HIGH PRESSURE HYDRAULIC APPARATUS
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ABSTRACT OF THE DISCLOSURE

This disclosure relates to a high pressure hydraulic apparatus comprising a motor driven high pressure fluid pump; a trigger controlled nozzle; a pressure responsive unloader; a spring loaded-bypass venturi unit, the outlet of the venturi being connected to the pump inlet, the suction port of the venturi being connected through a solenoid valve and a metering valve to a supply of liquid chemical concentrate, and said venturi having an inlet connected to a supply of fluid; a pressure operated electrical switch connected to the venturi suction port and responsive to the pressure thereat so as to switch from an open contact position to a closed contact position when the pressure at the suction port increases above a predetermined level; a latching relay; and means interconnecting said electric switch, said solenoid valve and said latching relay so that for successive closings of said electric switch, said solenoid valve is alternately opened and closed to control the flow of concentrate to said suction port for blending with fluid flowing through said venturi.

This invention has special application to the field of high velocity fluid washers, such as automobile washers, but the invention is not exclusively applicable to that field. For example, the principles of the invention may be applied to apparatus for applying weed destroying chemical to bodies of water, such as ponds and lakes.

Various objects and advantages of my invention will become apparent to those skilled in the art upon reading the following detailed description of a preferred embodiment thereof in which the single figure is a schematic diagram.

Referring to the drawing, numeral 10 generally depicts a hydraulic apparatus utilizing my invention. It is shown in the form of a portable hydraulic car washing apparatus which includes a trigger controlled nozzle 12. Nozzle 12 includes a pistol type nozzle 14 having a trigger 15 and a barrel member 16 terminating with an appropriate nozzle 17.

Apparatus 10 further includes a motor driven high pressure fluid pump 20 having an inlet 21 and an outlet 22. Pump 20 may be of any units well known to those skilled in the art. In some cases it is desirable to have a bleeder valve 24 connected to the top of the pump housing for bleeding the system.

A by-pass unloader 28 of well known construction is used to protect the pump 20 during periods when fluid is not being discharged from nozzle means 12. The unloader has an inlet connection 29 connected to the outlet 22 of pump 20. It further has an outlet 30 which is connected through a T fitting 31 and a flexible hose member 32 to connect with an inlet fitting in the nozzle means 12. A pulse dampener 34 may be connected to the T 31 to dampen fluid surges in the system. The by-pass unloader 28 has a by-pass outlet 36 to which is connected a hose or pipe 37 which in turn is connected via a T 38 to the inlet 21 of pump 20.

A spring loaded-by-pass venturi unit 40 is provided having an inlet 41, an outlet 42, and a suction port 43. Venturi unit 40 may be of any suitable type for the intended purpose, but I have found the type shown in FIGURE 5 of the Jacuzzi Patent 2,621,596 to be especially effective. Inlet 41 is adapted to be connected to a supply of fluid by a suitable connector 45. In some cases it is desirable to reduce the pressure from the source and this may be achieved by the use of a pressure regulator 46 connected between the inlet 41 and the connector 45. The outlet 42 of venturi 40 is connected via a T 38 to inlet 21 of pump 20.

The suction port 43 of venturi 40 is connected via a T 50, a metering valve 51, and a solenoid valve 52 to a suction tube 53 having at the end thereof a suitable suction screen 54. A pressure operated electric switch 60 is also connected to T 50. Switch 60 has electrical contacts therein which are adapted to be changed from an open contact position to a closed contact position when the pressure at the suction port increases above a predetermined level. Switch 60 should be capable of sensing a pressure approximately 50% less than the normal pressure to be expected at the inlet 41 of venturi 40 or, in other words, the setting of pressure regulator 46. For one application I have found a Type 4000 Series of switch (as sold by the Hobbs Division of the Stewart Warner Company) set at 4 pounds per square inch to be satisfactory.

The system further includes a latching relay 62 having a coil 63 adapted to be connected by a lead 64 to one side of a suitable source of electric power 65. The other side of coil 63 is connected by a lead 66 to one terminal 67 of pressure switch 60. The other terminal 68 of switch 60 is connected by a contact 70 to the other side of line supply 65. One type of latching relay which is quite satisfactory for this purpose is the Potter & Brumfield Type PC—11A. As will be understood by those skilled in the art, latching relay 62 functions so that its contacts are alternately open or closed upon successive energizations.

For example, if the contacts are open, then when the coil is energized the contacts will close and remain closed until the coil goes through a complete cycle of being de-energized and then energized once again. The latching relay 62 has contacts 72 and 74. Contact 72 is connected to lead 64 and contact 74 is connected by a lead 75 to a first terminal 76 of solenoid valve 52. The other terminal 77 of solenoid valve 52 is connected to terminal 68 of switch 60 and hence to the other side of line supply 65. An indicator pilot light 80 is connected by suitable leads to terminals 76 and 77 of solenoid valve 52 so that whenever solenoid valve 52 is receiving electrical energization this will be indicated by the pilot light 80, this being a valuable convenience for the operator of the apparatus to receive visual communication that the solenoid valve is open to permit the flow of concentrate through the suction tube 53, solenoid valve 52, metering valve 51, and T 50 to the suction port 43 of venturi 40 for blending of the concentrate with fluid flowing through the venturi.

