Sept. 13, 1949. R. A. NICHOLSON 2,481,612

LIQUID LEVEL SWITCH

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Fig. 1.

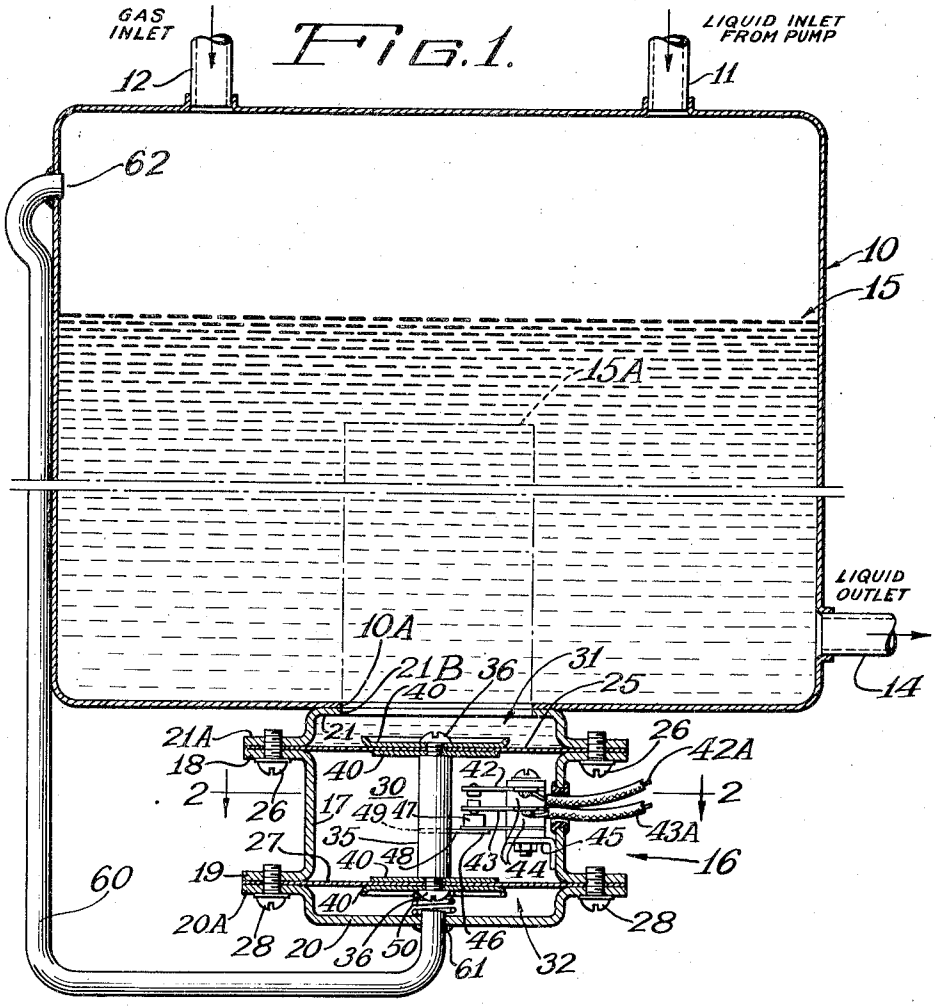
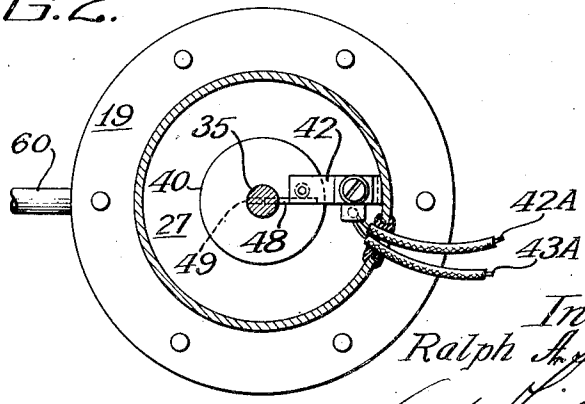


Fig. 2.



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LIQUID LEVEL SWITCH

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2 Claims. (Cl. 200—81.5)

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This invention pertains broadly to liquid level control devices, and has as its principal object the provision of a highly efficient and simplified control of this character especially suited for use with beverage dispensing equipment utilizing carbonated water, it being understood, however, that the control is not limited to such application or use.

Equipment designed for dispensing carbonated water or beverages commonly includes a receiver for the water or liquid and a connection to this receiver from a source of carbonating gas, such arrangements frequently being designated in the art as carbonators or mixers, this practice arising from the commercial expediency of distributing the carbon dioxide gas in replaceable drums or cylinders which are replaced when exhausted by fully charged cylinders.

