United States Patent

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[54] **WASHING APPARATUS FOR HOLLOW CONTAINERS**

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[51] **Int. Cl.**.....**B08b 3/02,** B67c 1/06

[58] **Field of Search**.....15/56, 67; 134/44, 46, 49, 134/52–55, 58 R, 58 DL, 129, 143, 167 R, 168 R, 170, 175, 177, 199, 200, 83, 152; 118/326

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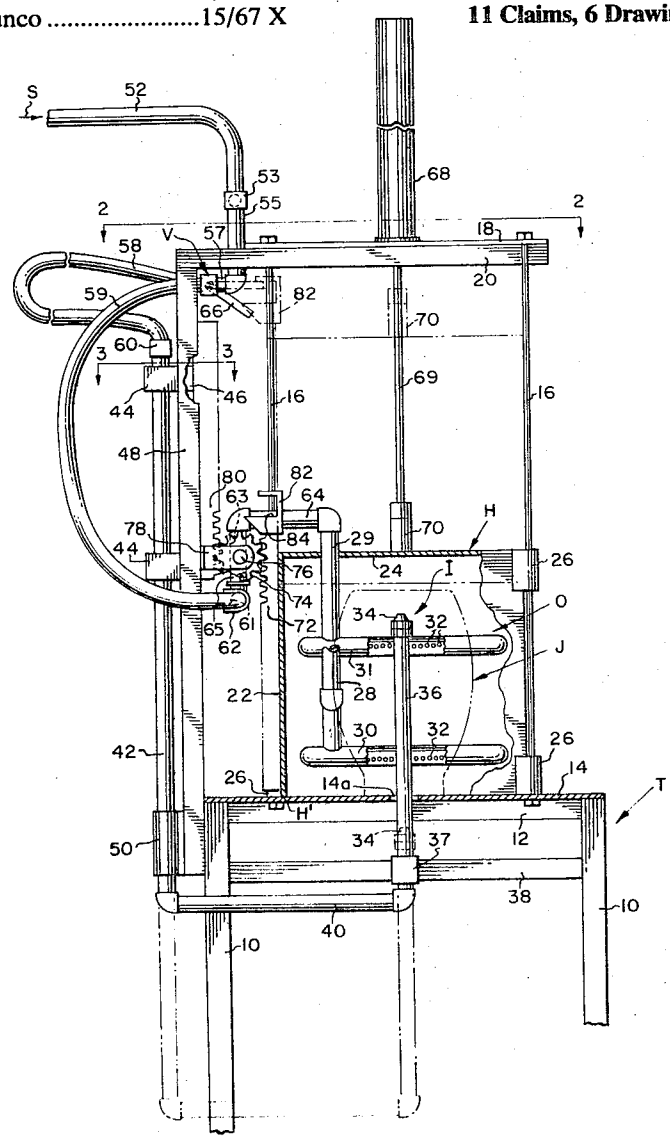
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[57] **ABSTRACT**

Apparatus for washing a hollow container positioned on a support with the container mouth opening downwardly comprising an open bottom, cup-shaped spray hood movable from a raised position to a lowered position surrounding a container positioned on the support, a first sprayer mounted in the hood for spraying a fluid against the outer surface of the container when the housing is moved downwardly to the lowered position, and a second sprayer mounted below the support for movement upwardly through the mouth of the container to a raised position inside the container, the movements of the hood and the second sprayer being synchronized to effect simultaneous washing of the inner and outer surfaces of the container.

