June 2, 1953 E. J. SANDERS ET AL 2,640,724

ENGINE CLEANING EQUIPMENT

Filed March 20, 1950 2 Sheets-Sheet 1

Fig. 1.

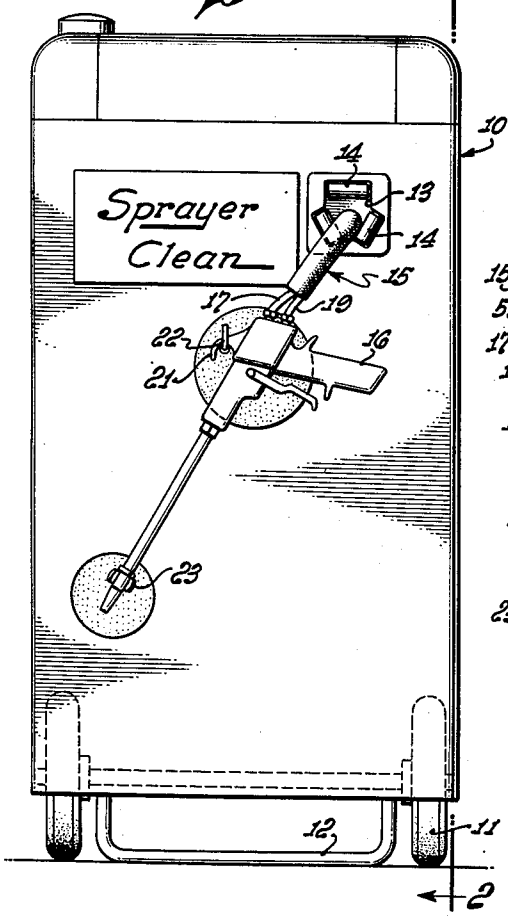
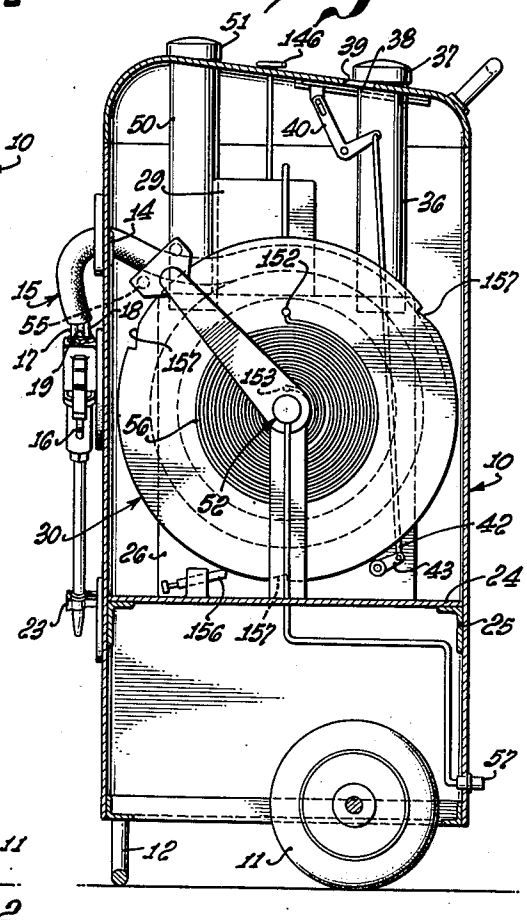


Fig. 2.



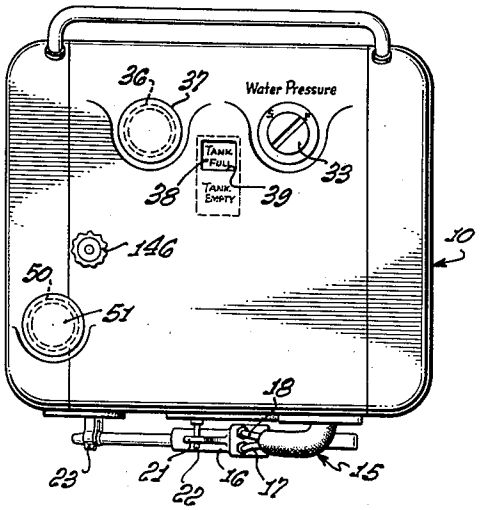


Fig. 3.

