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APPARATUS FOR IMPREGNATING A LIQUID WITH A GAS

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1 Claim. (Cl. 261—19)

The present invention relates to an apparatus for impregnating a liquid with a gas, comprising a container having feeding conduits for the liquid and for the gas, respectively, and a discharge conduit for the impregnated liquid, the feed of the gas being controlled by regulating means according to the depth of the liquid in the container, while the feed of liquid is automatically controlled by the pressure in the container, the apparatus being adapted to be actuated for discharge of impregnated liquid by operating a device controlling an air discharge conduit connected with the interior of the container.

Thus the apparatus operates continuously until it is stopped by said control device. This may for example be obtained by an operating handle of a retailing cock connected into the discharge conduit for impregnated liquid.

Other advantages and features of the present invention will become apparent from the description now to follow, of two preferred embodiments thereof, given by way of example and in which reference will be had to the accompanying drawings, in which:

Fig. 1 is a sectional view of the first embodiment in rest position;

Fig. 2 is a section along the line II—II in Fig. 1;

Fig. 3 shows, at enlarged scale, a vertical section through a block comprising control means, and

Fig. 4 illustrates the second embodiment in a view similar to Fig. 1 but with some parts removed.

In the first embodiment reference numeral 1 designates a circular base plate into which is screwed a vertical bolt 2. A plate 3 is screwed onto the upper end of bolt 2 and a jacket 4 is welded to the periphery of this plate 3. The plate 3 is provided on its upper portion with a threaded neck portion onto which is screwed a bell-shaped casing 5 forming, together with the plate 3, a closed container serving to receive the liquid to be impregnated with gas. A central spindle 6 of square-section is screwed into the upper surface of plate 3. Two diagonally opposite edges are formed as grooves 7. The thus formed two longitudinal grooves 7 are engaged by two pins 8 provided on a tube 9 slipped over the spindle 6, and provide a vertical guiding for a float 10. Reference numeral 11 designates a conduit, serving to de-aerate the container 3, 5 and extending through the entire length of the guiding spindle 6, through the plate 3 and along a portion of the length of the supporting bolt 2. In the zone of the lower end of conduit 11 a lateral casing 12 is screwed into the bolt 2, which casing 12 contains a valve body 14 slidable in said casing to control an opening 12 of the latter and spring-loaded by a compression spring 13. A wire 14a is fixed to said valve body 14. The air discharge conduit 11 is somewhat widened in the region of the plate 3 for reasons of manufacture.

The two guiding pins 8 provided at the lower end of the float tube 9 co-operate with the forked ends of a control lever 16 swingably arranged about a pin 17 on a block 18. This block 18 further comprises a lower threaded tap 18a, by means of which it is screwed into

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a corresponding bore of the plate 3, and an upper recess serving to receive the axle of the control lever 16. The latter serves to actuate a piston 19, slidable in a vertical bore of block 18, and which in turn acts upon a needle 20 also slidable in said block 18. This needle 20 rests with its thickened lower end on a valve ball 21 spring-loaded on the side opposite the needle by a pressure spring 22. Spring 22 is located in an insert 23 provided in the threaded tap 18a of block 18 and serving as a seat for the ball 21. The insert 23 is provided on its circumference with axial grooves 23a connecting, as shown in Fig. 3, a space 3a provided in a boring of the plate 3 with a space 18b in which is arranged the valve ball 21. The mentioned boring 3a of plate 3 further comprises a feed conduit 24 for gas, for example carbonic acid. The opening of this conduit 24 is provided with a rubber lip valve 25 of known type, acting as a check valve and having, as indicated by dotted lines, a slit which is opened or closed according to the applied pressure.

