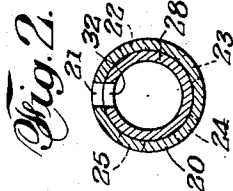
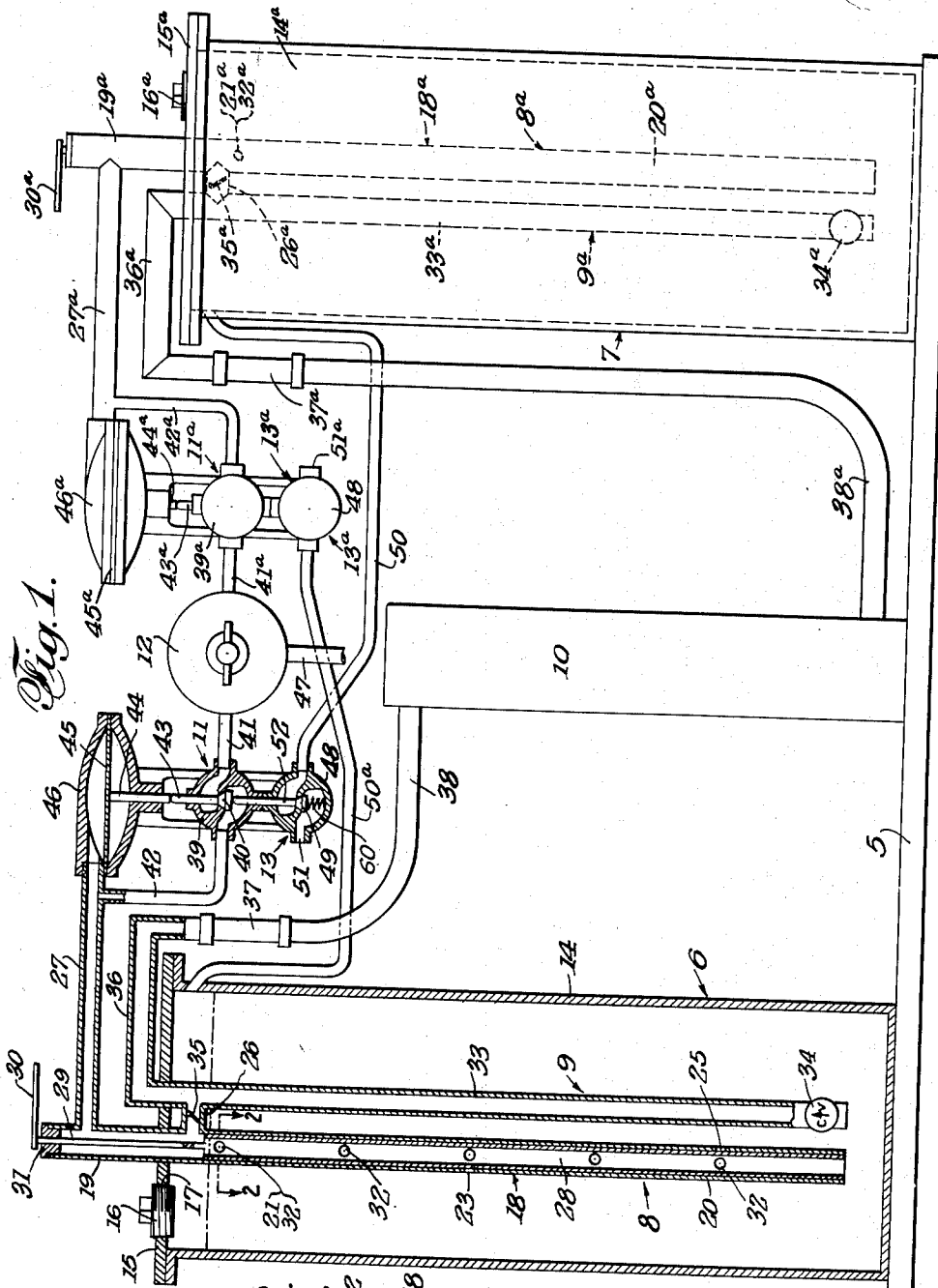


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REVERSE FLOW SURGE WASHER

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REVERSE FLOW SURGE WASHER

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This invention relates to apparatus for washing through articles for the purpose of cleaning them and more particularly deals with apparatus for surge or reverse flow through radiators, dish washers, parts washers or any device which needs fluid flow for cleaning the same. The apparatus contemplated may also be used for sludging or de-scaling combustion engines, transmissions or differentials.