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Filed March 20, 1950 2 Sheets-Sheet 2

Fig. 4.

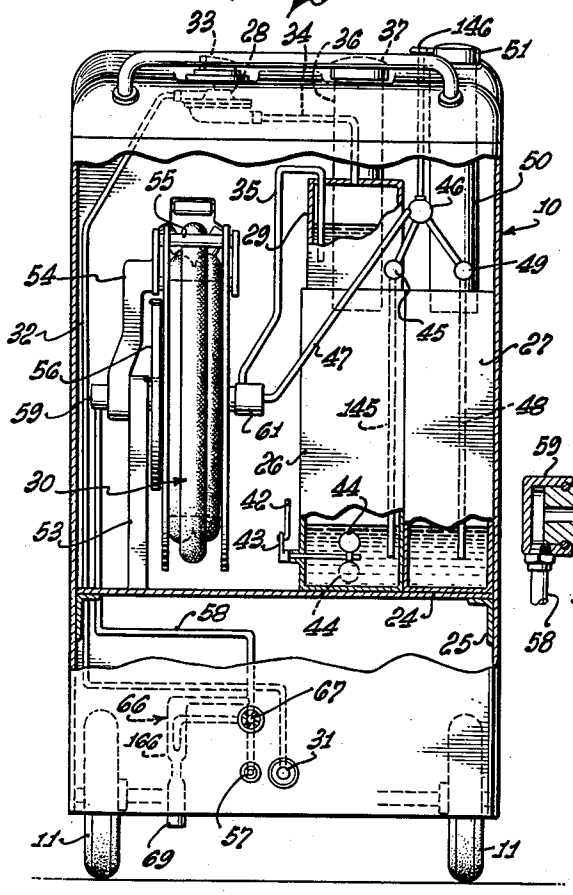


Fig. 6.

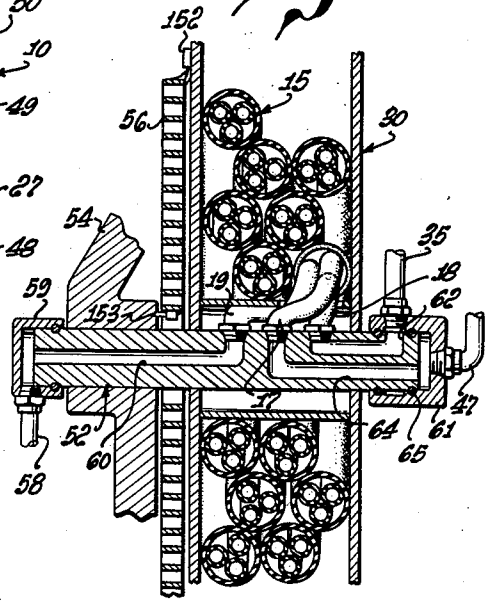
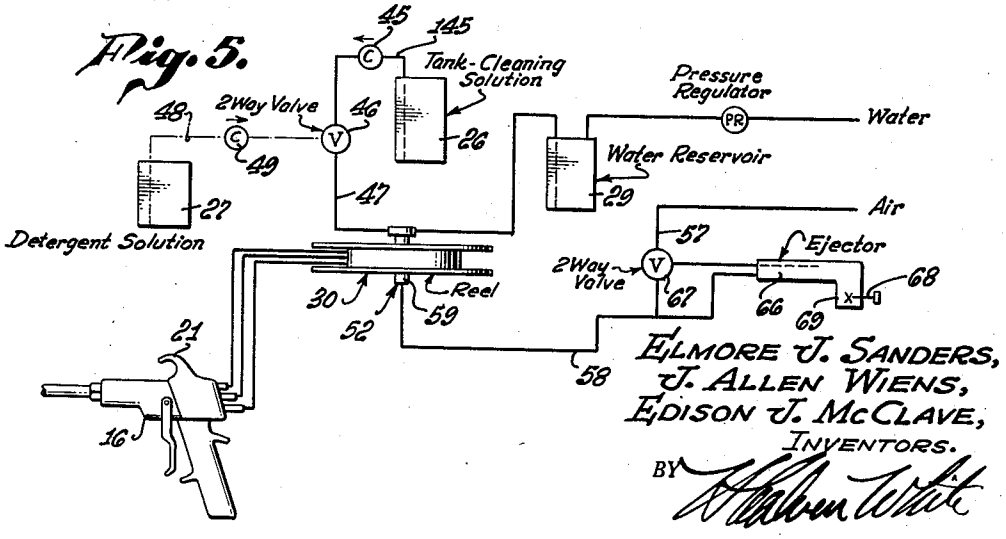


Fig. 5.



