# United States Patent [19]

**Froeschner**

[11] **3,715,173**

[45] **Feb. 6, 1973**


## [54] PUMP CONTROLLER


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[22] Filed: **March 9, 1971**

[21] Appl. No.: **122,438**

[52] **U.S. Cl.** ..... **417/37**
[51] **Int. Cl.** ..... **F04b 49/00**
[58] **Field of Search** ..... 200/85 R; 417/36, 44



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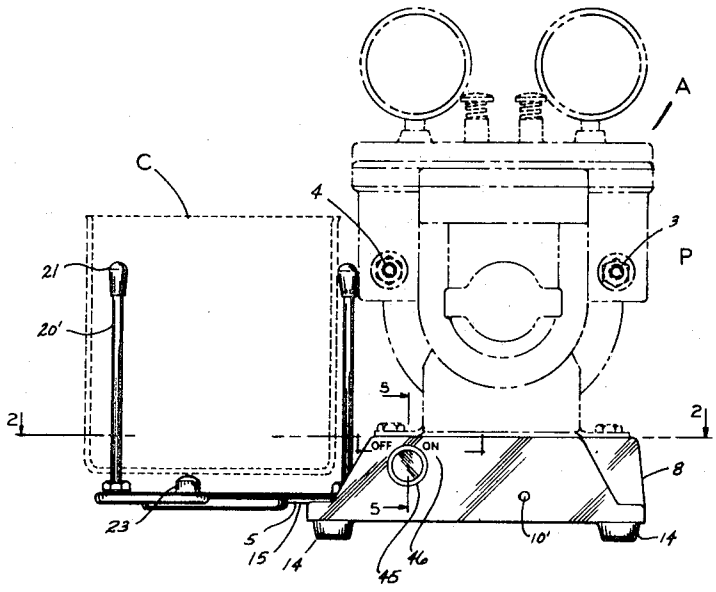
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[57] **ABSTRACT**

A controller for pumps used in the dispensing of liquids to a vessel for effecting discontinuance of pump operation when the vessel has received a predetermined volume of liquid comprising a pivoted arm for supporting the vessel to be filled, a pump switch having cooperating components, said arm carrying a component of said switch, means urging said arm upwardly for normally maintaining said switch in closed, pump-operating condition with said means being overcome by the combined weight of the vessel and the received predetermined volume of liquid whereby said switch will be automatically opened. Cam means are provided for preventing switch-closing swinging of said arm upon removal of the liquid-containing vessel.


