June 10, 1969 W. J. BERRY 3,448,743

APPARATUS FOR CLEANING CONTAINERS

Filed Nov. 7, 1966

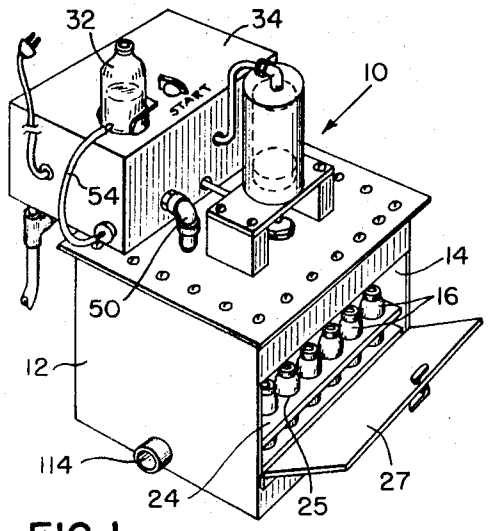


FIG. 1

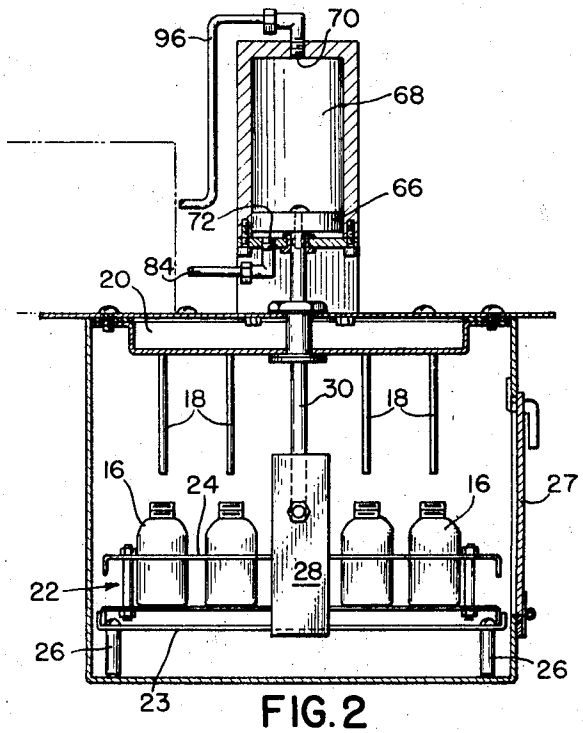
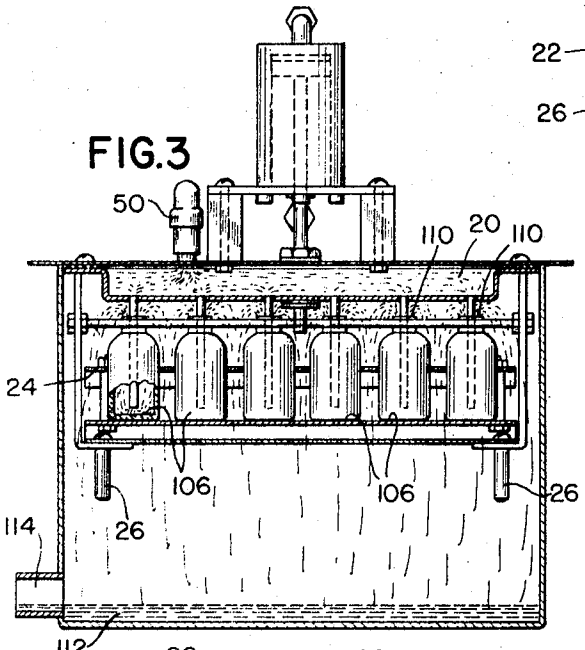