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ENGINE CLEANING EQUIPMENT

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8 Claims. (Cl. 299—84)

1

This invention relates generally to improved apparatus for cleaning automobile engines and concerns particularly novel equipment for supplying a number of fluids to an engine cleaning spray gun.

In our copending application, Serial Number 146,416, we have disclosed a spray gun designed for cleaning automobile engines by sequential impingement of the engine surfaces with sprays of a number of cleaning fluids. Specifically, the gun is operable to selectively eject sprays of air, water and a suitable cleaning fluid, such as a hydrocarbon solvent, in a manner effectively cleaning an entire engine in a period of but a few minutes. To assure most effective operation of this gun and to facilitate control of the fluid streams by an operator, it is desirable that air be furnished to the gun under considerable pressure and that water and cleaning fluid be supplied at a relatively low, approximately atmospheric pressure. The compressed air is then employed selectively as either a separate cleaning or drying agent or as a motive fluid for inducing sprays of the other fluids as desired.

Maintenance of both the water and cleaning fluid at approximately atmospheric pressure is highly desirable for several reasons. In the first place, when the water and cleaning fluid are at atmospheric pressure, their discharge may be easily commenced and interrupted by control of the spray inducing air stream, to thus greatly facilitate handling and control of the gun in use. Further, such maintenance of the water and cleaning fluid both at approximately atmospheric pressure eliminates any possibility of one fluid flowing into and contaminating the supply system of the other fluid, as for instance by flowing from one supply system into the other through the gun.

The general object of the present invention is to provide apparatus for supplying air, water and cleaning fluid at proper pressures and in most convenient manner to an engine cleaning spray gun of the above character. A particular object is to provide a fluid handling unit for this purpose especially designed for convenient use at a service station or automobile repair garage, where it is contemplated guns of this character will normally be used. In this connection, the fluid supply apparatus is preferably contained within a portable wheeled cabinet adapted for bodily movement to various locations around a service station or garage. The fluids may be supplied to a gun carried by the cabinet through a multiple passage hose wound about an automatic take-up reel adapted to normally retain the hose in a retracted condition while permitting manual withdrawal of the hose from the reel when the occasion arises for its use.

2

Particularly contemplated is the provision of means for assuring the delivery of a continuous supply of water to a spray gun at the proper relatively low pressure. For this purpose, we preferably include in the water system a pressure reducing valve operable to automatically reduce the pressure of a supply of water to a value only slightly in excess of atmospheric pressure.

When cleaning an automobile engine, it is sometimes necessary to remove pools of water or other liquid from various cavitated surfaces of the engine or frame, A further object of the invention is to provide a system which, in addition to supplying the necessary fluids for spray cleaning an automobile engine, is adapted for reversal of operation to create a suction at the gun nozzle to rapidly and effectively draw liquid into the gun and through the gun to a waste outlet. As will appear, this effect may be attained by employment of an aspirator device operated by the pressure of the compressed air normally directed into the gun and acting to create a partial vaccum in a line leading to the gun.

Though solvent, water and air usually serve to clean an engine very satisfactorily, we have encountered situations where an added spray of detergent or soap solution has been desirable to assure a thorough cleaning job. Consequently, we prefer to include in our fluid handling system means for holding a supply of such detergent, and we especially form the control apparatus to permit selective introduction of either the solvent or the detergent into a line leading to the spray gun.

The above and further features and objects of the present invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a front view of a preferred form of portable fluid supply unit embodying the invention;

Fig. 2 is a side view of the cabinet with its wall broken away to reveal the internal parts of the apparatus, this view being taken on line 2—2 of Fig. 1;

Fig. 3 is a plan view of the cabinet;

Fig. 4 is a rear view of the cabinet with its wall partially broken away to show the hose reel and liquid containing tanks;

Fig. 5 is a schematic representation of the fluid handling system; and

Fig. 6 is a vertical section through the reel and

its mounting structure and showing particularly the swivel inlet connections through which water, air and solvent are introduced into the reel carried hose.

