

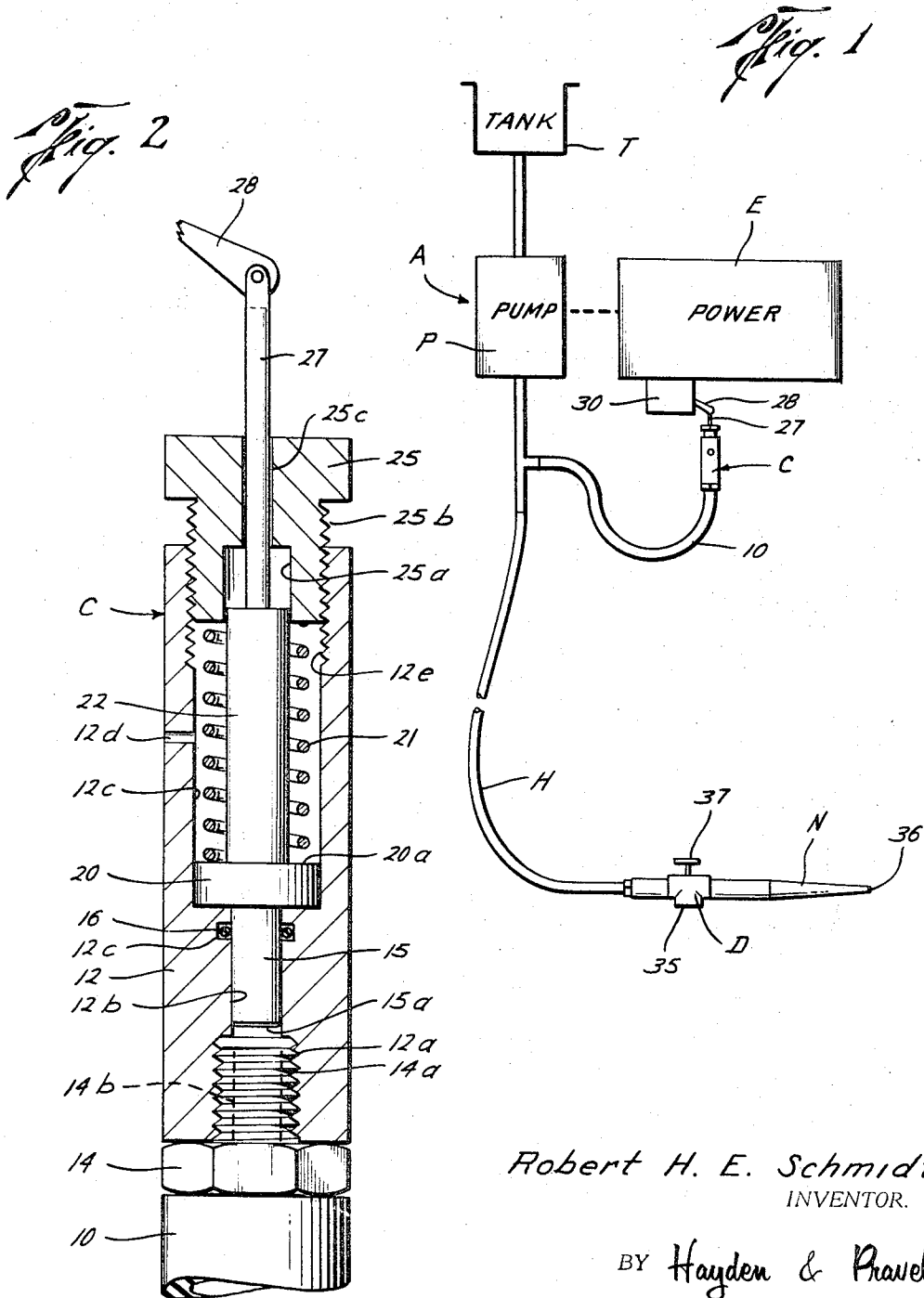
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R. H. E. SCHMIDT

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BACK-PRESSURE-CONTROLLED-MOTOR-POWERED PUMP

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Robert H. E. Schmidt
INVENTOR.