The main object of the present invention is to provide a novel and improved device embodying an apparatus for surge washing alternately in both directions through articles such as above enumerated.

Another object of the invention is to provide such a device in which the reverse cycle changes automatically to give rapid and efficient operation.

Another object of the invention is to provide a two-way surge washer of the type indicated which not only automatically reverses its directional flow but also starts operating automatically and continues to function until stopped.

A further object of the invention is to provide a washing apparatus as indicated which may be pre-set to give various rates of cycle changes and thereby to obtain surges of longer or shorter duration through the article being washed.

A still further object of the invention is to provide apparatus of the character indicated which is arranged as a unitary device adapted to be portable for ready conveyance to stationary articles to be washed.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Fig. 1 is a semi-diagrammatic view half in elevation and half in section of a unitary device embodying the apparatus of the present invention.

Fig. 2 is an enlarged cross-sectional view as taken on the line 2—2 of Fig. 1.

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The apparatus which is illustrated comprises, generally, a base 5 which is adapted to be supported on caster wheels in a conventional manner; a pair of similar tanks 6 and 7 mounted on the base 5; pre-settable liquid level control means 8 in each tank; a flow pipe 9 in each tank each having an outer connection to an article 10 to be flushed by the present apparatus; a diaphragm controlled valve 11 connected between each of said means 8 and a pneumatic pressure source such as a pressure regulating and reducing valve 12; and a venting valve 13 operatively associated with each valve 11 for effecting alternate venting or release of pressure in the tanks 6 and 7.

Inasmuch as the tanks 6 and 7 and the apparatus connected to each are identical, only one need be described. The reference numbers to the parts associated with tank 7 are identified by the letter "a."

The tank 6 comprises a cylinder 14 of suitable capacity and provided with an air-tight cover 15. The latter, preferably, is provided with a plug 16 sealing an inlet 17 through which the tank 6 may be filled with a suitable cleaning fluid. A suitable drain for the tank may be provided in a conventional manner.

The liquid level control means 8 in tank 6 is shown as comprising a vertical pipe 18 carried by the cover 15 and extending longitudinally as at 20 into the tank to a point adjacent the bottom thereof. An upper extension 19 of said pipe is also provided. The pipe 20 is provided with a series of spaced openings 21, 22, 23, 24 and 25, each having a different angular disposition. A connection 26 is provided in the pipe 20 adjacent the cover 15 and a connection 27 to the pipe 19 is also provided.

A sleeve or pipe 28 is fitted in the pipe 20 and a rotatable connection 29 having a manual handle 30 extends through a sealed end 31 of the pipe 19 and is connected to pipe 28. The latter is open at the bottom and provided with a series of vertically aligned spaced holes 32, one in horizontal alignment with each hole 21, 22, 23, 24 and 25. Because of the different angular dispositions of the latter holes, only one hole 32 can be placed in register with one of the holes 21, 22, 23, 24 and 25 at a time. Suitable manipulation of handle 30 can effect this adjustment to communicate the interior of pipe 28 with the interior of tank 6 at different levels of said tank.

The flow pipe 9 has a portion 33 in the tank generally coextensive with the pipe 20, said portion 33 near its bottom being provided with a spring loaded check valve 34 which checks flow downward through the bottom of the pipe but

opens for upward flow by a pressure on the liquid in the tank. The connection 26 connects to the pipe portion 33 beneath and adjacent to the cover 15 and a swing check 35 in said connection permits flow only from pipe 33 to pipe 18.

The pipe 9 has an outer extension 36 in which is embodied a sight glass 37 and the outer end of which is provided with a suitable connection 38 to the article 10. The connection 38 is made to one flow passage of said article and the connection 38a to the other flow passage.

The controlled valve 11 comprises a body 39 in which a poppet 40 controls flow from a line 41 to a line 42 connected to the pipe 27. A stem 43 on said poppet engages a stem 44 on a diaphragm 45 in a housing 46. The pipe 27 communicates with said housing so that air pressure on the diaphragm will flex the same to cause stems 44 and 43 to unseat the poppet 40 and allow flow through valve 39.