The illustrated fluid supplying equipment is contained within a substantially rectangular upstanding cabinet or housing 10 mounted for portability by a pair of wheels 11 and having a downwardly projecting U-shaped leg member 12 offset forwardly of the wheels and cooperating with the wheels to support the portable cabinet in any position to which it may be moved. The forward side of the housing contains an upper hose passing opening 13 about which are positioned rollers 14 and through which hose 15 extends outwardly for connection to spray gun 16. Hose 15 contains three inner conduits 17, 18 and 19 for conducting water, solvent and air respectively to the gun. When not in use, the gun is mounted to the outside of the housing by reception of its upper integral hook portion 21 within a mounting bracket 22 on the cabinet and by reception of its outer nozzle end between spring fingers 23 on the cabinet.

At its inside, the cabinet or housing 10 contains a transverse floor 24 supported by angles 25 and upon which most of the fluid handling apparatus is carried. Specifically, we provide in the housing above floor 24 a first supply tank 26 for containing a suitable cleaning solvent, a second supply tank 27 for containing a detergent solution, a water pressure reducing valve 28, a water reservoir 29, and an automatic take-up hose reel 30 carrying hose 15 to which the various fluids are supplied.

Solvent tank 26 is supported by floor 24 alongside the hose reel 30. In flowing from this tank to the hose reel, solvent passes first upwardly through line 145 and check valve 45, and then through two-way valve 46 and line 47 to the reel. Tank 26 is adapted to be filled through an upper filling tube 36 projecting through the top of the cabinet and normally closed by a removable cap 37. Sliding indicator plate 38, having the markings "tank full" and "tank empty" alternately visible through an opening 39 in the top of the cabinet (see Fig. 3), serves to indicate when the solvent tank has reached an empty condition. As seen best in Fig. 2, movement of this indicator plate between its "tank full" and "tank empty" positions is effected by pivotal movement of bell crank 40 about its fulcrum point 41, which movement is in turn caused by vertical movement of control rod 42. This control rod is actuated by crank arm 43, which moves in response to the upward and downward movement of float 44 within the solvent tank. As will be understood, as long as a considerable amount of solvent remains in the tank, float 44 will remain in its upper full line position of Fig. 4 to retain sliding plate 38 in its Fig. 3 position registering "tank full." When the solvent level falls lower, float 44 moves downwardly toward its broken line position of Fig. 4 to move the sliding plate to a position in which the words "tank empty" are visible through window 39.

Detergent tank 27 is mounted on floor 24 alongside solvent tank 26 and is adapted to discharge detergent into line 47. For this purpose, line 48 leads upwardly through the top of the detergent tank and check valve 49 to valve 46. Valve 46 is of any conventional two-way construction, being operable by a handle 146 at the top of the housing to selectively admit either solvent from tank 26 or detergent from tank 27 into line 47 leading to the hose. Detergent tank 27 is adapted to be filled by an upwardly extending filling connection 50 carrying a cap 51 above the top of the cabinet (see Fig. 2).

Water at any convenient pressure is introduced into the cabinet through an inlet fitting 31 at the lower portion of its rear side and flows upwardly through line 32 to pressure reducing valve 28 at the top of the cabinet. This valve is adapted to reduce the pressure of the water to a value only slightly in excess of atmospheric pressure, the exact pressure at the discharge side of the valve being controllable by knob 33 at the top of the housing. Water from pressure reducing valve 28 flows through line 34 into the top of water accumulating reservoir 29. The pressure reducing and regulating valve thus serves to maintain a supply of water at a predetermined relatively low pressure within the water reservoir at all times. Water at this low pressure may then be discharged from the reservoir into hose 15 through line 35. The pressure reducing valve is normally maintained at a setting such that the water as it reaches the gun is at atmospheric pressure. However, this valve may be completely opened by handle 33 to supply full line pressure to the gun when desired.