**8 Claims, 6 Drawing Figures**



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SHEET 1 OF 2

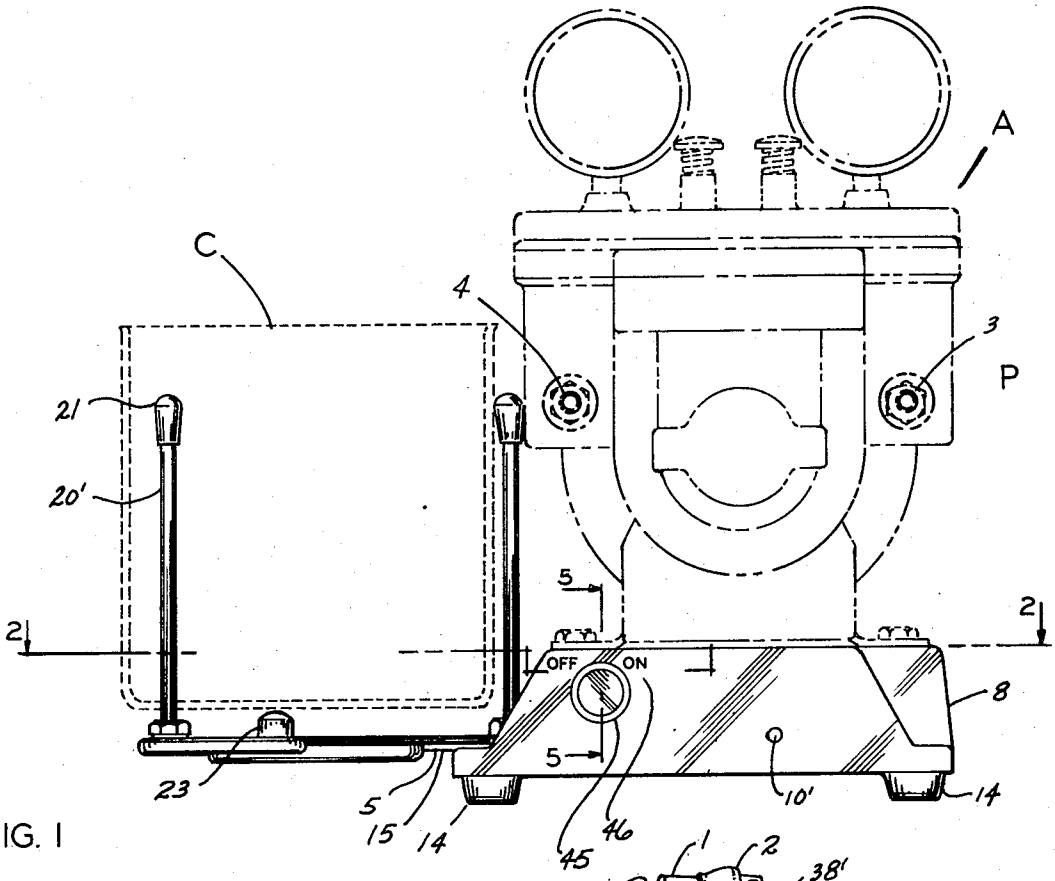



FIG. 1