A horizontal, cylindrical boring of block 18 receives a hollow control piston 26 containing a pressure spring 27 acting upon an auxiliary piston 28 projecting beyond piston 26. A further pressure spring 29 tends to maintain the control piston 26 in its end position represented in Fig. 3, in which it closes an opening 30 provided in block 18. With this opening 30 is connected an annular conduit formed by a distributor tube having its circumference provided with a plurality of openings 32. The annular conduit 31 is supported by a nipple 31a inserted into a boring of plate 3 and connected with a feed conduit 33 for liquid to be impregnated. This liquid may be water and then conduit 33 may be connected with a water distribution system. A lip valve 34, similar to the aforementioned lip valve 25 of conduit 24, is provided at the end of conduit 33 within the space 3b provided by the mentioned boring in the plate 3. Thus the annular conduit 31 may be fed as well with liquid from conduit 33 as also with gas from conduit 24.

A pipe 35, serving to discharge carbonated water, is fixed to the plate 3 and the portion 36 of this pipe projecting beyond the plate receives an arched pipe 37. This pipe 37, which is held in the represented position by not represented securing means has its other, longer end freely projecting into a recess 40 in the plate 3 as is visible in Fig. 3. An opening 36a of the pipe portion 36 may be closed by the auxiliary piston 28 upon corresponding actuation of the control piston 26 carrying this auxiliary piston 28. The carbonated water discharge pipe 35 is connected to a not represented cock having an operating handle connected over the wire 14a with the air discharge valve 12—14. Actuation of this handle results in the valve body 14 being retracted by the wire 14a to such an extent, that the mentioned discharge conduit 11 is connected with the atmosphere through the opening 15 provided in the valve casing 12. This in turn results in the compressed air, contained in the upper portion of the bell-shaped casing 5, escaping through conduit 11. The pressure in the container 3, 5 decreases below the liquid pressure within conduit 33 so that, when the latter is not closed, liquid, i. e. water, enters into the container 3, 5 through conduit 33 and the annular conduit 31. Thereby the float 10, owing to the forces acting on it through the control lever 16 etc., is first held down and immersed by the liquid in the container 3, 5. At the moment these forces are mastered the float 10 suddenly jumps upwards and the valve ball 21 is pressed on the seat formed by the insert 23 owing to the action of the elements 9, 8, 16. This results in an angular conduit 38, provided in the block 18, to be liberated thereby effecting a connection between the two spaces 18b, 18c of the block the latter containing the control piston 26 and the auxiliary piston 28. The

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conduit 24 being open, carbonic acid may pass from the space 3a and through conduit 33 into the space 18c and displace the piston 26 against the action of spring 29. This results in the opening 30 in the block 13 being liberated so that carbonic acid may enter the annular conduit 31 and from the latter into the water contained in the container 3, 5 to produce carbonated water. As the opening of conduit 11 coincides with the opening of the retailing cock carbonated water will immediately leave the container 3, 5 through the opening 36a of the pipe 36 and through conduit 35. However, more water is supplied per time unit from conduit 33 to the container 3, 5. Owing to the mentioned displacement of the control piston 26 the auxiliary piston 28 of the latter will close the mentioned opening 36a of the pipe portion 36 so that carbonated water leaves the container 3, 5 through conduit 35 only through the upper opening of conduit 37, which is of smaller diameter than the opening 36a. Owing to the inlet end of the pipe 37 being arranged in the recess of the plate 3, a calm inflow of carbonated water into the pipe 37 is obtained, and the amount of carbonated water leaving per time unit the container 3, 5 is smaller than the amount of water supplied to the latter through conduit 33.

During the impregnation of the water in the container 3, 5 by the carbonic acid fed through the annular conduit 31 the pressure in the container 3, 5 increases in spite of the opened air discharge conduit 11. As the inner pressure in the container 3, 5 attains a predetermined degree, i. e. as it is superior to the pressure of the water within the conduit 33, the lip valve 34 in the space 3b closes automatically and interrupts the further supply of water to the container 3, 5.