FIG. 2

FIG. 3



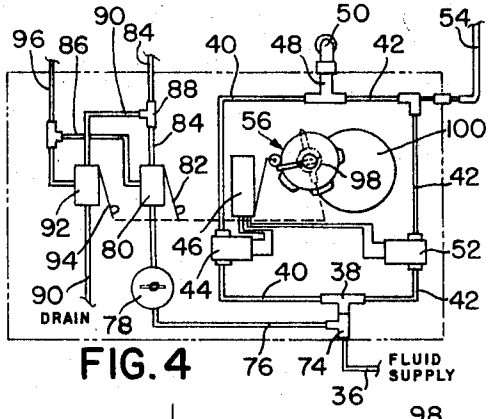


FIG. 4

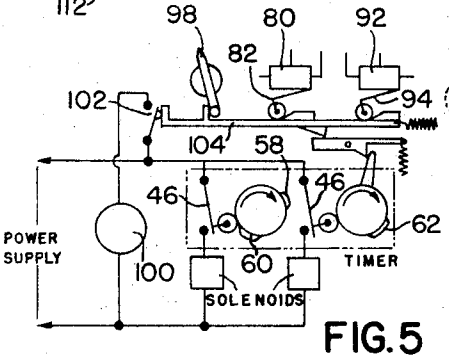


FIG. 5

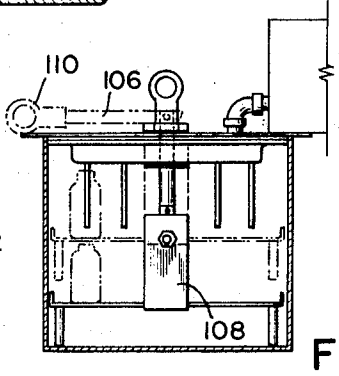


FIG. 7

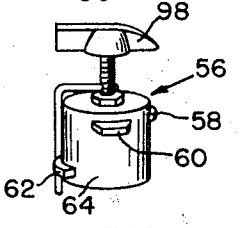


FIG. 6

United States Patent Office 3,448,743 Patented June 10, 1969

3,448,743

APPARATUS FOR CLEANING CONTAINERS

William J. Berry, Durham, N.C., assignor to R & D Suppliers, Inc., Durham, N.C., a corporation

Filed Nov. 7, 1966, Ser. No. 592,553
Int. Cl. B08b 3/04
U.S. Cl. 134—58 5 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for cleaning containers in which a fluid dispensing line connected to a source of fluid is introduced into and withdrawn from a container to be cleansed and fluid is dispensed for a period of time to cleanse the container internally and externally with the container having its open end facing upwardly.

This invention relates to new and useful improvements in apparatus for cleaning containers, and more particularly it relates to equipment and methods for washing, cleaning and sterilizing laboratory glassware such as vials, test tubes, flasks, bottles, syringes, pipettes, and the like.

Numerous problems exist in hospitals, medical centers and laboratories in washing, rinsing and sterilizing adequately the assortment of glassware used in medical research and treatment so that such are thoroughly cleaned internally and externally to permit their reuse. Glassware of the type mentioned above often contains tissue cultures, blood, labels, markings, agar, chemicals, tar and distillates which are difficult to remove by ordinary cleaning and sterilizing processes. Additionally, particular substances such as autoclaved protein and other recalcitrant deposits which collect on the walls of such articles are oftentimes nearly impossible to remove by conventional means.

The present invention concerns apparatus adapted to extend within the interiors of containers to be cleansed so that the wash and rinse fluids may be applied to the soiled containers in a continuous, flushing manner. By a unique combination of detergent and water injected within and near the bottom of the containers, their interiors are systematically cleansed, and the washing and rinsing cycles are interspersed so that particles of foreign materials adhering to the surface of the container interiors are eventually softened, dislodged and conveyed outside the container by the flushing action of the introduced fluid.

The present apparatus has been found extremely effective for use with bottles having restricted, narrow openings which are primarily used for handling radioactive specimens that require a high degree of purity. Such containers are extremely difficult to wash by conventional means or methods because of the narrow openings which preclude insertion of a brush or similar device to scrub the vessel interior walls. Use of the present invention allows the fluid dispenser to be introduced within these bottles through the narrow opening so that a continuous flushing action takes place as fluid and detergent is introduced selectively into the bottle and overflows through the openings during both the wash and rinse cycles.

