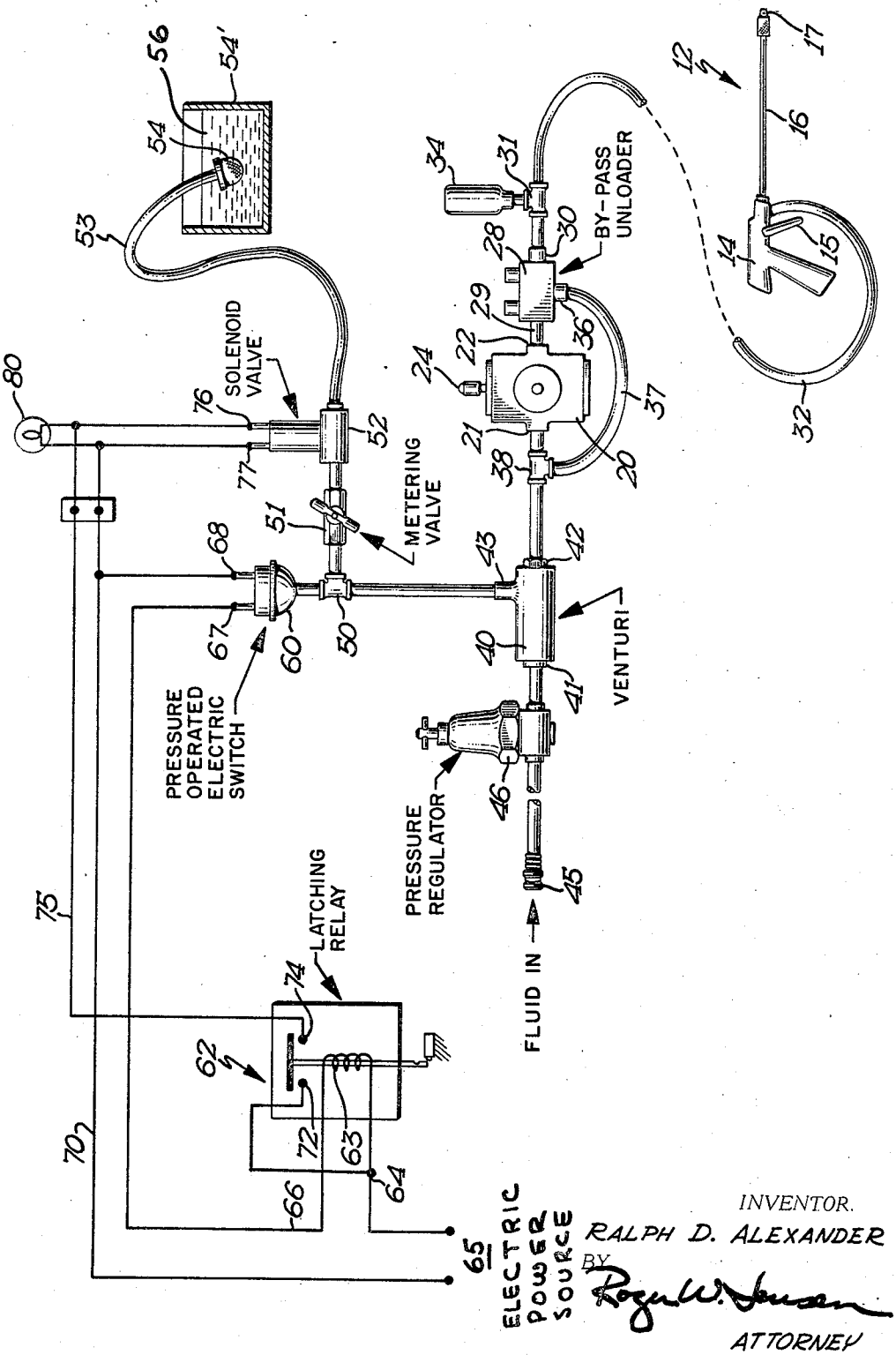
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HIGH PRESSURE HYDRAULIC APPARATUS

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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 controrlled nozzle means **12**. Nozzle means **12** includes a pistol type member **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 any of the 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 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 connector **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 termials **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 leads **64** and **70**. 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 **60** will respond to close the contatcs 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 **38** 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** thereof to 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 pressure operated 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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