11 Claims, 6 Drawing Figures



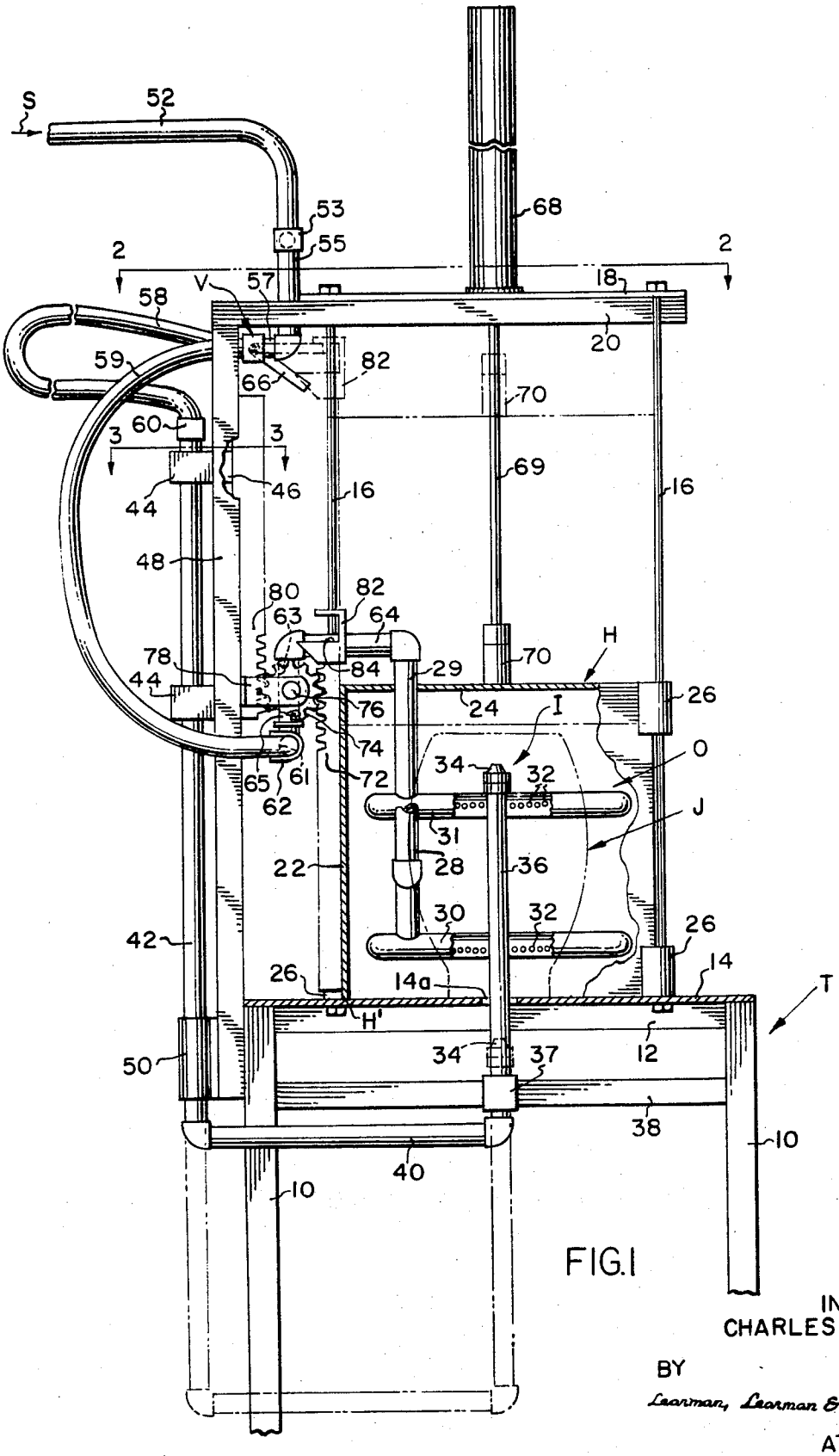
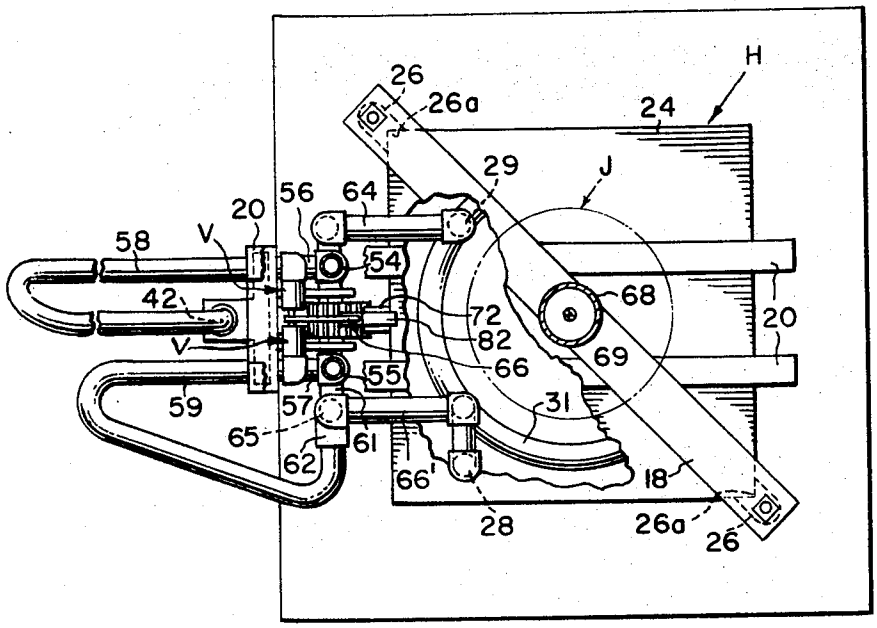


FIG.1

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FIG. 2.