It is, therefore, a primary object of the present invention to provide a device for washing and rinsing laboratory glassware such as test tubes, flasks, bottles, syringes, vials, pipettes and the like.

Another object of the present invention is to provide a container cleaning apparatus which can be introduced within the container to permit a continuous flow of fluid and detergent therethrough for selected time intervals.

Yet another object of the present invention is to provide an apparatus for cleaning containers and the like which utilizes selectively actuated solenoids to introduce discriminately fluid and detergent within the interior of soiled containers.

Still another object of the present invention is to provide a container cleaning apparatus having means for permitting relative motion between dispensers and soiled containers so that the dispensers may be introduced within the containers for cleaning.

Yet another object of the present invention is to provide a container cleaning apparatus embodying a unique fluid actuated container displacing component which can be controlled by a timer that governs the wash and rinse cycles.

These and other objects of the present invention will be clearly apparent during the course of the following description while considering the accompanying drawings constituting a part hereof and in which like characters of reference designate like parts and in which:

FIG. 1 is a perspective view of the container cleaning apparatus constituting the preferred embodiment of the present invention showing the cleanser reservoir and the dispenser displacing system utilizing fluid flow to either side of a centrally positioned piston;

FIG. 2 is a side elevational, sectional, fragmentary and slightly enlarged view of the preferred embodiment of the present invention showing the dispensers and communicating manifold and the containers to be cleansed positioned therebeneath along a supporting and movable platform;

FIG. 3 is a front elevational, sectional, fragmentary and slightly enlarged view of the preferred embodiment of the present invention showing the dispensers injected within containers to be cleaned and the circulating fluid introduced therein;

FIG. 4 is a mechanical-hydraulic schematic diagram of the preferred embodiment of the present invention illustrating the flow mechanism for controlling fluid flow during the wash and rinse cycle and the hydraulic operating means controlling the movement of the supported containers from a dispenser-retracted to a dispenser-inserted position;

FIG. 5 is an electro-mechanical schematic diagram showing the wiring connection of the drive motor and valve controlling solenoids in the preferred embodiment of the present invention;

FIG. 6 is a perspective enlarged view of the timer assembly showing the wash and rinse cycle programmed solenoid trip cams positioned thereon; and

FIG. 7 is a side elevational, fragmentary and sectional view of an alternative embodiment of the present invention showing a hinged lever attached to the container supporting platform for raising and lowering that platform when manual or independent displacement is desired.

Referring now to the drawings and particularly to FIG. 1, there is shown one embodiment of a container cleaning apparatus generally designated **10** comprising a housing **12** which is provided with an opening **14** wherein a plurality of containers **16** may be placed for cleaning.

Apparatus **10** includes fluid dispensing means in the nature of a plurality of hollow fluid dispensers **18** extending downwardly from a communicating manifold **20** from which fluid can be evenly and uniformly distributed into containers **16**.

A rack generally designated **22** has a retainer **24** which is perforated with a number of openings **25** shaped to receive the cross-sectional configuration of a container so as to sustain these containers in a side-by-side relationship and in one position during the wash and rinse operation. A platform **23** supports rack **22** and has a number of adjustable braces **26** for positioning the platform a prescribed distance from the dispensers according to the height of the rack **22** and containers **16** positioned thereon that are to be cleaned. A vertically extending member **28** is secured to the platform and provides means for attaching a lever or other linking member **30** whose operation will be described subsequently in greater detail. Rack **22** is slidably removable through opening **14** onto platform **23** thus permitting any number of differently designed racks to be used according to the shape of the containers to be washed. A door **27** covers opening **14** and prevents fluid from splashing outwardly therefrom.

In order to provide fluid and detergent for introduction and circulation within containers **16**, a cleanser aspirator or reservoir **32** is situated atop the control housing **34** so that when the introduction of cleanser into the containers is called for by way of the program timer, detergent or cleanser will flow from reservoir **32** through vessel **54** and subsequently into manifold **20** for distribution into the various containers.