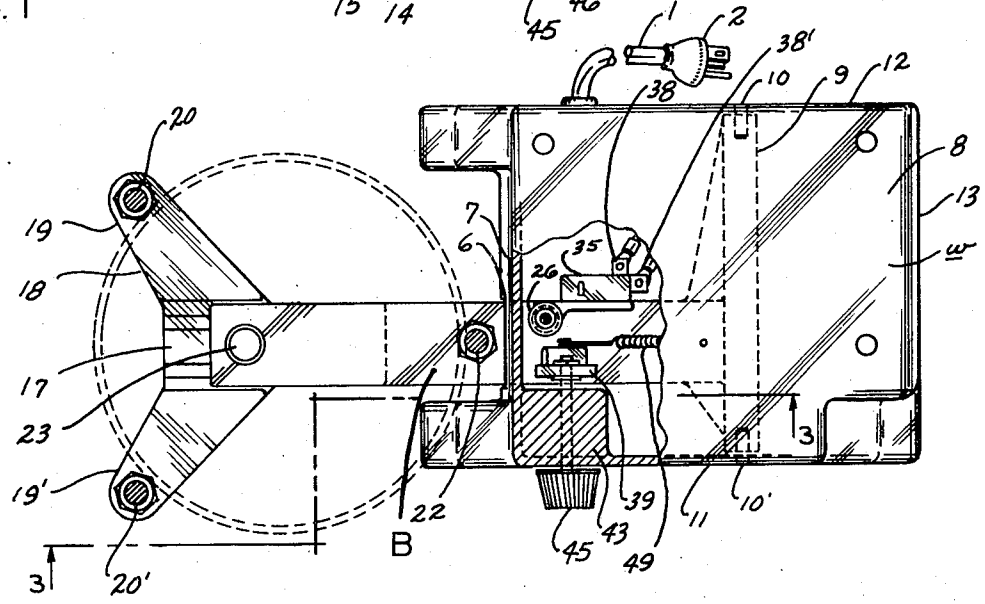



FIG. 2

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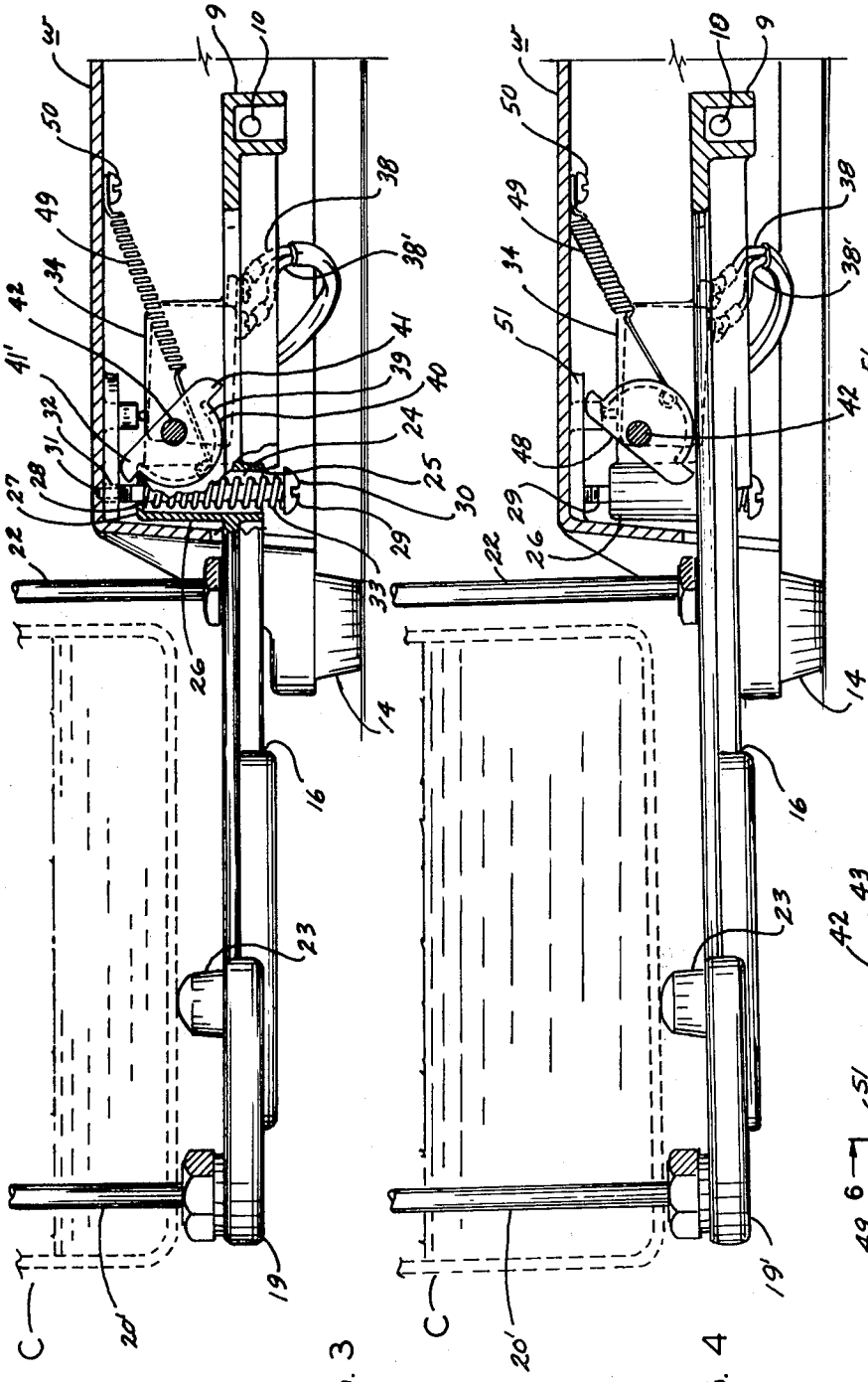