Hose reel 30 is rigidly carried by a central shaft 52 rotatively supported by bearing member 53 projecting upwardly from the cabinet floor. Hose 15 is secured at its inner end to the reel and is normally wound about the reel in the condition shown in the figures. The outer end of the hose projects outwardly through hose passing opening 13 in the cabinet for connection to the spray gun, as previously described. To accurately guide the hose, bearing 53 may carry an arm 54 projecting angularly toward the hose passing opening in the cabinet and carrying a pair of rollers 55 through which the hose extends as it leaves the reel. As seen best in Fig. 6, the usual take-up spring 56 is mounted at the side of the reel and tends to rotate the reel in a direction retracting the hose. This spring may be connected at its outer end 152 to the reel and at its inner end 153 to bearing 53. The usual latch element 156 cooperates with notches 157 in the reel to releasably lock the reel in any desired withdrawn condition.

Compressed air is supplied to the cabinet through inlet fitting 57 from which it flows upwardly through line 58 into swivel inlet 59 at one side of the reel mounting. This swivel inlet introduces fluid into passage 60 in tubular shaft 52, which passage connects at its inner end with hose conduit 19. Similarly, solvent or detergent may be introduced into passage 62 at the opposite end of shaft 52 through swivel inlet 61, to flow through that passage into the conduit 18 of the hose. Water from line 35 is introduced through the same swivel inlet 61 into passage 64 in the shaft to flow through that passage into water conduit 17 of the three-fluid hose. As will be understood, the water and solvent are separated within the swivel inlet by a seal ring 65.

Beneath floor 24 of the cabinet, I mount a fluid ejector or aspirator 66, the primary side or jet tube 166 of which is placed in communication with the compressed air inlet line 58 through a two-way valve 67. The secondary side of the ejector is connected to air line 58 beyond valve 67. A discharge valve 68 controls the discharge from the ejector through waste outlet fitting 69. Normally, two-way valve 67 will be in a condition permitting the passage of

compressed air from inlet connection 57 through line 58 and into the air line within hose 15. However, when it is desired to employ the gun for picking up a pool of liquid, two-way valve 67 is turned to a condition in which compressed air from inlet 57 flows into the jet tube of the ejector rather than into the hose. Valve 68 is then opened, and the ejector acts to create a suction in line 58, hose conduit 19, and the gun, so that liquid may be drawn into the gun through its outer nozzle to be carried through the hose and line 58 to waste discharge outlet 69.

In preparing the illustrated portable fluid supply unit for use, tank 26 is filled with cleaning solvent through filling connection 36, tank 27 is filled with a suitable detergent solution through filling connection 50, a compressed air supply hose is connected to air inlet fitting 57, and a water supply line carrying water under pressure, as for instance under normal commercial pressure, is connected to water inlet fitting 31. Two-way valve 67 is normally turned to a position to admit compressed air into the hose through line 58. Two-way valve 46 is normally turned to a position to place solvent tank 26 in communication with line 47 and hose conduit 18.

With the apparatus in this condition, air is supplied to the gun at a relatively high pressure, and water and solvent are supplied to the gun at approximately atmospheric pressure. The gun may then be employed to direct sprays of these fluids in different combinations against the engine surfaces to be cleaned. If it is desired to discharge the detergent solution rather than solvent, two-way valve 46 is reversed to admit detergent from tank 27 into line 48 and to close off the supply of solvent. When high water volume and pressure are desired, as for rinsing purposes, pressure reducing valve 28 may be regulated by handle 23 to supply water under full line pressure to the gun. Also, as previously described, valves 67 and 68 may be actuated to convert the gun to serve as a suction device.

The portable construction of the unit permits its movement to any convenient location within the range permitted by the air and water supply lines, and the extensibility of hose 15 by withdrawal from the reel further increases the facility with which an engine cleaning operation may be accomplished.

We claim:

1. Apparatus for supplying fluids to an engine cleaning spray gun, comprising flexible hose means adapted to connect at an outer end to an engine cleaning spray gun, a tank for containing a supply of cleaning fluid, means for placing said tank in communication with said hose means to deliver cleaning fluid therethrough to the gun, means for placing a source of water in communication with said hose means, an aspirator communicable with said hose means and operable by compressed air to draw fluid inwardly through the hose means from the gun, and means for selectively connecting a source of compressed air with said hose means or said aspirator.

2. Apparatus for supplying fluids to an engine cleaning spray gun, comprising flexible hose means adapted to connect at an outer end to an engine cleaning spray gun and containing three individual fluid conducting passages leading separately to the gun, a tank for containing a supply of cleaning fluid, means for placing said tank in communication with a first one of the passages in said hose means to deliver cleaning fluid therethrough to the gun, means for placing a source of compressed air in communication with a second passage in said hose means, means for conducting water from a supply thereof to the third passage in said hose means, an aspirator communicable with one of the passages in said hose means and operable to draw fluid inwardly therethrough from the gun, and a valve for controlling a supply of pressure fluid to said aspirator.