BY Hayden & Pravel

ATTORNEYS

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3,335,962 BACK-PRESSURE-CONTROLLED-MOTOR- POWERED PUMP

Robert H. E. Schmidt, 5910 Long Drive,
Houston, Tex. 77017

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This invention relates to new and useful improvements in cleaning apparatus, and particularly apparatus utilizing water or other liquid under high pressure for cleaning and the like.

In United States Patent No. 3,147,767, one type of hydraulic cleaning apparatus is illustrated, wherein the pressure of the water discharged at the nozzle is controlled through the use of an electrical control line which extends from the nozzle to an engine operating a pump for the water. Instead of using the electrical control line as in said Patent No. 3,147,767, a dump valve has been used in proximity to the nozzle, but with such arrangement, the engine for operating the water pump operates at full speed even when the dump valve is dumping the water instead of discharging it through the nozzle.

An object of the present invention is to provide a new and improved hydraulic cleaning apparatus wherein the speed of the engine for operating the water pump is automatically decreased to idle speed when there is no need for water at the nozzle, and conversely, the speed of the engine for operating the water pump is automatically increased to the desired operating speed when there is a need for water under high pressure at the nozzle, all of such speed changes being accomplished without the use of an electrical control line or any separate control line of any sort.

The preferred embodiment of this invention will be described hereinafter, together with other features thereof, and additional objects will become evident from such description.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

FIG. 1 is a schematic view illustrating the cleaning apparatus of this invention; and

FIG. 2 is a view, partly in elevation and partly in section, illustrating in detail the fluid-actuated throttle control mechanism of the present invention.

In the drawings, the letter A designates generally the cleaning apparatus of this invention, which broadly includes a source of fluid T, a pump P, an engine E for driving the pump P, a nozzle N mounted on a flexible hose H, a dump valve D and a fluid actuated control means C. The fluid actuated control means C is connected with the discharge fluid from the pump P by means of a tube or connecting line 10. As will be more evident hereinafter, the cleaning apparatus of this invention is so constructed that an operator using the nozzle N at a remote point from the pump P and the engine E may control the operation of the engine through the opening and closing of the dump valve D. By reason of such control at the dump valve D, it is unnecessary to provide auxiliary lines running for the length of the hose H, and the engine E may operate at idle or low speed when fluid is not needed or desired for discharge at the nozzle N.

Considering the invention more in detail, the fluid actuated control means C includes a housing or cylinder 12 which is connected to the connector tube 10 by means of any suitable fitting such as the threaded fitting 14. The threaded fitting 14 is secured to the hose 10 in any known manner and is provided with a threaded tube 14a which

is threaded into a threaded bore 12a of the housing 12. The threaded tube 14a has a passage 14b therethrough so that fluid may flow from the bore of the hose or tube 10 through the passage 14b and into the interior or inner bore 12b of the cylinder or housing 12.

A piston 15 is slidably mounted in the bore 12b and is surrounded by one or more fluid-tight seals 16 which may be an O-ring made of rubber or other similar material. Such O-ring 16 fits within an annular groove 12c so that fluid is prevented from passing around the external annular surface of the piston 15.

The piston 15 is preferably provided with an enlargement 20 having an annular shoulder 20a which is engaged by a coil spring 21 or similar resilient means disposed in an enlarged bore or counterbore 12c of the cylinder 12. A relief port 12d is provided in the cylinder 12 to prevent a fluid lock as the piston 15 moves in the bore 12b. It will be understood that the piston 15 moves only a limited distance so that the extreme end 15a of the piston 15 does not ever move past the seal 16 or above the seal 16 as viewed in FIG. 2.

The coil spring 21 is preferably centered by means of an extension 22 the upper end of which as viewed in FIG. 2 extends into a guide bore 25a of an adjusting nut 25. The adjusting nut 25 is provided with external threads 25b which are in engagement with internal threads 12e in the cylinder 12 so that the nut 25 may be moved upwardly and downwardly to adjust the compression of the spring 21 as desired.