The air pressure reducing and regulating valve 12 is generally conventional having a high pressure inlet 47 from a source of pressure, a low pressure outlet through line 41 to valve 39 and a similar low pressure outlet through line 41a to valve 39a.

The venting valve 13 comprises a body 48 which has a poppet 49 controlling flow from a pipe 50, connected to the tank 7 above the topmost hole in pipe 20a, to an outlet port 51 in the valve body. A stem 52 on poppet 49 engages poppet 49 so that said poppets move in unison for simultaneous opening and closing of the valves 11 and 13. A spring 60 normally holds valves 49 and 49 closed.

In operation, an article 10 to be flush cleaned is connected in series with the pipes 38 and 38a substantially as indicated. The plug 16 is removed and one tank, say the tank 6, is filled with the flushing liquid to the approximate level shown. The plug is replaced. The handles 30 and 30a are then turned to register one of the openings 32 in pipes 28 and 28a with one of the openings 21, 22, 23, 24 or 25 in pipes 20 and 20a. In this instance, it is assumed that, as shown in Fig. 2, openings 32 and 21 are registered to give the slowest cycle change. The valve 12 is operated to open lines 41 and 41a.

When the flushing liquid poured in tank 6 rose above the level of the registered openings 32 and 21, air was trapped in pipe 19 and 27 and held by swing check 35. Although the unit pressure of this trapped air is small, its total pressure on diaphragm 45 is sufficiently large to depress the latter and "crack" the valve 11 by unseating the poppet 40. Thus, when valve 12 is opened, air under pressure from line 41 will now pass through valve 11 to line 42. This air pressure will further depress diaphragm 45 to fully unseat poppet 40 and provide for a full flow of compressed air through pipes 27 and 19 into pipe 28. The unseating of poppet 40 will cause unseating of poppet 49 of valve 13 so that the tank 7 is vented through line 50 and port 51 of the latter valve. At this time, valves 11a and 13a are closed, the latter closing vent line 50a of tank 6.

The compressed air flowing into pipe 27 will pass through the registered openings 32 and 21 into the top of tank 6 and will drive the flushing liquid past spring check 34 into pipe 9 and through connections 36 and 38 into article 10. The liquid, under pressure, will flush through said article in one direction and will then flow through connections 38a and 36a into pipe 9a where its flow is trapped by check 34a. The flow

can then only pass by swing check 35a into pipe 8a and out into the vented tank 7 through registered openings 32a and 21a and the open bottom of pipe 28a.

The flushing liquid continues to rise in tank 7 until the openings 32a and 21a are covered, trapping air in pipes 19a and 27a and causing depression of diaphragm 45a and resulting in "cracking" of the poppet of valve 11a and simultaneous "cracking" of the poppet of valve 13a. The air pressure line 41a is thus opened to admit air pressure to the diaphragm 45a and resultant full opening of valves 11a and 13a. Simultaneously, pressure is now directed to pipe 8a and tank 6 is vented through line 50a and valve 13a, since pressure in pipe 27 is released and spring 60 acts to close valves 40 and 49. Thus, vent 50 is closed and the air pressure to line 42 is shut off.

The pressure in pipe 8a will now act to drive the liquid in tank 7 past check 34a and through pipe 9a and connection 38a into and through article 10 in the other direction.

It will be noted that the registered apertures 21, 32 are shown somewhat larger than the passage in pipe 42 and that vent line 50a is approximately the same size as pipe 42. Consequently, the mentioned release of pressure in pipe 27 is effective to allow spring 60 to close valves 40 and 49, since practically all the air supplied by pipes 42 passes out through port 51a.

It will be evident that the direction of the flushing flow changes automatically as described as the level of liquid rises in each tank alternately to cover the openings 21 and 32 or 21a and 32a, as the case may be. Accordingly, should a pair of openings at a lower level in each tank be aligned, as controlled by handles 30 and 30a, the flushing cycle can be hastened since the cycle changes become effective when the liquid level in a tank reaches the aligned openings therein.

The surges or pulses for similar pre-setting of the registered openings in both tanks will be of similar duration. However, should the duration of the surges in one direction be desired to be longer than the duration of the surges in the other direction, a suitably different setting in the tanks may be effected.