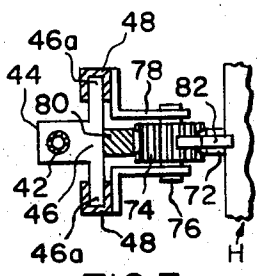


FIG. 3

FIG. 4

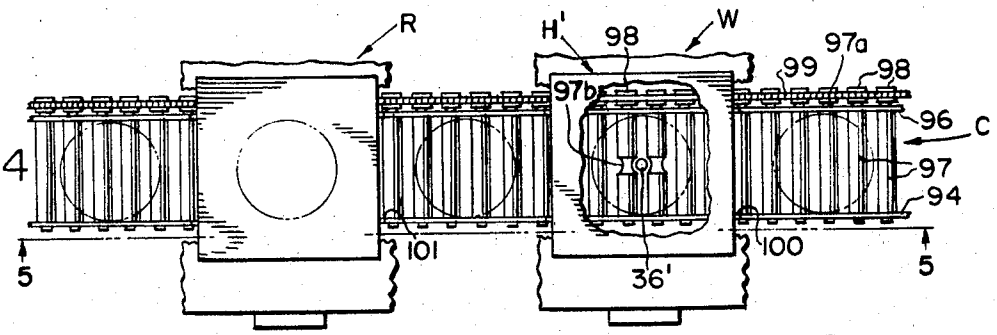


FIG. 5

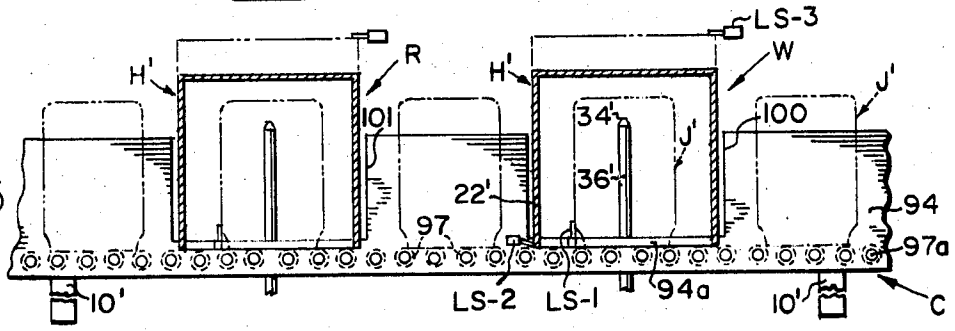
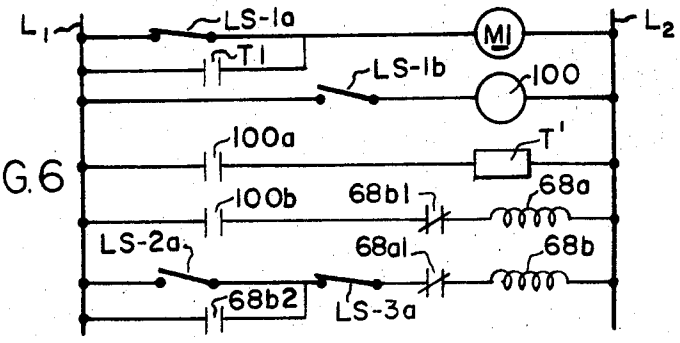


FIG. 6



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WASHING APPARATUS FOR HOLLOW CONTAINERS

FIELD OF THE INVENTION

This invention relates to washing apparatus and more particularly to apparatus for simultaneously washing the inside and outside surfaces of a hollow container.

BACKGROUND OF THE INVENTION

In the past, hollow containers such as large (5–10 gallon) glass jugs used for transporting and storing food such as pickled bologna, commonly have been washed, in batches, by hand. Although slow, hand washing generally has been the most effective method of washing large jugs because commercially available washing machines are not well suited for this purpose.