Thereupon the float 10 moves downwardly according to the amount of carbonated water leaving through conduit 35, thereby swinging downwardly the control lever 16 this movement resulting in an upward movement of piston 19 in the block 18 and closing of the connection 38 by the valve ball 21. As now the supply of carbonic acid to the annular valve 31 ceases the control piston 26 is forced by spring 29 back into its starting position shown in Fig. 3 and thereby closes the opening 30 provided in the block 18 and leading to the annular conduit 31. This return movement of the control piston 26 results in the entrained auxiliary piston 28 liberating the opening 36a of the pipe portion 36 so that carbonated water may leave the container 3, 5 through the opening 36a and the pressure in the container 3, 5 decreases accordingly. As soon as this pressure is below the pressure of the water within the conduit 33 the lip valve 34 is opened and water enters the container 3, 5 again. Accordingly the float 10 is again lifted and the whole operation is repeated until the retailing cock is closed and releases through the wire 14a the valve body 14 which, under the action of its spring is moved into a position in which the air conduit 11 is closed. If upon closing of the retailing cock an appropriate pressure exists in the container 3, 5 water will be supplied through conduit 33 until the pressure difference is eliminated.

The wire 14a may for example be replaced by a control lever acting upon the valve body 14 and supported on the retailing cock, the arrangement being such that, owing to an appropriate spring action, lifting of the retailing cock produces a swinging movement of this control lever which results in a movement of the valve body out of its closing position.

The double piston 26, 28 is designed so that, upon its

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displacement under the action of the gas pressure, first the auxiliary piston 28 closes the opening 36a in the pipe portion 36 and subsequently the control piston 26 liberates the opening 30 in the block, while the return movement of this double piston 26, 28, after the interruption of the gas supply to the annular conduit 31, first closes the mentioned opening 30 and afterwards only liberates the opening 36a. By this arrangement entering of water from the annular conduit 31 through the opening 30 into block 13 is effectually prevented. On the other hand it is thereby attained that increasing pressure in the container 3, 5 forces carbonated water through the smaller opening 37a in the arched pipe 37, while upon decreasing pressure the carbonated water leaves the container through the larger opening 36a so that a continuous and uniform supply of carbonated water is guaranteed as long as the retailing cock is held open. A resistance formed by a packing is mounted into the conduit 35 for throttling the discharge of liquid when the device is started and the container 3, 5 has a low liquid level.

The embodiment of Fig. 4 differs from the aforedescribed embodiment in that the annular conduit 31 receives gas only. A further annular conduit 41 is provided in the container 3, 5 above the first-mentioned annular conduit for the gas and serves to supply the container with liquid to be impregnated. For this purpose the annular conduit 41 is provided with openings 42 and is connected through three pipes 43, 44 and 45 with a connection piece 46, secured to the plate 3 and connected with the valve space 3b (Fig. 1) provided in the latter and thus with the conduit 33 supplying the liquid to be impregnated.

Construction and operation of the remainder parts of the embodiment of Fig. 4 are similar to the corresponding parts of the first embodiment.

Both described embodiments are of easy design, simple construction and reliable in operation.

What I claim is:

An apparatus for impregnating a liquid with a gas comprising a container, a feed conduit for the liquid, a feed conduit for the gas, a discharge conduit for the impregnated liquid, a vent conduit for the excess gas, said conduits being connected with the interior of the container, a float provided in said container and responsive to the liquid level therein, a gas inlet valve connected with said float and adapted to be opened upon the raising of said float, automatically operating pressure responsive means for regulating the feed of liquid to said container in accordance with the pressure therein, a control piston arranged in said feed conduit for the gas and adapted to open the passage for the gas into the container, and an auxiliary piston operatively connected with said control piston, said discharge conduit being provided with two inlet openings for the impregnated liquid, one of said openings having a larger sectional area than the other and being adapted to be closed by said auxiliary piston upon operation of the control piston.

References Cited in the file of this patent

UNITED STATES PATENTS

1,713,787	Stinson et al.	May 21, 1929
2,077,850	Painter	Apr. 20, 1937
2,314,984	Hudson	Mar. 10, 1943
2,401,915	Di Pietro	June 11, 1946
2,441,419	Hudson	May 11, 1948
2,534,483	Thomas	Dec. 19, 1950
2,647,734	Nicholas	Aug. 4, 1953