Control box **34** houses the hydraulic, mechanical and electrical control system for operating the container cleaning apparatus, a portion of which system is particularly illustrated in FIG. 4 wherein a fluid, usually water, is furnished from a fluid supply under pressure and is introduced into the intake line **36** which is comprised of a suitable tubular material of sufficient size to accommodate the passage of a quantity of fluid. Fluid flow is directed to a T connection **38** and there divides into two tubular conductors **40** and **42**. Line **40** enters a chamber generally designated **44** which contains a solenoid and solenoid-operated valve for passing or restricting flow through conduit **40**. A duplex microswitch **46** energizes the solenoid within chamber **44** at the appropriate time as will be subsequently described.

Line **40** continues from housing **44** to another T connection **48** where it is then channeled through a larger conduit **50** directly into manifold **20** for even and continuous distribution to the plurality of dispensers **18** communicating with the manifold and extending therefrom.

Line **42** also enters a solenoid and solenoid operated valve chamber generally designated **52** for selectively controlling fluid flow therethrough. The solenoid of chamber **52** is controlled by the second post of duplex switch **46** which will be described subsequently. Line **42** continues until it intersects cleanser feed line **54** which extends from cleanser reservoir **32** and supplies cleanser or detergent for the washing operation. Flow of fluid and cleanser then continues in line **42** until it reaches the T connection **48** where it is then introduced in conduit **50** for transferral to manifold **20**.

A timer best illustrated in FIG. 6 and designated generally **56** is positioned near duplex microswitch **46** and controls the actuation of solenoids contained within chambers **44** and **52**. Timer **56** is preferably of an electrical type though obviously a mechanical device could be used. A one-hour timer cycle is found to give best results in the preferred embodiment of the present invention so that timer **56** is provided with cams **58**, **60** and **62**. As the cam sustaining surface **64** of the timer rotates during the wash and rinse cycle, the cams selectively actuate the particular post of switch **46** to either pass or restrict fluid in lines **40** and **42**.

In the preferred embodiment of the present invention as particularly set forth in FIG. 2, a piston **66** is affixed to lever **30** for slidable movement within a chamber **68** which is sealed except for intake and exhaust ports **70** and **72** which allow the flow of fluid into and out of the chamber as directed to displace piston **66** in one direction or the other according to the desired operation.

The introduction of fluid to control movement of piston **66** is particularly illustrated in FIG. 4 where fluid from a source is introduced into line **36** and divides at connection **74**, a portion continuing to T-connection **38** and a portion entering line **76** in which is positioned a pressure pressure regulator **78** for sustaining a constant fluid pressure against the piston and providing immediate response to fluid flow through line **76** when such is desired. Line **76** continues until it enters a mechanical valve **80** which is opened or closed according to its valve control lever **82**. Lines **84** and **86** extend from valve **80**, line **84** continuing through a connector **88** until it is introduced into port **72** contained in the lower portion of chamber **68**. Line **90** extends to a second mechanical valve **92** having a valve control lever **94** and on to the drain as indicated.

Still another tubular connection **96** extends from valve **92** into port **70** located at the top of chamber **68**, and line **86** intersects line **96** the purpose for which will be more clearly defined subsequently.

The wash and rinse cycle and the platform raising mechanism are initiated by rotating the indicator **98** which in turn moves cam supporting surface **64** of timer **56** so that valve levers **82** and **84** actuate valves **80** and **92** and permit fluid flow through valve **80** and into port **72** thus filling the lower portion of chamber **68** and raising piston **66** to an extended position (see FIG. 3). During this operation, valve **92** permits passage of fluid therethrough and into the drain once piston **66** has been raised to its uppermost position so that the lower portion of chamber **68** which is filled with water can be maintained under constant pressure while water is continuously circulated through the valves. Valve **92** also serves as an escape or relief valve since raising piston **66** without such a provision would cause somewhat abrupt and rapid movement of platform **23** and perhaps disturb the arrangement of containers **16** positioned thereon.