Recently the Pure Food and Drug law relating to the preparation of containerized food has been changed to eliminate the previously permitted "batch method" of washing containers which are to be reused as containers for salable food. This change has all but eliminated the hand washing of jugs because when jugs are hand washed they are generally placed in a large tank of water to assure adequate wetting of the entire jug surface. If the water must be replaced after each individual jug is washed in compliance with the law, the costs of the cleaning agent and water are exorbitant. Other recent changes in the Pure Food and Drug law which restrict the type of washing materials previously permitted also have affected adversely the hand washing industry.

The cleaning of the rims of large jugs is a particularly difficult task in that it is in this area that an unusually large amount of corrosion and dirt collect. Failure to clean the rim area results in costly repetitive washings.

It is an object of the present invention, therefore, to provide improved apparatus for washing large hollow containers.

It is another object of the present invention to provide apparatus for simultaneously washing the inside and outside surfaces of large hollow containers.

Yet another object of the present invention is to provide apparatus for containing the spray around a container being washed.

Still another object of the present invention is to provide apparatus which is particularly suited for washing the rims of large jugs.

A further object of the present invention is to provide apparatus for washing large jugs and which includes apparatus for automatically moving a washed container out of the washing apparatus while simultaneously moving an unwashed container therein.

A still further object of the present invention is to provide apparatus for washing and subsequently rinsing large hollow containers.

Briefly, according to the present invention there is provided apparatus for washing hollow containers comprising support means for supporting a container to be washed at a wash station, an open bottom, spray retaining hood means forming a chamber, means mounting the hood means for vertical movement between a raised position and a lowered position adjacent the support means to surround the container to be washed, spray means mounted within the chamber and movable with the hood means for directing the fluid against the outer surface of the hollow container to be washed during the vertical movement of the hood means, and means for vertically moving the housing means between the raised and lowered positions.

Other objects and advantages of the present invention will become apparent to those skilled in the art by the following description when it is considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a partly sectional, side elevational view illustrating the container washing apparatus formed according to the invention and a container in position to be washed, parts being broken away to illustrate more clearly certain portions thereof;

FIG. 2 is a partly sectional, top plan view taken along the line 2—2 of FIG. 1;

FIG. 3 is a sectional view, taken along the line 3—3 of FIG. 1, illustrating the drive apparatus for vertically moving the spray and hood members;

FIG. 4 is a fragmentary, top plan view of a mechanized system for sequentially washing and rinsing jugs;

FIG. 5 is a partly sectional, side elevational view taken along the line 5—5 of FIG. 4; and

FIG. 6 is a schematic diagram of a typical electrical control circuit for controlling the apparatus illustrated in FIGS. 4 and 5.

Apparatus constructed according to the preferred embodiment of the invention includes an outer spray mechanism generally designated O and an inner spray mechanism generally designated I for respectively washing the outer and inner surfaces of an inverted jug, illustrated in chain lines at J, supported on a top wall **14** of a table T which includes four table legs **10** connected by top cross members **12** supporting the top wall **14**. The outer spray mechanism O includes a pair of vertically spaced, annular tubular members **30** and **31** positioned within the chamber formed by a cup-shaped, spray containing housing, or hood, H which includes four side walls **22** and a top wall **24**. Projecting through, and welded to, the top wall **24** of the housing H are a pair of pipes **28** and **29** connected at their lower ends with annular, tubular spray members **30** and **31**, respectively. Each of the spray members **30** and **31** is provided on its inner periphery with a plurality of evenly spaced outlet openings **32** for permitting the washing fluid, which is supplied in a manner to be later described, to be emitted downwardly, inwardly therefrom onto the outer surface of the jug J positioned on the table T.

The hood H is vertically movable on a pair of support rods **16** extending upwardly from the top wall **14** and mounting, at their upper ends, a diagonally disposed bar **18** having a pair of support members **20** welded to the underside thereof. The hood H is slidably mounted on the guide rods **16** by sleeve members **26** connected to the upper and lower portions of opposite corners **26***a* of the housing H. Suitable lubricant may be placed on the rods **16** to minimize friction between the members **26** and the guide rods **16**.

The inner spray mechanism I includes a spray head **34** connected with the upper end of a vertically extending pipe **36** which passes through an aperture **14a** in the table top **14** and is slidably received in a sleeve member **37** connected with a cross piece **38** spanning the legs **10**. A spray head of the type illustrated in U.S. Pat. No. 2,305,210, manufactured by Spraying System Co., and

sold under the trademark "FUEL JET" is suitable for this purpose.

