, the bar cams 67 so that the gripper bar is urged to clamp the bottles A in an upright position.

One-half degree of rotation after the nozzle assembly reaches its low point and the gripper actuation post reaches its high point or, in other words, after the cam assembly has rotated 92 degrees, the cam follower 178 encounters the rise in the cam track 177 of the platform cam 127 and the platform assembly is rotated, during the following 111 degrees of cam rotation, until the adjustment screw 78a (Figure 14) strikes the resilient pad 75a (Figure 1) on the rotational limit block 74, thereby stopping said platform at exactly 180 degrees of rotation even though the splined sleeve 42 turns a few degrees further. The platform 31 and the guide mechanism 44 have now replaced the platform 32 and mechanism 45 in the bottom position on the platform assembly (Figure 8). It will be noted that the bottle clamping action of the guide mechanism 44 and the lowering of the nozzle assembly 13 is necessarily accomplished before the platform assembly is rotated. This is intended to prevent the escape of any bottles A from the trough 54 during the rotation of the platform and to prevent injury of the cleaning nozzles 81 by moving the inverted bottles B (Figure 11) before the discharge pipes 108 have been completely withdrawn from the bottle necks C. The drag device 39 prevents undesirable movement of the platform assembly during and after its rotation.

One-half degree of rotation of the cam assembly 14 after the platform assembly has been completely rotated, that is, after the cam assembly has rotated 203.5 degrees, the cam follower 142 encounters the fall in the cam track 141 of the nozzle cam 126 and the nozzle assembly is raised during the ensuing 75 degrees of rotation of the cam assembly 14 for insertion of the discharge pipes 108 into the inverted bottles A (Figures 8 and 12). The discharge pipes 108 enter the bottles A through the bottle necks C which rest within the nozzle head recesses 95. During the same 75 degrees of rotation that said nozzle assembly is raised by lowering the nozzle rack 143, the actuation post 136 and engaging pin 139 are lowered. Said engaging pin engages the slot 79a (Figure 8) in the cam shaft actuator 73a, which has now taken the exact position held by the actuator 73 before the platform assembly was rotated, and rotates said actuator, hence the bar cams 68, so that the bar springs 72a are permitted to draw the gripper bar 48a back into bottle releasing position (Figure 12). All bottles B, which have been clamped within the guide mechanism 45 (Figure 11) at the beginning of the operating cycle, are now on the top side of the platform assembly (Figures 8 and 12) are now released, may be slid from the bottle trough 54a and replaced by a new set of bottles in substantially the same manner as the bottles A were fed into the bottle trough 54 as hereinabove described.

During the last 16.5 degrees of rotation of the cam assembly and, in fact, until the selector handle 168 is so moved that the reverse cycle of operation is commenced, the nozzle assembly will remain in contact with the bottles A (Figure 12) and the gripper bar 48a will be left in the bottle releasing position. The cam follower 131 is caused to open the fluid control valve 132 by contacting the high dwell 128 during the last 10 degrees of the operating cycle, thereby permitting the cleaning fluid, here compressed air, to be emitted from the discharge pipes 108 into the bottles A. The fluid continues to flow from the pipes 108 until the selector handle 168 is moved to the reverse cycle position and the fluid control valve is closed in proper order at the beginning of the next cycle. The cleaning fluid emitted into the inverted bottles may be exhausted through the exhaust conduits 104 and the exhaust header 106 in a conventional manner.

As far as the results are concerned and as far as the operation of the various assemblies need be considered, the sequence of the reverse cycle is identical with the forward cycle hereinabove described. It will be noted that in one cycle the actuating arm 121 moves downwardly and the platform rack moves upwardly and the platform assembly rotates in one direction, whereas in the other cycle such movements and rotations are reversed, however, the sequence of operations throughout the two cycles remains the same.

In general, either sequence comprises: stopping the flow of cleaning fluid, clamping the bottles within the upwardly facing guide mechanism, lowering the nozzle assembly away from the bottles clamped in the downwardly facing guide mechanism, rotating the platform assembly 180 degrees, moving the nozzle assembly up to the new batch of inverted bottles, releasing the cleaned bottles from the upwardly facing guide

mechanism, and releasing the flow of cleaning fluid into the inverted bottles.