FIG. 3

FIG. 4

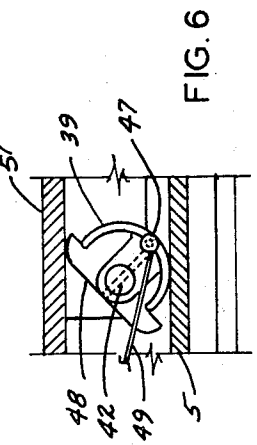


FIG. 6

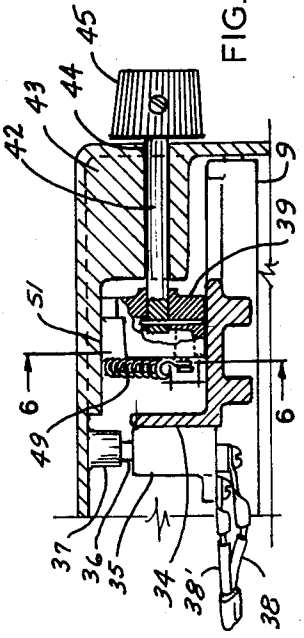


FIG. 5

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# PUMP CONTROLLER

## BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates in general to pumps and, more particularly, to a pump controller adapted for maintaining a pump in liquid discharging condition for a period sufficient to dispense a predetermined volume of liquid to a presented container.

Heretofore, various expedients have been attempted for controlling the volume of liquid within a receiving container. For example, floats have been employed for determining the height at which a liquid will rise within a receptacle by either operating a shut-off valve, or actuating an electrical switch in circuit with a solenoid valve or a pump for discontinuing the liquid supply. Additionally, weight sensitive platforms for a receptacle have been utilized to actuate a switch when the receptacle has been filled to a desired level. Such devices have proved deficient in practice since the receptacle or container could not be removed without an immediate or automatic re-establishment of fluid flow, thereby causing spillage and waste of the particular liquid.

Therefore, it is an object of the present invention to provide a controller for a liquid discharging pump which is adapted to automatically cause cessation of pumping action upon the receipt of a predetermined volume of liquid within the presented receptacle.

Another object of the present invention is to provide a pump controller of the type stated having associated means for preventing resumption of pumping action immediately upon withdrawal of the liquid retaining receptacle.

Another object of the present invention is to provide a pump controller of the type stated which is of marked sensitivity whereby accurate filling of the container to the desired volume is assured, thus eliminating the heretofore normally accepted variations in automatic pumping devices.

It is a still further object of the present invention to provide an apparatus which integrally comprises a pump, a pump operating switch, and a pump controller adapted to support a vessel during pumping action and designed to effect switch-opening action responsive to reception of the predetermined volume of liquid in the vessel.

It is a further object of the present invention to provide a pump controller of the type stated which is adapted for ready adjustment so as to permit variation in the volume of liquid dispensed to the receiving vessel before terminating pumping action.

It is another object of the present invention to provide a pump controller of the type stated which is simple in construction; economical in manufacture; reliable and durable in usage; fully automatic in operation; and which may be simply incorporated into composite pump-included units for presenting a compact, integrated device.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of an apparatus for container filling operation incorporating a pump controller constructed in accordance with and embodying the present invention.



FIG. 2 is a horizontal section taken on the line 2—2 of FIG. 1 with a portion of the support housing being broken away.

FIG. 3 is a vertical transverse sectional view on the line 3—3 of FIG. 2 illustrating the apparatus in switch-closed position and with the container being partially filled.

FIG. 4 is a vertical transverse sectional view taken substantially on the line 3—3 of FIG. 2 illustrating the apparatus in switch-closed position.

FIG. 5 is a vertical transverse sectional view taken on the line 5—5 of FIG. 1.