The lower end of the pipe **36** is coupled to a generally horizontally extending pipe **40** which in turn is coupled to a vertically extending pipe **42** fixed at its upper end, by a pair of vertically spaced brackets **44** forming parts of slide **46** (FIG. 3). For guiding the end portions **46***a* of the slide **46**, a pair of opposed, vertically extending U-shaped ways **48** are fixed between the upper pair of support members **20** and the legs **10** of the table T. The lower portion of the pipe **42** is slidably received in a sleeve member **50** which is fixed to the lower portion of the guides **48** in any suitable manner, such as by welding.

Washing fluid for the spray members **30**, **31**, and **34** is supplied from a constant pressure source, indicated by the arrow S, which may comprise, for washing purposes, a drum (not shown) of soapy water pumped to the supply pipe **52** by means of a constant pressure pump of the type manufactured by Gray Company, Inc., Minneapolis, Minnesota, and designated Grayco Powerflow Pump, Model No. 206596, and a power head attached thereto also manufactured by Gray Company, Inc., and designated Model No. 204640.

The soapy water delivered to the pipe **52** is divided into two paths by a T-shaped coupling **53** which is connected with a pair of downwardly extending pipes **54** and **55**. At their lower ends. The pipes **54** and **55** are connected with horizontally extending pipes **56** and **57**, respectively, which in turn are connected to a pair of hoses **58** and **59**, respectively. The hose **58** is joined to the upper portion of the vertically extending pipe **42** by means of a coupling **60**. The hose **59** is connected with one end of a horizontally extending pipe **61** by means of a T-shaped coupling **62**. The other end of the pipe **61** is connected with the vertically extending pipe **63** which, at its upper end, is connected with a horizontally extending pipe **64** connected to the vertically extending pipe **29** fixed in the upper wall of the housing H. The T-shaped coupling **62** also is connected with a vertically extending pipe **65** which, at its upper end, is connected with an L-shaped, horizontally extending pipe **66'** connected with the upwardly extending pipe **28** in the top wall **24** of the housing H. Butterfly valves V, spring biased to the open position to permit fluid to flow therethrough are connected in lines **56** and **57** and are movable to a closed position to interrupt the flow of fluid by an operating lever **66** which is actuated in a manner later to be described.

For moving the hood H and outer spray mechanism O upwardly and simultaneously moving the inner spray mechanism I downwardly, a double-acting solenoid actuated pneumatic cylinder **68** is connected with the cross member **18** and includes a piston rod **69** connected to a suitable lug **70** on the upper wall **24** of the hood H. A pneumatic cylinder of the type manufactured by ARO Corporation, Bryon, Ohio, under Model No. 996, has been found suitable for this purpose, when used in conjunction with a solenoid-operated valve (not shown), also manufactured by ARO Corporation, under Model No. 696.

To couple the energy of the hood H being moved vertically by the cylinder **68** to the spray mechanism I, a pinion gear **74** is mounted on a shaft **76** journaled in suitable bearings provided in trunions **78** which are fixed to the vertically extending guides **48**. The pinion gear **74** is drivingly engaged on one side with a rack **72** connected with one of the side walls **22** of the housing H, and on its opposite side with a rack **80** secured to the vertically movable guide **46**. Thus, as the hood H and outer spray mechanism O move upwardly, the rack **72** drives the pinion **76** counterclockwise, as viewed in FIG. **1**, to drive the rack **80** and the slide **46** downwardly to move the inner spray mechanism I downwardly to the chain line position illustrated in FIG. **1**.

In place of the pinion gear **74** and the associated racks **72** and **80**, the lower spray mechanism I may be coupled to the hood H with a cable which is trained around a pair of pulleys positioned on the upper end of the guides **48** and the cross bars **20** adjacent the cylinder **68** and connected at opposite ends to the upper wall **24** of the housing H and the guide **46**. As the housing is raised by the cylinder **68**, the inner spray mechanism I will lower under the force of gravity and as the housing is lowered, the cable (not shown) moves the spray mechanism I upwardly.

The valves V in the water supply lines **56** and **57** are normally spring biased to the open position to permit soapy water to flow to the outer and inner spray mechanisms O and I, respectively, when they are in the positions shown in full lines in FIG. **1**. A latch member **82** is mounted on the top wall **24** of the hood H and is formed with a recess **84** for receiving the valve actuating arm **66** as the hood H is moved upwardly to the chain line position shown in FIG. **1** to close the valves V and shut off the supply of water to the outer and inner spray mechanisms O and I. The interruption of the flow of water after each jug is washed, minimizes the water requirements and permits the washed jugs J manually to be removed from the table T and replaced by another unwashed jug J without the operator's being scalded.