Heretofore, elaborate level control arrangements of pressure-sensitive valves, switches, flotation devices and the like have been employed for controlling the operation of a pump to force water into the carbonator against the pressure of the carbonating gas, and such prior arrangements, in addition to being relatively complex and costly, as well as bulky or space-consuming, require careful adjustment, supervision, and frequent servicing.

The present invention provides a control which is very small, compact, simple, and inexpensive; it is also highly reliable in operation, sensitive to level response, and where servicing is required, easily accessible as to the few working parts of which it is comprised.

In addition to the broadly stated object hereinabove set forth, it is a more particular object of the invention to provide a liquid level control which utilizes a portion of the head of liquid in the receiver in opposition to gas pressure therein for actuating a pump-control switch when the liquid level falls below a desired value;

Another object is the provision of a simple switch-control including diaphragms respectively exposed to the gas pressure and the liquid head pressure, in opposition, and jointly displaced to actuate a switch when the head-pressure falls below a desired value;

Another object is the provision of a pressure-sensitive switch of general application, and especially suited to installation on a carbonator or the like, and including a chamber having a pair of jointly movable diaphragms therein and sealed so that the chamber is divided into a central compartment in which the switch means is situated for actuation responsive to displacement of the diaphragms in one direction, together with separately sealed compartments into one of which leads a communication with the gas pressure in the carbonator, and into the other of which the head of water in the carbonator communicates with one of the diaphragms, such that when the head of water falls below the desired point, the diaphragms are displaced by gas pressure and/or spring means to actuate the switch and start the liquid pump motor to retore the level.

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Other objects and aspects of novelty in the invention relate to details of construction and operation of the preferred embodiment described hereinafter in view of the annexed drawing in which:

Fig. 1 is a vertical section through a carbonating receiver and the novel control means;

Fig. 2 is a horizontal section through the control means along lines 2—2 of Fig. 1.

Referring to Fig. 1, a sealed carbonating receiver 10 is provided with connection 11 leading to the liquid or water supply (not shown), from which the liquid is pumped by an electrically driven or controlled pump, not shown, of which there are numerous types known in the art.

A conduit or connection 12 leads from the receiver, at the top thereof, to the usual supply cylinder of carbonating gas under considerable pressure, 30 pounds or more, the purpose of the electrically driven or controlled pump means being to force the water from the supply source into the receiver against this gas pressure, the gas and water or other liquid or beverage becoming intermingled in the receiver, and the gas tending to force the water from the receiver into the outlet or dispensing line connection 14 near the bottom of the receiver.

In the illustrative embodiment, it is assumed that the liquid level is to be maintained at the point 15 in the receiver, and the novel means for accomplishing this includes the control generally indicated at 16.

In a preferred form of construction, the control 16 includes a central metal ring 17 having upper and lower flanges 18 and 19, and recessed or concaved end caps or pieces 20 and 21 each having flange portions 20A and 21A adapted to seat against the flange portions of the central ring, thus forming a main chamber which is attached to the bottom of the carbonator or receiver 10 by welding or the like of upper end piece 21 to the bottom of the receiver, there being an opening 21B of predetermined size in this upper end piece, which opening registers with a like opening 10A in the bottom of the receiver.

Interiorly of the main control chamber is an

upper membrane or diaphragm 25 clamped in sealed condition between flanges 18 and 21A by screw means 26 in the latter, while a similar diaphragm 27 is sealingly clamped in the lower part of the main chamber between flanges 19 and 20A, as by screws 28.

The membranes or diaphragms 25 and 27 thus divide the main chamber into a central compartment or chamber 30, which is sealed off from an upper compartment or chamber 31 by upper diaphragm 25, and a lower compartment or chamber 32, which is sealed off by lower diaphragm 27.

The two diaphragms are interconnected by a stud 35 in axial alignment with the centers of these diaphragms and attached to the latter by screws 36 through sealing washers 40, so that the diaphragms can move jointly up and down.

Control switch means for the liquid pump is situated in the central chamber, and includes a pair of switch blades 42 and 43 secured and biased in normally open-circuit condition between the usual insulating wafers 44 on a mounting bracket 45 welded to the interior of this central chamber, there being also an operating blade 46 having an insulating stud 47 adapted to bear up against the lower switch blade 43 to push the latter into circuit-closing engagement with the companion switch blade 42, there being an arm or extension 48 on the operating arm extending into driving engagement with the diaphragm-connecting stud 35, as by engagement in a slot 49 therein. Thus, when stud 35 moves upwardly, as by displacement upwardly of the diaphragms, switch blades 42—43 will be closed together by upward movement of insulated stud 47.