Although the above mentioned drawings and description apply to one particular, preferred embodiment of the invention, it is not my intention, implied or otherwise, to eliminate other variations or modifications which do not depart from the scope of the invention unless specifically stated to the contrary in the hereinafter appended claims.

I claim:

1. In a machine for cleaning bottles having openings, the combination comprising: a structural base and a pair of spaced, upright frame structures secured to said base, said frame structures having inner mounting plates secured to their opposed sides intermediate their upper and lower ends, said plates having vertical parallel slots; a pair of parallel, spaced, horizontal, elongated platforms secured to each other to form a platform assembly and means rotatably supporting said assembly upon and between the upper portions of said frame structures, said rotation being about a horizontal axis, and said platforms facing in opposite directions; a pair of bottle guide and gripping mechanisms adjustably secured and longitudinally disposed along each of said platforms, said mechanisms having means for positioning said bottles with respect thereto; a cam shaft rotatably supported upon said base substantially between said frame structures under said platform assembly and parallel with the rotational axis thereof; a manually controllable reciprocable actuator effecting rotational movement of said cam shaft through less than 360 degrees in each direction; means including a first cam rotatable with said cam shaft and a vertically reciprocable rack operable by said first cam for rotating said platform assembly; adjustable stop means limiting the rotation of said platform assembly to 180 degrees; means including a second cam rotatable with said cam shaft and a vertically reciprocable actuation post operable by said second cam for urging said guide and gripping mechanism into and out of bottle clamping position; a nozzle support member extending through the slots in said mounting plates and being adjustably secured to a pair of vertically reciprocable plates slidably supported adjacent to the mutually remote surfaces of said mounting plates, said member supporting a plurality of bottle cleaning nozzles horizontally adjustable therealong, directly beneath said guide and gripping mechanisms and alignable with said openings in said bottles when inverted by said mechanisms; means including a third cam rotatable with said cam shaft and a vertically reciprocable rack operable by said third cam for lowering and raising said nozzle support; means for vertically adjusting said support member with respect to said reciprocable plates; means including a fluid control valve for supplying cleaning fluid to said nozzle; and means including a fourth cam rotatable with said cam shaft for opening and closing said fluid control valve; all arranged and constructed so that a unidirectional stroke of said reciprocable actuator causes, in sequence, the closing of the cleaning fluid control valve, the lowering of the nozzles, the moving of the guide and gripping mechanism then in the upper position to its bottle gripping position, the 180 degree rotation of the platform assembly, thereby inverting any bottles so gripped by said mechanism, the raising of said nozzles to operably engage and enter said bottles, the release of the other guide and gripping mechanism from bottle clamping position, and the opening of said fluid control valve, thereby releasing cleaning fluid into said inverted bottles.