In operation, if the housing H and the spray mechanisms O and I are initially in the chain line position, shown in FIG. **1**, the valves V are in the off position so that no water flows through the spray mechanisms O and I.

A jug J is placed on the support table T in the inverted position with its opening in alignment with the opening **14***a* of the table T and the inner spray apparatus I. The solenoid valve (not shown), associated with the cylinder **68**, is actuated so as to direct air to the cylinder **68** in a manner to move the piston rod **69** downwardly. After the lower rim portion H' of the hood H has moved to a position slightly below the upper surface of the inverted jug J, but before the annular member **30** has moved to a position below the upper surface of the inverted jug J, the actuating member **66** is released to open the valves v and permit water to flow through the pipe **52** to the flexible hoses **58** and **59** and thence to the spray members **30**, **31** and **34**. The members **30** and **31** are positioned a sufficient distance above the rim H' of the hood H that the inner wall of the hood will intercept the spray deflected by the jug J, so as substantially to prevent the deflected hot, soapy wash water from scalding personnel in the immediate area. The simultaneous movement of the spray mechanism O and hood H and the location of the spray members **30** and **31** in the housing H are important features of the invention.

As the hood H and spray mechanism O are lowered, the pinion gear **74** is rotated to drive the slide **46** and the spray nozzle **34** upwardly such that the spray head **34** has been moved to a position just entering the mouth of the jug J as the valve V in line **56** is turned on to permit the soapy water to flow to the inner spray mechanism I through the flexible member **38** and the pipe **49**. The water emitted by the spray member **34** is sprayed upwardly and outwardly so as to wash the inner surface of the jug and particularly the bottom which, in most cases, is more soiled than the remainder of the jug.

The hood H continues to move downwardly until the rim H' rests on the upper surface **14** of the table T. When the hood is in this position, the lowermost annular spray member **30** is in spaced relation to the top wall **14** of the table T so as to effect thorough washing of the neck and rim areas of the jug J. The size and location of the piping connected to the annular spray members **30** and **31** are such as to cause the wash fluid to be emitted from the lowermost annular spray member **30** under a higher pressure than that emitted from the upper spray member **31**. This is important because the neck and rim areas of the jug J are particularly difficult to clean and require a higher pressure spray than that required for the remainder of the jug.

After the hood H reaches its lowermost position the reverse solenoid of the valve for the double-acting cylinder **68** is actuated to move the hood H and outer spray members O upwardly and simultaneously move the inner washing mechanism I downwardly while the members **30** and **31**, and **34** continue to spray an annular curtain of wash fluid against the jug J. The washing apparatus thus provides a two-stroke wash which emits spray against the outer and inner surfaces of the jug J on both the upward and downward movements of the spray members. In actual operation, it has been found that it takes approximately **15** seconds to complete one cycle of the operation. After the hood has been moved upwardly to the chain line position, the valves V are moved to the off position to interrupt the supply of fluid and the washed jug J is removed manually. Another unwashed jug is then moved into the wash station and the cycle is repeated.

It should be understood that the outer and inner spray mechanisms O and I may be used independently of each other. For example, the inner spray mechanism I could be used to clean a cylindrical collander by spraying fluid outwardly therethrough. As the spray hood H is moved to the lowered position, only the valve V in the line **57** would be actuated to supply washing fluid only to the lower sprayer **34**. The valve V is actuated in timed relation with the position of the hood H so that substantially all of the spray is contained within the hood H.

Referring now to FIGS. **4** and **5**, a system is illustrated wherein wash and rinse stations are provided at W and R, respectively. The apparatus for each of the wash and rinse stations is identical to that disclosed in FIGS. **1–3**, with the exception of the conveyor designated generally C, which has replaced the table top **14** and cross members **12**, and similar parts will be designated with similar reference characters, but followed by a "prime" designation.

The conveyor C preferably is a powered roll conveyor having side frame members **94** and **96** supported by legs **10'** in any suitable manner, and journaling conveyor rolls **97**, which are shown as having reduced ends or journals **97*a*** received by the supporting side members **94** and **96**.