OPERATION

In operation of the apparatus as a car washing device, the operator would insert the suction tube 53 into a container 54 of highly concentrated liquid cleaning material 56. The connector 45 would be connected to a suitable source of fluid, such as a regular water supply, and line supply 65 would be connected to T 30. The operator would also actuate the motor (not shown) which drives pump 20. This typically would be an electric motor. The latching relay 62 would (depending on its last operated position) either have its contacts 72 and 74 closed or open. Assume that they had been closed. Then, when the pressure at the suction port 43 increases, the pressure switch 50 will respond to close the contacts thereof to energize the coil 63 of the relay to open contacts 72 and 74. Thus solenoid valve 52 will be de-energized preventing any concentrate 56 from
being drawn into the main stream of fluid flowing through the venturi. Actually up to this point no fluid has been flowing because the trigger 15 on the gun handle 14 has not been articulated. Assume now the operator articulates the trigger 15. This then will permit the flow of fluid from inlet connection 45 through regulator 46, venturi 40, T 35 to pump 20 within which the pressure is very substantially increased and thence through unloader 28, T 31, flexible hose 32, and nozzle means 12 to exit as a high velocity jet or spray from the nozzle fitting 17. At this point, because solenoid valve 52 is closed, no concentrate is permitted to be introduced into the suction port 43 and hence only pure or untreated water is being discharged from the nozzle. This, in the context of a car washing operation, would be identified as the rinse or flushing operation. Assume now that the operator wanted to apply a mixture of water and concentrate to the automobile such as in connection with applying a soapy mixture. This function is easily achieved by articulating the trigger 15 through a complete cycle, i.e. the trigger is first moved to the closed position and then reopened so as to interrupt the flow of fluid through the system. When the fluid ceases to flow through venturi 40 the pressure at the suction port 43 rises to a relatively high value, thus closing the contacts in pressure switch 60. This in turn re-energizes the coil 63 of latching relay 62 to thereby complete the contact between the two terminals 72 and 74 to thereby complete the electric energization of solenoid valve 52, causing the same to be opened to permit concentrate to be drawn into the system. Metering valve 51 is set to adjust the level of concentrate being blended with the fluid passing through the venturi. The mixture of concentrate and fluid will continue being discharged through the nozzle means 12 as long as the trigger 15 is held on the last described position. When the operator desires to go to the rinse mode, then he articulates the trigger 15 once again through a full cycle. Again the increase in pressure applied to pressure switch 60 will re-energize the coil 63 of latching relay 62 to thereby break the circuit between contacts 72 and 74 to thereby de-energize solenoid valve 52.

As indicated, the apparatus may be used for other purposes. It will be understood that the system can be used for introducing weed killing chemicals to a pond or a lake by having connector 45 used to introduce lake water into the system.

The spring loaded by-pass venturi unit is set to permit some intake water to by-pass the suction section. In this manner, a very highly concentrated material 56 can be used because there is a diluting action that takes place at the discharge or outlet of the venturi. This is highly advantageous because then less volume or space is required for storage of chemicals. Whether the apparatus is portable or stationary this is very desirable.

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

1. A high pressure hydraulic type apparatus comprising:
   a motor driven high pressure fluid pump having an inlet and an outlet;
   a trigger controlled nozzle means having an inlet, and a nozzle tip, and "on-off" valve means operated manually from an "off" position to an "on" position and vice versa by each articulation of said trigger,
   fluid being permitted to flow from said nozzle inlet through said nozzle valve means to said nozzle tip when said nozzle valve means is operated to the "on" position;
   a pressure responsive unloader having an inlet connected to said pump outlet, a first outlet connected to said inlet of said nozzle means, and a by-pass outlet connected to said pump inlet;
   a venturi unit having an inlet, an outlet, and a suction port;
   means for connecting said venturi inlet to a supply of fluid;
   means connecting said venturi outlet to said pump inlet;
   a pressure operated electric switch connected to said suction port and adapted to switch from an open contact position to a closed contact position when there is a substantial change in pressure at said suction port;
   a concentrate suction tube connected through a solenoid valve and metering valve to said venturi suction port;
   a latching relay; and
   means interconnecting said electric switch, said solenoid valve and said latching relay so that for successive closings of said electric switch, said solenoid valve is alternately open and closed to control the flow of concentrate to said suction port for blending with fluid flowing through said venturi.

2. Apparatus as described in claim 1 further characterized by said venturi unit being of the spring loaded by-pass type so that a substantial diluting function is produced by said venturi.

3. Apparatus as described in claim 2 further characterized by said venturi unit being connected to said supply of fluid via a pressure regulator.

4. Apparatus as described in claim 3 further characterized by said spring loaded electric switch and said latching relay functioning to alternately open and close said solenoid valve for each cycle of low pressure-high pressure as measured at the suction port of said venturi unit.

5. Apparatus as described in claim 4 further characterized by electric responsive signal means being connected to said solenoid means to respond when said solenoid means is energized.

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