2. In a machine for cleaning bottles having openings, the combination comprising: a structural base and a pair of spaced, upright frame structures secured to said base; a pair of parallel, spaced, horizontal, elongated platforms secured to each other to form a platform assembly and means rotatably supporting said assembly upon and between the upper portions of said frame structures, said rotation being about a horizontal axis and said platforms facing in opposite directions; a pair of bottle guide and gripping mechanisms adjustably secured and longitudinally disposed along each of said platforms, said mechanisms having means for positioning said bottles with respect thereto; a cam shaft rotatably supported upon said base substantially between said frame structures under said platform assembly and parallel with the rotational axis thereof; a manually controllable reciprocable actuator effecting rotational movement of said cam shaft through less than 360 degrees in each direction; means including a first cam rotatable with said cam shaft and a vertically reciprocable rack operable by said first cam for rotating said platform assembly; adjustable stop means limiting the rotation of said platform assembly to 180 degrees; means including a second cam rotatable with said cam shaft and a vertically reciprocable actuation post operable by said second cam for urging said guide and gripping mechanism into and out of bottle clamping position; a nozzle support member adjustably secured to and extending between a pair of vertically reciprocable plates slidably supported upon said frame structures, said member supporting a plurality of bottle cleaning nozzles horizontally adjustable therealong, directly beneath said guide and gripping mechanisms and alignable with said openings in said bottles when inverted by said mechanisms; means including a third cam rotatable with said cam shaft and a vertically reciprocable rack operable by said third cam for lowering and raising said nozzle support; means for vertically adjusting said support member with respect to said reciprocable plates; means including a fluid control valve for supplying cleaning fluid to said nozzle; and means including a fourth cam rotatable with said cam shaft for opening and closing said fluid control valve; all arranged and constructed so that a unidirectional stroke of said reciprocable actuator causes, in sequence, the closing of the cleaning fluid control valve, the lowering of the nozzles, the moving of the guide and gripping mechanism then in the upper position to its bottle gripping position, the 180 degree rotation of the platform assembly, thereby inverting any bottles so gripped by said mechanism, the raising of said nozzles to operably engage and enter said bottles, the release of the other guide and gripping mechanism from bottle clamping position, and the opening of said fluid control valve, thereby releasing cleaning fluid into said inverted bottles.

3. In a machine for cleaning bottles having openings, the combination comprising: a base and a pair of spaced, upstanding frame structures secured to said base; a pair of parallel, spaced, oppositely facing bottle guide and gripping mechanisms secured to each other to form a bottle supporting assembly and rotatably supported about a horizontal axis upon the upper

portions of said frame structures, said mechanisms having bottle positioning means; a cam shaft rotatably supported under said assembly; manually controllable actuating means effecting reversible rotation of said cam shaft of less than 360 degrees; means including a first cam rotatable with said cam shaft and a vertically reciprocable rack operable by said first cam for rotating said bottle supporting assembly through approximately 180 degrees; means including a second cam on said cam shaft and a vertically reciprocable actuation post operable by said second cam for urging said guide and gripping mechanism into and out of bottle clamping position; a plurality of nozzles vertically adjustably supported upon a pair of vertically reciprocable plates which are slidably supported upon said frame structures, said nozzles being horizontally adjustable with respect to each other and located directly beneath the axis of rotation of said bottle gripping assembly and alignable with said openings in said bottles when same are inverted by said assembly; means including a third cam on said cam shaft and a vertically reciprocable rack operable by said third cam for lowering and raising said nozzles; means including a valve for supplying cleaning fluid to said nozzles and means including a fourth cam for opening and closing said valve; all so arranged and constructed that a single actuation of said manually controllable means causes, in sequence, the closing of the said valve, the lowering of the nozzles, the clamping of one guide and gripping mechanism upon a plurality of bottles, the inversion of said bottles, the raising of said nozzles to operably engage said bottles, the release of the other guide and gripping mechanism from clamping position, and the opening of said valve thereby releasing cleaning fluid into said inverted bottles.

4. In a bottle cleaning machine, the combination comprising: a base and a pair of spaced, upstanding frame structures secured to said base; a horizontally disposed bottle guide and gripping mechanism rotatably supported about a horizontal axis upon the upper portions of said frame structures, said mechanism having bottle positioning means; a rotatable first cam under said mechanism and a vertically reciprocable rack operable by said cam for rotating said guide and gripping mechanism through approximately 180 degrees; a rotatable second cam under said mechanism and a vertically reciprocable post operable by said second cam for urging said guide and gripping mechanism into and out of bottle clamping position; a pair of vertically reciprocable plates slidably supported upon said frame structures and a nozzle adjustably supported thereon, said nozzle being directly beneath said guide and gripping mechanism and alignable with a bottle inverted by said mechanism; a rotatable third cam under said mechanism and a vertically reciprocable rack operable by said third cam for lowering and raising said reciprocable plates; means including a valve for supplying fluid to said nozzle and a fourth rotatable cam for opening and closing said valve; and manually controllable means for effecting a related rotational movement of said cams; whereby a single actuation of said manually controllable means causes, in sequence, the closing of said valve, the lowering of the nozzle, the clamping of the guide and gripping mechanism upon a bottle, the inversion of said bottle, the raising of said nozzle to engage said bottle, and the opening of said valve thereby releasing fluid into said inverted bottle.