Mounted on the outer ends **97*a*** of each of the rolls **97** are sprockets **98** around which an endless chain **99** is trained and driven by any suitable electric motor M–1 (FIG. **6**) which may have its output shaft connected, through suitable speed reduction gearing, to the sprockets **98**, to drive the chain **99** intermittently in a manner to be hereinafter described.

The side frame members **94** and **96** are spaced so that the spacing is just greater than the outside diameter of the jugs J so as to permit the jugs to pass freely therebetween without tipping sidewise. At the wash and rinse stations W and R, cut out portions **100** and **101** are provided in the side wall members **94** and **96**, to permit the housings H' of the respective wash and rinse stations W and R to move downwardly. The walls **22'** of the housings H' may be slotted at their lower ends to receive the side wall portions **94*a*** supporting the rollers **97** at the wash and rinse stations when the housings H' are in their lowermost position.

Each of the rollers **97** may be formed of rubber or rubber covered steel rollers to minimize breakage of jugs and to increase the frictional driving force between the rollers **97** and the conveyor engaging rim portions of the jugs. At each of the wash and rinse stations, two of the roller members **97** are formed with an annular semi-cylindrical groove **97*b***, which receives the upwardly extending pipe **36'** mounting the spray nozzles **34'** for washing the inside of the jugs J.

Referring now to FIG. **6**, a typical electrical schematic diagram of a control circuit for controlling the apparatus shown in FIGS. **4** and **5** is illustrated. For purposes of convenience and clarity, only the circuit for operating the apparatus at the washing station W has been shown, although it should be understood that a duplicate circuit is provided for the rinse station.

Referring now to FIG. **6**, a suitable source such as 110 volt, 60 cycle, alternating current is connected across the lines L_1 and L_2. A limit switch LS–1 is mounted on the conveyor C and is actuated when a jug J' is moved into position at the wash station to open a normally closed set of contacts LS–1*a* and close a set of normally open contacts LS-1*b*. The contacts LS–1*a* are connected in series circuit with the motor M–1 for driving the conveyor chain **99**. The set of contacts LS–1*b* are connected in series circuit with a relay **100**, which when actuated, closes sets of normally open contacts **100*a*** and **100*b***. The contacts **100*a*** are connected in series circuit relation with a timer T of the type manufactured by Eagle Manufacturing Company of Davenport, Iowa, and include a set of normally open contacts T1 which are connected in parallel circuit with the limit switch contacts LS–1*a* and which close when the timer T times out. The timer T, for example, may be set to expire at the end of 15 seconds. The advance and retract solenoids for lowering and raising the housing H' are shown at **68*a*** and **68*b***, respectively. When actuated, the solenoid **68*b*** is operable to open a set of normally open contacts **68*b*2**. The solenoid **68a** is connected in series circuit with the normally closed contacts **68*b*1** and the normally open contacts **100*b***. A limit switch LS–2 is provided adjacent the upper surface of the con-

veyor C in position to be actuated when the housing H' reaches the lowermost position in engagement with the conveyor C to close the normally open contacts LS–2*a*. A raised limit switch LS–3 is mounted on suitable mounts (not shown) and is actuated when the housing H' reaches its uppermost position to open the normally closed contacts LS–3*a* connected in series circuit relation with the normally open contacts LS–2*a*, the normally closed contacts **68***a***1** and the solenoid **68***b*. The set of normally open contacts **68***b***2** are connected in parallel with the contacts LS–2*a* and are closed when the solenoid **68***b* is energized.

In operation of the apparatus illustrated in FIGS. **4** and **5**, the motor M–1 is operated to drive the power driven rolls **97** to advance a jug J' to the wash station W, where it actuates a limit switch LS–1 to open the normally closed contacts LS–1*a* to stop the motor M–1. Simultaneously, the limit switch contacts LS–1*b* close to energize the relay **100**, closing the contacts **100***a* and **100***b*. When the contacts **100***b* close, the advance solenoid **68***a* for lowering the housing H' is energized to move the housing downwardly and simultaneously move the lower sprayer **34'** upwardly. When the housing H' has reached its lowermost position, the limit switch LS–2*a* is closed and the reverse solenoid **68***b* is energized to move the housing H' and spray mechanism O' to its initial raised position and lower the inner spray mechanism I' to its initial lowered position. When the housing H' reaches its uppermost position and engages the limit switch LS–3, the limit switch contacts LS–3*a* are opened. Substantially simultaneously, the timer times out and the contacts T_1 are closed to reenergize the motor and move the washed jug forwardly. As the washed jug moves forwardly, the limit switch contacts LS–1*a* again close to maintain circuit continuity through the motor M as the contacts LS–1*b* open to pull out the relay **100** and deenergize the timer T which is reset to open the contacts T1 so that the cycle may be repeated.