As soon as indicator **98** has started the timer cycle by closing switch **102** and energizing the timer motor **100**, the timer **56** commences its rotation at a constant speed so that cams **58**, **60** and **62** are positioned against duplex switch **46** at selective times and for selective durations so as to pass or restrict fluid and cleanser flow into manifold **20**. Once indicator **98** has initiated the operation of valves **80** and **92**, these valves remain in an actuated state until the completion of a full cycle when the timer will then disengage these devices so that water pressure will be removed from the bottom of chamber **68**. The fluid within the bottom portion of chamber **68** will then flow back through valve **92** and out into the drain because of the force exerted on piston **66** from the weight of the platform and its carried receptacles.

Thus the commencement of the wash-rinse cycle by rotating indicator **98** also displaces linkage **104** and closes switch **102** controlling the timer motor.

It will be readily apparent that many other variations in raising and lowering mechanisms can be substituted for that herein shown and described without departing from the overall concept of the washer assembly, and one such embodiment is set forth in FIG. 7 wherein there is shown a pivotal linkage **106** secured to the paltform connecting member **108** so that the platform **112** can be raised and lowered as linkage **106** is displaced. A connecting ring **110** allows this linkage member to be operably secured to any other convenient raising and lowering mechanism. Obviously this arrangement could be manually operated in that linkage **106** could be raised and pivotally locked as shown in FIG. 7 until the wash cycle is terminated at

which time the platform **112** could be manually lowered to the soak or draining position.

While there is herein illustrated and described containers of the miniature vial type for which the present apparatus can be most effectively applied, obviously the operational sequence and structural features of this machine can be utilized to wash, rinse and sterilize any number of breakers, vials, or tubular containers by simply varying the recesses or apertures within member **24** to accommodate the cross-sectional configuration of each container used.

An operational cycle of one hour duration is suggested by programming solenoid-engaging cam **58** to permit an initial ten minute period for introducing hot water and detergent by actuating the solenoid valve contained in chamber **52** so that these substances will pass from lines **42** and **44** through line **50** and into manifold **20**. It is suggested that this initial water and detergent cycle be followed by a ten minute cut-off period within which time the containers may soak with the hot water and included detergent so that particles adhering to the interior of the container might be loosened and freely carried away by the subsequent flow and flushing action of the fluid.

After the ten minute soak period, a second surface cam **60** will displace switch **46** and cause the actuation of the solenoid valve contained in chamber **44** so as to allow a second application of hot water to be injected within the manifold **20** for a period of approximately five minutes. A second soaking period follows for approximately ten minutes, and then a rinse cycle lasting for approximately ten minutes is commenced. After the rinse is completed, the containers are allowed to sit for the balance of the one hour operating cycle at which time they may be emptied by hand or other suitable means and placed in a drying rack or storage.

It is also within the intent of embodiment herein disclosed and illustrated to provide for a suction device that can be operably secured to the apparatus **10** to evacuate the rinse fluid contained in the vials or tubes so that these containers can then remain completely untouched by human hands.

The introduction of fluid into a plurality of containers within housing **12** and the continuous flow and flushing action resulting therefrom is best illustrated in FIG. 3 where the dispensers **18** are positioned inside container **16** so that the fluid is circulated against the bottom **106** of the container interior upward along the interior wall **108** and out through the containers' somewhat restricted openings **110**. Fluid then spills over into the chamber basin **112** where it is evacuated through a drain **114** carrying the dislodged particles from the interiors of the containers to a remote location.

Obviously, the unique arrangement of the various components and their cooperation each with the other would permit a container washing apparatus of any desirable size to be made and utilized according to the disclosure herein set forth.

Of course, many modifications and variations may be made in the configuration and arrangement of the container supporting platform, the various solenoid and valve arrangements and the platform displacing mechanism as well as other phases of the present inventive concept in light of the above teachings without departing from the real spirit and purpose of this invention. Such modifications of parts and alternatives as well as the use of equivalents to those herein illustrated and described are included and contemplated.