FIG. 6 is a vertical transverse sectional view taken on the line 6—6 of FIG. 5.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A generally designates a composite unit for dispensing liquid to a container which comprises a pump P (having a motor not shown) connected to a convenient source of electrical power, as by a conventional cord or cable 1, through a plug 2, there being three leads (not shown), one being connected to ground, a second being connected to one side of the pump motor (not shown) and the third for connection to a microswitch to be described hereinbelow. Said pump is provided with an intake port 3 for connection by a conduit (not shown) to liquid supply source (not shown) and a discharge port 4 communicating by a pipe, tube, or the like (not shown) with a container or vessel C to be filled. Vessel C rests upon the outer portion of a support arm 5 of a pump controller, indicated broadly B, the inner portion of which arm proceeds through an opening 6 within the adjacent side wall 7 of a standard-forming housing 8 for pump P; said arm 5, at its inner extremity, being integral with a rock shaft 9 pivotally mounted at its opposite ends upon pintles 10,10' engaged in front and rear walls 11,12, respectively, of housing 8. Said housing 8 is of general quadrilateral character having an outer side wall 13 opposed to inner side wall 7 and a top wall *w* upon the upper surface of which pump P is rigidly mounted, as by bolts, and incorporates in its corner portions foot members 14 for engaging a support surface. On its under surface, arm 5 on its outer portion is provided with a pair of depending rib-like projections 15 for slideable reception within companion guideways, as indicated at 16, formed in the upper surface of the web 17 of an extension member 18 having a pair of arms 19,19' projecting from opposite sides of said web 17 in general Y-shape formation. On each outer end of arms 19,19' there is mounted an upstanding retaining rod 20,20', respectively; each being provided with a flexible cap 21 at its upper end. Rods 20,20' cooperate with a like rod 22 upstanding from arm 5 immediately outwardly of housing side wall 7 to define therewith a retention zone for container C to prevent accidental displacement of the same from arm 5 during liquid reception. By virtue of the relative slideability of extension 18 with respect to arm 5, the same may be adjusted lengthwise of the latter for accommodating vessels of varying cross section. A capped screw 23 is provided for extension through aligned openings (not shown) in arm 5 and ex-

tension 18 to maintain the latter in preselected adjusted condition. It will be seen that the capped end of screw 23 will abut the under surface of container C when the latter is in liquid receiving disposition so that the weight of the same, together with the liquid, will be transmitted to arm 5 through screw 23 thereby concentrating the developed downward force upon said arm 5.

Inwardly of side wall 7, arm 5 is provided with an opening 24 which is continuous on the under and upper sides of said arm 5 with the bore 25 of a sleeve 26 which at its upper end is provided with an end wall 27 having a central aperture 28 of less cross section than bore 25. Received within sleeve 26 is a screw 29 having its head end 30 downwardly of arm 5 and its upper, threaded end 31 extending through aperture 28 for engagement within a tapped recess 32 formed in housing top wall *w;* there being a compression spring 33 encircling the shank of screw 29 within sleeve 26 with one end thereof bearing against the normally under face of head 30 and the upper end bearing against the inner face of end wall 27. Thus, spring 33, by reason of its engagement against end wall 27, urges arm 5 upwardly. It is, of course, apparent that the pressure of spring 33 may be controlled by the appropriate threading or unthreading of screw 29 within opening 32. Recognizedly, variations in the strength of spring 33 will conduce to an enhanced range of adjustability so as to render arm 5 capable of marked sensitivity for controlling action of pump P in a manner to be described hereinbelow.

Formed integral with sleeve 26 and upstanding from the normally rearward edge of arm 5 within housing 8 is a mounting flange 34, on the rearwardly presented face of which is secured a microswitch 35 having a customary spring-pressed actuating button 36 extending from its top wall for normal switch-closing abutment against a boss 37 depending from the under surface of housing top wall *w*. Microswitch 35 is connected by leads 38,38′ to the other side of said pump motor and the third lead of cable 1. With pump P connected to a source of electrical power through plug 2; with a container C to be filled supported on arm 5 and being retentively disposed within rods 20,22; and with arm 5 in upwardly swung position under normal bias of spring 33, microswitch 35 will be in closed condition (see FIG. 5) so that the circuit to the pump motor is closed and pump P will commence liquid discharge through the conduit (not shown) leading from port 4. As liquid is received within container C increasing force will be directed upon arm 5 against the pressure of spring 33 tending to effect a gradual downward lowering of arm 5. The pumping action will continue until the combined weight of container C and the received volume of liquid overcomes spring 33 so as to cause arm 5 to be swung downwardly with a concurrent stressing of spring 33. Microswitch 35 will be opened through the parting of button 36 and boss 37. Thereupon the circuit to the pump motor will be opened and pumping action immediately discontinued. As indicated above, through the adjustment of screw 29 and/or utilization of a spring 33 of preselected strength, the juncture at which arm 5 is forced downwardly a sufficient distance to open microswitch 36 may be controlled. Consequently, by means of the pump controller B described, liquid pumping is sensitively and accurately controlled so that when the receiving container has accepted a predetermined liquid volume, pumping action will automatically discontinue without the intervention of human effort and with assurance that the exact volume desired has been dispensed.