It should be understood that the circuits for the rinse and wash stations R and W may be interconnected so that the conveyor C will not operate unless the hoods H' and the outer and inner spray mechanisms O' and I' of both the rinse and wash stations are in the removed, inoperative position.

It is to be understood that the drawings and descriptive matter are in all cases to be interpreted as merely illustrative of the principles of the invention, rather than limiting the same in any way, since it is contemplated that various changes may be made in various elements to achieve like results without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. Apparatus for washing hollow containers having an open mouth comprising:

support means for supporting a container to be washed at a wash station;

open bottom, closed top and side housing means defining a downwardly opening chamber adapted to accommodate such a hollow container;

means mounting said housing means for vertical movement between a raised position and a lowered position adjacent said support means to surround the container to be washed;

first spray means carried for movement with said housing means and adapted to be connected with a source of liquid for directing an annular, vertically moving curtain of spray inwardly toward and along the length of the container to be washed while said housing is moving between said lowered and raised positions, said first spray means including means disposed within said chamber and surrounding a container at the wash station when said housing means is in said lowered position;

second spray means adapted to be connected to said source of liquid and movable from a lowered position through the mouth of said hollow container positioned at said wash station to a raised position inside said container for directing a liquid toward the inner surface of the hollow container;

means for moving said housing means and said first spray means between said raised and lowered positions and for simultaneously moving said second spray means between its lowered and raised positions to simultaneously wash the outer and inner surfaces of said container; and

control means operative according to the vertical position of said housing means for initiating the flow of said liquid to said first and second spray means.

2. Apparatus as set forth in claim **1** including means for introducing washing liquid to said first and second spray means; said control means controls the flow of washing liquid to said spray means, said liquid control means being operative to supply liquid to said spray means when said housing means moves downwardly and upwardly between said raised position and said lowered position to wash the container on both the downward and upward strokes and to interrupt the flow of liquid when said housing means moves toward said raised position.

3. Apparatus as set forth in claim **1** wherein said first spray means is positioned in said chamber in such manner that when the housing means has been moved to a position such that the lower edge of said housing means is below the uppermost portion of the container said first spray means is above the uppermost portion of the container.

4. Apparatus as set forth in claim **1** including means for actuating said spray means to emit a washing liquid after the lower edge of the housing means has been moved to a position below the uppermost portion of the container.

5. Apparatus as set forth in claim **1** wherein said first spray means is positioned in said housing means in such a manner that the inner surface of said housing means will intercept the liquid emitted by said spray means after it is deflected by the container being washed.

6. Apparatus as set forth in claim **1** wherein said first spray means includes means operative to spray liquid against the outer surface of the container when the housing is being moved both downwardly and upwardly between the raised and lowered positions.

7. Apparatus as set forth in claim **1** wherein said first spray means comprises upper and lower vertically spaced liquid emitting means which encircle the container when the housing means is in the lowered position; and means for causing the washing liquid emitted by said lower liquid emitting means to be emitted at a

higher pressure than the pressure of the washing emitted by said upper emitting means.

8. Apparatus as set forth in claim 1 wherein said first spray means is positioned in said chamber in such manner that when the housing means is in said lowered position, said spray means is vertically spaced from said support means.

9. Apparatus as set forth in claim 1 wherein said support means includes conveying means for conveying the washed container out of the wash station while simultaneously moving an unwashed container into position at said wash station.

10. Apparatus as set forth in claim 9 including rinse apparatus downstream of said washing apparatus for receiving the washed containers at a rinse station, said conveying means including means for conveying the washed containers to said rinse stations.

11. Apparatus as set forth in claim 10 wherein said rinse apparatus comprises:

open bottom rinse housing means defining a rinse chamber adapted to accommodate a container;

means mounting said rinse housing means for vertical movement between a raised position and a lowered position adjacent said conveying means to surround the washed container positioned at said rinse station;

rinse spray means carried by said rinse housing means for movement therewith for directing rinse liquid toward the washed container positioned on said conveying means at said rinse station; and

means for moving said rinse housing means between said raised and lowered positions.

* * * * *