What is claimed is:

1. A container cleaning apparatus for cleansing containers, vials and the like, comprising: a fluid dispensing means adapted to be received within at least one container; means for supporting at least one container with its open end up proximate said dispensing means; means for displacing said dispensing means and said container supporting means relative to each other from a dispenser-inserted position to a dispenser-retracted position; means for introducing fluid under pressure into said dispensing means for projection in said container, a dispenser manifold communicating with said dispenser; a fluid supply; a cleanser reservoir, said fluid introducing means including conveying means for supplying fluid and cleanser from said fluid supply and said cleanser reservoir to said manifold and dispenser, said displacing means including a lever connected to said container supporting means, means associated with said lever for displacing said container supporting means relative to said dispensing means to the dispenser-inserted position, valve means operable with said conveying means for allowing and restricting fluid and cleanser flow to said manifold and dispenser so that the container is selectively subjected to fluid and cleanser; and solenoid control means for actuating said valve means.

2. A container cleaning apparatus as claimed in claim **1**, said solenoid control means including a first solenoid, a first solenoid operated valve operable with said first solenoid for selectively controlling fluid flow from said fluid supply to said manifold and dispenser, a second solenoid, a second solenoid operated valve operable with said second solenoid for selectively controlling cleanser flow from said cleanser reservoir to said manifold and dispenser, and a timer for selectively actuating said solenoids to provide cleanser and fluid flow from said reservoir and fluid supply to said manifold and dispenser.

3. A container cleaning apparatus as claimed in claim **1**, said lever associated means including a piston connected to said lever, a chamber cooperatively receiving said piston for selective movement therein and means for introducing a medium into selected portions of said chamber to urge said piston in a preselected direction and move said lever and container supporting means accordingly.

4. A container cleaning apparatus as claimed in claim **3**, said medium introducing means including fluid intake and exhaust ports within said chamber and fluid conveying means connecting said intake and exhaust ports with said fluid supply, said ports positioned to allow introduction and evacuation of fluid into and out of said chamber selectively as said piston is urged in a preselected direction, a piston operating valve operable with said solenoid control means for selectively controlling fluid flow between said fluid supply and said chamber.

5. A container cleaning apparatus as claimed in claim **1** comprising valve means operable with said conveying means for allowing and restricting fluid and cleanser flow to said manifold and dispenser so that the container is selectively subjected to fluid and cleanser; and solenoid control means for actuating said valve means, said solenoid control means including a first solenoid, a first solenoid operated valve operable with said first solenoid selectively controlling fluid flow from said fluid supply to said manifold and dispenser, a second solenoid, a second solenoid operated valve operable with said second solenoid for selectively controlling cleanser flow from said cleanser reservoir to said manifold and dispenser, and a timer for selectively actuating said solenoids to provide cleanser and fluid flow from said reservoir and fluid supply to said manifold and dispenser, said lever associated means including a piston connected to said lever, a chamber cooperatively receiving said piston for selective movement therein, and means for introducing a medium into selected portions of said chamber to urge said piston in a preselected direction and move said lever and container supporting means accordingly, said medium introducing means including fluid intake and exhaust ports within said chamber and fluid conveying means connecting said intake and exhaust ports with said fluid supply, said ports positioned to allow introduction and evacuation of fluid into and out of said chamber selectively as said piston is urged in a preselected direction, a piston operating valve operable with said solenoid control means for se-

lectively controlling fluid flow between said fluid supply and said chamber.

References Cited

UNITED STATES PATENTS

743,155	11/1903	Eick	134—167
843,056	2/1907	Young.	
1,644,384	10/1927	Kendall	134—141 XR
2,655,160	10/1953	Casady et al.	134—171 XR
2,671,457	3/1954	Cozzoli	134—58 XR
2,691,381	10/1954	Strunck et al.	134—152

2,814,575	11/1957	Lange	134—152 XR
3,294,101	12/1966	Suzuki et al.	134—58

FOREIGN PATENTS

1,355,416	2/1964	France.
489,440	1/1954	Italy.

ROBERT L. BLEUTGE, *Primary Examiner.*

U.S. Cl. X.R.

134—100, 141, 152, 171