5. In a container cleaning machine, the combination comprising: a frame; a container holding mechanism having releasable container gripping means thereon and being rotatably supported about a horizontal axis upon said frame; a rotatable cam shaft under said mechanism and manually controllable means effecting reversible rotation of said shaft; a first cam on said shaft and a vertically reciprocable rack operable by said cam for rotating said holding mechanism; a second cam on said shaft and means including a vertically reciprocable post operable by said second cam for actuating said gripping means; a plurality of nozzles adjustably and vertically reciprocably supported upon said frame beneath said holding mechanism and alignable with containers inverted thereby; a third cam on said shaft and means including a vertically reciprocable rack operable by said third cam for lowering and raising said nozzles; means connecting said nozzles to a source of fluid supply; and means including a cam for controlling the flow of cleaning fluid to said nozzles; all arranged and constructed so that a partial rotation of said cam shaft causes, in sequence, the interruption of fluid flow to the nozzles, the lowering of the nozzles, the gripping of a plurality of containers within the holding mechanism, the inversion of said containers, the raising of said nozzles to engage said containers, and the release of fluid through said nozzles into said inverted containers.

6. In a container cleaning machine, the combination comprising: a frame; a container holding mechanism having releasable container gripping means thereon and being rotatably supported about a horizontal axis upon said frame; a rotatable cam shaft under said mechanism and manually controllable means effecting rotation of said shaft; a first cam on said shaft and a vertically reciprocable rack operable by said cam for rotating said holding mechanism; a second cam on said shaft and means including a vertically reciprocable post operable by said second cam for actuating said gripping means; a nozzle vertically reciprocably supported upon said frame beneath said holding mechanism and alignable with a container inverted thereby and means connecting said nozzle to a source of cleaning fluid; a third cam on said shaft and means including a vertically reciprocable rack operable by said third cam for reciprocating said nozzle; whereby rotation of said cam shaft effects, in sequence, the lowering of the nozzle, gripping of the container within the holding mechanism, inversion of said container, and raising of said nozzle into contact with said inverted container.

7. In a container cleaning machine, the combination comprising: a frame; a container holding mechanism having releasable container gripping means thereon and being rotatably supported about a horizontal axis upon said frame; a first cam rotatably supported under said mechanism and a vertically reciprocable rack actuable by said cam for rotating said mechanism; a second cam rotatably supported under said mechanism and means including a vertically reciprocable post operable by said second cam for actuating said gripping means; a nozzle vertically reciprocably supported upon said frame beneath said mechanism, alignable with a container inverted thereby and connectable to a source of cleaning fluid; a third cam rotatably supported under said mechanism and means including a ver-

tically reciprocable rack operable by said third cam for reciprocating said nozzle; and means effecting related and reversible rotation of said cams, thereby causing, in sequence, lowering of the nozzle, gripping of a container within said holding mechanism, inversion of said container, and raising of said nozzle into contact with the inverted container.

8. In a container cleaning machine, the combination comprising: a frame; a container holding mechanism having releasable container gripping means thereon and being rotatably supported about a horizontal axis upon said frame; a first actuating means under said mechanism and a vertically reciprocable rack actuable by said first means for rotating said mechanism; a second actuating means under said mechanism and a vertically reciprocable post operable by said second means for actuating said gripping means; a nozzle vertically reciprocably supported upon said frame beneath said mechanism and alignable with a container inverted thereby; a third actuating

means under said mechanism and a vertically reciprocable rack operable by said third means for reciprocating said nozzle and means connecting same to a source of cleaning fluid; and means driving said several actuating means in predetermined, timed relation to each other, thereby causing, in sequence, the lowering of the nozzle, gripping of the container within the holding mechanism, inversion of said container, and raising of said nozzle into contact with said inverted container.

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