Provided for maintaining arm 5 in its downward or switch-opened position so that container C with its received liquid volume may be removed from arm 5 without automatic upward returning swinging of arm 5 into switch-closed position is a detent plate cam 39 having a substantially semi-circular peripheral operating surface 40 for engaging the confronting upwardly presented surface of arm 5 inwardly of wall 6 (see FIGS. 3 to 6). Said cam 39 is provided at its normally upper portion with diametrally opposed ears 41,41′ which extend radially outwardly of the adjacent portions of surface 40 for stopwise abutment upon arm 5 for purposes to be described. Cam 39 is carried upon the inner end of an eccentric shaft 42; said shaft being journalled within a relatively elongated bearing block 43 formed integral with housing 8. At its outer end shaft 42 extends through an opening 44 in front wall 11 and on its outer extremity mounts a knurled knob 45. As best seen in FIG. 1 said knob 45 is presented with reference to "on" and "off" indicia on the outer face of front wall 11, as indicated at 46 in FIG. 1. Shaft 42 is disposed slightly to the right of center of cam 39 as viewed in FIGS. 3 and 4 so that by such eccentricity cam 39 will be gravitationally urged into the position shown in FIG. 4, that is, wherein arm 5 is in downward switch-open position. Fixed to the normally rearward face of cam 39 proximate peripheral surface 40 is a pin 47; the same being located slightly to the left (as viewed in FIG. 3) of a line passing through the axis of shaft 42 and being normal with the upper flat surface 48 of cam 39. Engaged to pin 47 is one end of an extension spring 49 which progresses upwardly and outwardly for securement at its opposite end upon a screw 50 fixed to housing top wall *w*. Thus spring 49 coacts with the gravitational bias of cam 39 for urging same into the rocked condition shown in FIG. 4 wherein ear 41′ will be located proximate arm 5. Immediately overlying cam 39 and formed with top wall *w* is a flat depending boss 51 presented for abutment by ears 41,41′ upon rocking of cam 39 so as to inhibit the arc of rock thereof.

Assuming that an empty container C is placed upon apparatus A for filling, and that knob 45 has been turned to "on" position, cam 39 will be presented with respect to arm 5 as shown in FIG. 3 wherein ear 41 will abut against the upper surface of arm 5 and ear 41′ will be in detaining engagement of the under face of boss 51. Spring 49 will thus be under tension. The upward urging of arm 5 through bias of spring 33 will create a sufficiently forceful engagement against cam peripheral surface 40 so that the bias of extension spring 49 and the gravitational bias of cam 39 will be overcome. Cam 39 will remain in such "on" position during the filling of container C and until arm 5 is forced downwardly through the combined weight of container C and the received liquid volume to a point at which the restraining force has been removed from cam 39 so that the latter through release of tension on spring 49 assisted by gravitational bias is free to cause shaft 42 to rock in a counterclockwise direction as

shown in FIG. 4 with such swinging being determined by abutment of ear 41 against boss 51. With this position of cam 39 arm 5 is prevented from upward swinging through the inherent prejudice of spring 33 which is effectively countered. Thus, container C may be removed from arm 5 without danger of the same swinging upwardly to cause a closure of switch 35 with an immediate resumption of operation of pump P. Said pump P will remain in non-operating condition until shaft 42 is rocked by operation of knob 45 for turning the latter from "off" position restoringly to "on" position. By such rocking of shaft 42 arm 5 is then permitted through operation of spring 33 to swing upwardly into switch-closed condition for the next succeeding filling operation.