3. Apparatus for supplying fluids to an engine cleaning spray gun, comprising flexible hose means adapted to connect at an outer end to an engine cleaning spray gun and containing three individual fluid conducting passages leading to the gun, a tank for containing a supply of cleaning fluid, means for placing said tank in communication with a first one of the passages in said hose means to deliver cleaning fluid therethrough to the gun, means for placing a source of water in communication with a second passage in said hose means, an aspirator communicable with said hose means and operable by compressed air to draw fluid inwardly therethrough from the gun, and means for selectively connecting a source of compressed air with the third passage in said hose means or said aspirator.

4. Apparatus for supplying fluids to an engine cleaning spray gun, comprising a housing, a rotatable reel within said housing, flexible hose means windable about said reel and extending outwardly through an opening in a wall of the housing to connect with an engine cleaning spray gun, said hose means containing three individual fluid conducting passages leading separately to the gun, a tank within the housing for containing a cleaning fluid, conduit means for placing said tank in communication with a first one of said passages in said hose means for delivery of cleaning fluid therethrough to the gun, a fluid passing fitting connectable to a source of water and communicating with a second passage in said hose means to deliver water thereto, and a fitting connectable to a source of compressed air and communicating with the third passage in said hose means to deliver air thereto.

5. Apparatus for supplying fluid to an engine cleaning spray gun, comprising a housing, a rotatable reel within said housing, flexible hose means windable about said reel and extending outwardly through an opening in a wall of the housing to connect with an engine cleaning spray gun, said hose means containing three individual fluid conducting passages leading separately to the gun, a tank within the housing for containing a cleaning fluid, means for placing said tank in communication with a first one of said passages in said hose means for delivery of cleaning fluid therethrough to the gun, means connectable to a source of water under pressure for conducting water therefrom to a second passage in said hose means, an automatic pressure regulating and reducing valve within the housing connected into the water supply line and acting to reduce the pressure of the water to and maintain it at a predetermined value, and means for placing a source of compressed air in communication with the third passage in said hose means.

6. Apparatus for supplying fluid to an engine cleaning spray gun, comprising a housing, a rotatable reel within said housing, flexible hose means windable about said reel and extending outwardly through an opening in a wall of the

housing to connect with an engine cleaning spray gun, said hose means containing three individual fluid conducting passages leading separately to the gun, a tank within the housing for containing a cleaning solvent, a second tank in the housing for containing a detergent solution, conduit means for selectively placing said tanks in communication with a first one of the passages in said hose means for selective delivery of solvent and detergent solution thereto, valve means connected into said conduit means for controlling the selection between said solvent and detergent, means for placing a source of water in communication with a second passage in said hose means, and means for placing a source of compressed air in communication with the third passage in said hose means.

7. Apparatus for supplying fluid to an engine cleaning spray gun, comprising a housing, a rotatable reel within said housing, flexible hose means windable about said reel and extending outwardly through an opening in a wall of the housing to connect with an engine cleaning spray gun, said hose means containing three individual fluid conducting passages leading separately to the gun, a tank within the housing for containing a cleaning fluid, means for placing said tank in communication with a first one of said passages in said hose means for delivery of cleaning fluid therethrough to the gun, means for placing a source of water in communication with a second passage in said hose means, an aspirator in the housing communicable with one of the passages

in said hose means and operable by compressed air to draw fluid inwardly therethrough from the gun, and valve means for selectively connecting a source of compressed air with the third passage in said hose means or said aspirator.

8. Apparatus for supplying fluids to an engine cleaning spray gun, comprising flexible hose means adapted to connect at an outer end to an engine cleaning spray gun, a tank for containing a supply of cleaning fluid, means for placing said tank in communication with said hose means to deliver cleaning fluid therethrough to the gun, means for placing a source of compressed air in communication with said hose means, means for conducting water from a supply thereof to said hose means, pumping means communicable with said hose means and operable to draw fluid inwardly therethrough from the gun, and means for controlling the energization of said pumping means.

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