Means for causing operation of the switch 42—43 responsive to lowering of the liquid level in the receiver, includes a small spring 50 expanding upwardly against the lower diaphragm assembly in the lower chamber 32 and of sufficient strength to displace this lower diaphragm upwardly to close switch 42—43 provided the head of water above openings 10A—21B bearing on the upper diaphragm 25 is less than a predetermined amount.

Normally, when the liquid level is at the point 15, this diaphragm-operating head is adequate to resist the upward effort of spring 50, but when the water level falls to the point 15A, the head of water (indicated in dash-dot lines in the receiver) is insufficient to overbalance spring 50, and the latter pushes the lower diaphragm, and hence the upper one as well, upwardly causing switch operating arm 48 to be carried upwardly with a consequent closing of switch 42—43 by stud 47, thus closing a pump motor operating circuit via conductors 42A and 43A.

In order to assure positive operation of the control 16 at all times and under all practical gas operating pressures in the dispensing system, the gas pressure in receiver 10 is balanced-out by means of a balancing connection or line 60 communicating from the lower chamber 32, as at 61, into the upper portion of the receiver, and above the normal water level 15 therein, as at 62.

Since the gas pressure in receiver 10 is exerted downwardly against the upper diaphragm 25, and simultaneously upwardly against the lower diaphragm 27, in opposition to the effort against the upper diaphragm, the net effect of this gas pressure on the diaphragms is substantially zero, and the diaphragm system is therefore sensitive only to variations in the head of liquid in receiver 10, and a highly satisfactory sensitivity to variations in liquid level becomes possible by selection of an appropriate spring tension for spring 50 depending on the level which is to be maintained.

The central chamber 30 is sealed off and no sealing precautions are necessary for switch leads 42A—43A; and there is adequate room in this chamber for installation of various types of switch other than that shown, it being possible to employ a small snap-action switch, if desired, in place of the blade switch described.

As heretofore mentioned, switch leads 42A—43A are adapted to be connected in the control circuit (not shown) for an unshown pump motor to force replenishing supply of water into the carbonator or receiver 10. Such motor pump arrangements are known in the art and do not per se constitute part of the invention, the principal invention being in the provision of a switch means actuated by a liquid head subjected to gas pressure, and means for balancing out the effects of the gas pressure so that the liquid level or head is the controlling factor, the invention also extending to details of the control device per se.

The foregoing specific description is not intended to be limiting excepting as may be expressly provided by the appended claims fairly construed in the light of the prior art.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent of the United States is:

1. A device of the class described comprising upper and lower chambers, said upper chamber adapted to contain liquid and gas under pressure, said lower chamber being of unitary construction and having a pair of parallel, spaced-apart diaphragms one above the other therein and dividing said lower chamber into an upper compartment, a lower compartment, and a middle compartment, said compartments all sealed off from each other and said upper compartment communicating vertically into said upper chamber such that a head of liquid and gas therein exerts a force on the uppermost of said diaphragms, a pressure-equalizing gas connection between the upper region of said upper chamber and the said lower compartment, and a switch situated in said middle compartment, wherein it is sealed against moisture and gas from said other compartments, and means mainly in said middle compartment operatively interconnecting said diaphragms with each other and with said switch for operation of the latter responsive to displacements of said diaphragms, jointly, predetermined amounts, together with spring means yieldingly urging said diaphragms upward with force to be balanced by a determined volume of liquid in said upper chamber.

2. A liquid level control comprising upper, lower, and median chamber portions formed to fit together and define a unitary chamber, a diaphragm sealingly clamped between said upper and median chamber portions and another diaphragm clamped sealingly between said lower and median chamber portions, said diaphragms being in approximate parallelism and one in alignment above the other such that said unitary chamber is divided into upper, middle, and lower compartments sealed off from each other, stud means operatively interconnecting said diaphragms in said middle compartment, a switch in said middle compartment and operatviely associated with said diaphragms by means of a projection therefrom extending into a slot in said stud such that back and forth motions of the stud responsive to corresponding displace-

ments of said diaphragms will actuate said switch, spring means normally urging said diaphragms jointly in a direction toward said upper compartment, a pressure opening communicating into said upper compartment for communicating a head of liquid pressure to the upper-most diaphragm, and pressure-balancing means including an opening into said lower compartment for introduction therein of a pressure acting on said head of liquid pressure but in addition to the latter, such that the loading effect of said additional pressure on said diaphragms is substantially balanced out, said switch being sealed off from substances in either of the upper or lower compartments.

RALPH A. NICHOLSON.

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