Thus, by the unique operation of cam 39, pump P may be maintained in a quiescent state during the interval a filled container C is removed from, and a succeeding empty container C is placed upon, arm 5.

Having described my invention, what I claim and desire to obtain by Letters Patent is:

1. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller comprising an arm for supporting said container in one end portion of said arm, means pivotally supporting said arm in its other end portion, resilient means urging said arm into upwardly swung position, a pump control switch having first and second cooperating components, said first switch component being carried on said arm, said second component being fixedly disposed above said arm and comprising a boss, said switch components being in closed relationship when said arm is in upward position, the bias of said resilient means being less than the combined gravitational force of the container and a predetermined volume of liquid whereby when such volume has been reached said arm will be swung downwardly causing switch opening with termination of liquid pumping action.

2. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller comprising an arm for supporting said container in one end portion of said arm, means pivotally supporting said arm in its other end portion, resilient means urging said arm into upwardly swung position, a pump control switch having cooperating components, one of said switch components being carried on said arm, said switch being closed when said arm is in upward position, the bias of said resilient means being less than the combined gravitational force of the container and a predetermined volume of liquid whereby when such volume has been reached said arm will be swung downwardly causing switch opening with termination of liquid pumping action, latch means engageable with said arm when the latter is in downwardly swung position to prevent premature upward swing upon removal of the container with the predetermined volume of liquid, said latch means comprising a plate cam having a peripheral operating surface, a shaft, means journalling said shaft, and said plate cam being eccentrically mounted on said shaft for rocking of said plate cam therewith.

3. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller as defined in claim 2 and further characterized by a biasing member engaged to said plate cam for urging same into rocked condition for preventing upward swinging of said arm when the latter is downwardly swung, said cam having detent ears for restricting the rocking of said cam in either direction.

4. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller as defined in claim 2 and further characterized by a control member mounted on said shaft for effecting manual rotation thereof to release same from arm-locking relationship.

5. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller comprising an arm for supporting said container in one end portion of said arm, means pivotally supporting said arm in its other end portion, resilient means urging same arm into upwardly swung position, a pump control switch having cooperating components, one of said switch components being carried on said arm, said switch being closed when said arm is in upwardly position, the bias of said resilient means being less than the combined gravitational force of the container and a predetermined volume of liquid whereby when such volume has been reached said arm will be swung downwardly causing switch opening with termination of liquid pumping action, detent surface means provided upwardly of said arm, a latch member disposed between said detent surface means and said arm and engageable therewith, means rockably mounting said latch member for rotation about an axis parallel to said detent surface means for movement between switch-closed position and switch-open condition, said arm resilient means overcoming said urging means prior to reception of a predetermined volume of liquid in said container to maintain said latch member in switch-closed condition for liquid pumping action.

6. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller as defined in claim 5 and further characterized by the rockable mounting means comprising a shaft, said latch member being eccentrically mounted on said shaft for rotationally urging said shaft through gravity into switch-open condition, said latch member urging means also comprising a spring.

7. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller as defined in claim 6 and further characterized by said latch member having opposed first and second detent elements for respective engagement with said detent surface means and said arm when said switch is in closed condition and in the opposite relationship therewith when said switch is in open condition.

8. For use with a liquid pump having a discharge port connected to a liquid receiving receptacle; a pump controller as defined in claim 6 and further characterized by the bias of said arm resilient means being so related to the latch member spring and the gravitational urging thereof through its eccentricity that when the said container has received a predetermined volume of liquid the arm resilient means will have been overcome and said latch member freed for rotative movement through its urging means into switch-open condition and to maintain said arm in downwardly swung condition upon removal of said liquid-bearing container.

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