An operating rod 27 is secured to or integral with, the extension 22 and it extends through a longitudinal opening 25c in the nut 25. In the preferred form of the invention, the rod 27 is pivotally connected to a throttle pin 28 of conventional construction which is a part of the throttle control of the engine E. Such throttle control is designated with the numeral 30 in FIG. 1. As will be more evident hereinafter, the rod 27 may be connected indirectly to the throttle control or throttle means 30 so as to change the operating speed of the engine E rather than being directly connected to the throttle lever 28. For example, the operating rod 27 may be connected to a solenoid forming a part of an electrical or electronic circuit which then operates the throttle means 30 of the engine E.

The dump valve D is of conventional construction and therefore details of such valve are not illustrated in the drawings, but it will be understood that the dump valve D has a discharge opening at its lower end 35 (FIG. 1) which is larger than the discharge opening from the end of the nozzle N indicated at 36. The nozzle N is thus also of conventional construction so that it has an orifice or restriction internally thereof which is small as compared to the size of the opening 35 for discharging liquid from the dump valve D when the dump valve D is in the open position. When the dump valve D is in the closed position, the opening 35 is closed so that all of the fluid is then directed through the dump valve D to the nozzle N for discharge at the nozzle outlet opening 36. Any suitable handle such as indicated at 37 for the dump valve D may be provided so that the operator handling the nozzle N for cleaning or other operations with the water or other fluid discharged from the nozzle N may control the opening and closing of the dump valve D, as will be more fully explained hereinafter.

The tank T may be a closed or open tank which has a liquid such as water therein which serves as a source of supply. The pump P may be any conventional pump suitable for pumping water or other liquids under high pressures. In cleaning operations which are performed with the apparatus of this invention, the water is discharged from the nozzle N at pressures within a range

of from about 3500 pounds per square inch to about 10,000 pounds per square inch. These extremely high pressures serve to effect a cleaning action and may perform other functions or operations as desired. The engine E is normally a diesel engine, gasoline engine or an electrical engine which is connected to the pump P for operating same. The pressure developed by the pump is therefore directly related to the speed of operation of the engine E.

In the operation or use of the apparatus A of the present invention, it will be assumed that the engine E is started in operation with the throttle lever 28 of the throttle control means 30 in an idle position so that the engine E is operating at a very low or idle speed. This is the position of the lever 28 shown in FIGS. 1 and 2 of the drawings. At this starting point, the dump valve D may be in the opened position so that any water pumped by the pump P passes through the hose H and is discharged through the dump valve opening 35 onto the ground or some receptacle which may be provided adjacent the nozzle N. When the operator is ready to use the nozzle N for a cleaning operation, he closes the dump valve D by turning or squeezing the handle 37 so that all of the fluid discharged from the pump P is passing through the nozzle N and none is being discharged through the opening 35 to the dump valve D. The restriction in the nozzle N is such that the pressure in the system immediately is raised to approximately 500 pounds per square inch or as high as 1500 pounds per square inch, depending upon the setting of the idle speed control 30. The pressure in the hose H is then sufficient to act through the tube 10 on the piston 15 in the fluid actuated control means C to move the piston 15 against the resistance of the spring 21 and cause the lever 28 to move to its desired operating position. Thus, as viewed in FIGS. 1 and 2 of the drawings, the piston 15 would move upwardly to force the operating rod 27 upwardly and to cause the lever 28 to swing upwardly from the position shown in the drawings. The engine E is accordingly caused to operate at a higher speed, the extent of which can be predetermined. For example, the spring pressure 21 may be adjusted by moving the nut 25 so as to increase or decrease the resistance provided by the spring 21 to the movement of the piston 15 so that the rod 27 may move a greater distance for a predetermined amount of pressure developed in the hose H. The operating lever 28 is normally connected to the flapper valve of the carburetor of the engine which, as previously pointed out is indicated schematically by the numeral 30 in FIG. 1. Such flapper valve is conventionally located in the carburetor throat so that the throttle control thus changes the amount of gas or diesel fluid supplied to the engine E for increasing the engine speed of the engine E and thereby for increasing the pump output to the hose H. As the pump output from the pump P is increased, the pressure in the hose H is increased to the desired range of from 3500 pounds per square inch up to approximately 10,000 pounds per square inch, depending upon the type of operation being performed.