The cycle of operation can be continued as indicated by the condition of the flushing fluid as seen in the sight glasses 37. The operation is stopped by closing off valve 12.

While we have illustrated and described what we now regard as the preferred embodiment of our invention, the construction is, of course, subject to modifications without departing from the spirit and scope of our invention. We, therefore, do not wish to restrict ourselves to the particular form of construction illustrated and described, but desire to avail ourselves of all modifications that may fall within the scope of the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a flushing apparatus, a tank, an inlet to said tank for flushing liquid, a vent for the tank, a normally-closed control for the vent, a controlled pressure connection to the tank, pre-settable means for controlling the level of the liquid received by said tank from the inlet while said vent is open, said means comprising an outer pipe having a set of longitudinally spaced openings and a relatively rotatable inner pipe having a set of openings horizontally aligned with said spaced openings, one set of openings being vertically aligned and the openings of the other set

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being differently radially directed, both said liquid inlet and said pressure connection being connected to the interior of said pipes, whereby the pipes are adapted to be arranged to register an opening in one pipe with the associated opening in the other to, thereby, trap air displaced by the liquid entering the tank, said pressure connection comprising an extension of the pre-settable means and receptive of said trapped air, and pressure means responsive to the pressure of said trapped air for admitting pressure through said pressure connection to force the liquid from the tank while the vent is closed, and means for operating said vent control.

2. A flushing apparatus comprising two tanks, a liquid-passing connection between the tanks for flushing liquid and embodying therein an article to be flushed by liquid passing through the connection from one tank to the other, a vent for each tank, a normally-closed control for each vent, a controlled pressure connection to each tank, pre-settable means for controlling the level of the liquid received by one tank from the other through said liquid-passing connection while the vent of said one tank is open, each pre-settable means comprising an outer pipe having a set of longitudinally spaced openings and a relatively rotatable inner pipe having a set of openings horizontally aligned with the spaced openings, one set of openings being vertically aligned and the openings of the other set being differently radially directed, the ends of the liquid-passing connection and the pressure connections being connected to the interiors of said pipes of both tanks, whereby the pipes of each tank are adapted to be arranged to register an opening in one pipe with the associated opening in the other to, thereby, trap air displaced by liquid entering one tank from the other, each said pressure connection comprising an extension of each respective pre-settable means and receptive of said trapped air, and pressure means responsive to the pressure of said trapped air in one extension for admitting pressure through said pressure connection to force the liquid from the tank in which air is trapped through the mentioned air-passing connection into the other tank and while the vent of the former tank is closed and the vent of the tank receiving the liquid is open, and means for operating said vent controls.

3. Apparatus according to claim 2: a vent valve in the vent of each tank and operable by the vent control of the other tank, whereby the vent valve in the vent receiving the liquid is opened by the pressure of the trapped air in the other tank.

4. Apparatus according to claim 2: each pressure connection including a normally-closed flow valve, the flow valve of the pressure connection

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of one tank and the vent valve of the other tank being operatively interconnected and simultaneously opened by the trapped air in said one tank.

5. Apparatus according to claim 2: each pressure connection including a normally-closed flow valve, the flow valve of the pressure connection of one tank and the vent valve of the other tank being operatively interconnected and simultaneously opened by the trapped air in said one tank, and a pressure-responsive diaphragm movable by said trapped air and operatively engaged with said valves to open the same.

6. In apparatus of the character described, a tank having a controlled vent, means controlling the level of liquid passing into the tank while the vent is open and comprising an outer tube extending vertically into the tank and spaced from the bottom thereof, said outer tube having a set of longitudinally spaced apertures, a relatively rotatable tube within said outer tube and having a set of similarly spaced apertures horizontally aligned with the respective apertures of the outer tube, the apertures of one set being vertically aligned and the apertures of the other set being differently radially directed whereby the rotatable tube is adapted to be adjusted to register one selected aperture therein with the horizontally aligned aperture of the outer tube, the interior of said tubes being open to liquid entering the tank the outer tube having an upper extension in which air is trapped and compressed by liquid filling the tank to a level above the registered apertures, a source of compressed air, a connection between said source and upper extension and means responsive to the pressure of said trapped air to open said connection to flow of compressed air into said extension from said source to effect discharge of liquid from the tank.

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