When the operator desires to stop the cleaning operation, or otherwise desires to stop the flow of the fluid under high pressure through the nozzle N, he simply manipulates the handle 37 of the dump valve D to open the dump opening 35 so that the pressure immediately is dropped in the entire system below the point at which the fluid pressure can overcome the spring 21. Thus, the spring 21 snaps the piston 15 back to the position shown in FIG. 2 and moves the throttle lever 28 to the idle position, thus causing the engine E to operate at idle speed again. The pump pressure and speed are thereby immediately reached so that actually the pressure of the water or other fluid discharged through the opening 35 is so low as to be insignificant. In the usual case the pressure discharged through the opening 35 with the dump valve D opened and with the engine E operating

at idle speed, would be approximately 5 pounds per square inch. The amount of water which is delivered at the idle speed of the engine E is at a minimum and therefore a minimum of water is dumped through the dump valve D when the nozzle N is not in use, while at the same time the nozzle N is readily available for instantaneous use when the operator resumes cleaning operation.

The dump valve D may be readily manipulated to close same when the operator desires to use the nozzle N again. It is important to note that the dump valve D is closed at extremely low pressure so that the dump valve seats are preserved.

It should be noted that the tube 10 is connected in the preferred form of the invention near the discharge end of the pump P so that the length of tube 10 is relatively short and is not associated with the hose H. This eliminates the problem of handling an extra line or control line by the operator at the nozzle N, thereby also eliminating the service problems connected with the type of remote control systems heretofore employed.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. Cleaning apparatus, comprising:

- (a) a source of fluid,
- (b) a pump for pumping such fluid,
- (c) an engine for operating said pump,
- (d) a fluid conductor connected to said pump for receiving the fluid pumped thereby,
- (e) a discharge nozzle at the end of the fluid conductor,
- (f) a dump valve mounted between said pump and said nozzle,
- (g) fluid-actuated control means for controlling the speed of operation of said engine in response to predetermined fluid pressures acting thereon, and
- (h) means establishing fluid communication between said fluid-actuated control means and the fluid discharged from said pump to supply the predetermined fluid pressures to said control means for causing the engine to operate at idle speed when the dump valve is opened and for causing the engine to operate at a predetermined operating speed when the dump valve is closed.

2. The apparatus set forth in claim 1, wherein:

- (a) said nozzle has an orifice therein through which fluid flows to discharge fluid from the nozzle, and
- (b) said dump valve has a discharge opening which is larger than said orifice to provide a fluid pressure in the fluid conductor which is lower when the discharge opening of the dump valve is open for the dumping of fluid as compared to the pressure developed in the fluid conductor when the discharge opening of the dump valve is closed.

3. The apparatus set forth in claim 1, wherein said engine has a throttle, and wherein said fluid-actuated control means includes:

- (a) a cylinder,
- (b) a piston slidably disposed in said cylinder, and
- (c) means operably connecting said piston to the throttle on said engine whereby movements of said piston change the throttle for varying the speed of the engine.

4. The structure set forth in claim 1, wherein:

- (a) said dump valve is disposed in said fluid conductor in proximity to said nozzle so that an operator at the nozzle may readily regulate the discharge of fluid and control the engine speed.

5. The structure set forth in claim 1, wherein said fluid conductor is a flexible hose which is adapted to be op-

erated at areas remote from said engine and said pump.

6. The structure set forth in claim 1, wherein said means establishing fluid communication is a tube extending from said control means to a point in proximity to said pump whereby said fluid conductor may be handled 5 without handling said tube.

7. The structure set forth in claim 1, wherein:

(a) said dump valve is disposed in said fluid conductor in proximity to said nozzle so that an operator at the nozzle may readily regulate the discharge of 10 fluid and control the engine speed, and

(b) said fluid conductor is a flexible hose which is

adapted to be operated at areas remote from said engine and said pump.

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M. HENSON WOOD, JR., *Primary Examiner.*

V. M. WIGMAN, *Assistant Examiner.*