MANIFOLD FOR HIGH PRESSURE WASHER IN MECHANICAL MODE SELECTION

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ABSTRACT

A hydraulic system which receives and pumps a mixture of water and cleaning concentrate or rinsing water alone at high pressure to a spray nozzle for washing and cleaning purposes. To permit selection of the "mix" or "rinse" mode, the system includes a dual mode selection valve the single output of which is connected to the inlet side of a high pressure pump. The valve has a pair of separate inputs for water and concentrate, respectively; and includes a mode selector which determines whether the flow of water through the valve is free or restricted. Under the latter condition, the flow to the pump inlet is less than the pump output capacity, and the concentrate is therefore drawn or aspirated into the valve to mix with the water.

12 Claims, 2 Drawing Figures
MANIFOLD FOR HIGH PRESSURE WASHER IN MECHANICAL MODE SELECTION

The invention relates to hydraulic systems which generate high pressure for spray cleaning, and to a valve usable in such systems which is selectively operable to deliver either a large flow of water or a mixture of water and cleaning concentrate to an outlet spray nozzle.

The use of high pressure spraying equipment is a well-accepted practice in cleaning and washing many articles, including automobiles. Generally, such high pressure washing systems have two modes of operation: a “mix” mode in which cleaning concentrate is mixed with fresh water and diluted prior to entering the pump, and a “rinse” mode in which only water flows through the pump. Pumps used in such systems are ordinarily of the positive displacement type and are capable of pumping liquid to high pressure for effective spray washing. As is typical with pumps of this type, if the inlet pressure and flow are less than the pump is capable of handling, suction results at the inlet. Consequently, if water is continuously supplied to the pump in a free and unrestricted manner, output of the spray nozzle is simply water under high pressure. If, however, the water flow to the pump is restricted, the pump itself draws the necessary amount of cleaning concentrate into its inlet to make up for the volume of water which it does not receive. The former is the “rinse” mode, and the latter is referred to as the “mix” mode.

In order to selectively control the desired operational mode of the system, two water flow passages to the pump inlet are necessary, together with a single passage for the cleaning concentrate. One of the water passages is unrestricted and allows a free flow of water to the pump during the rinse mode, whereas the second passage is restricted to effect aspiration of the concentrate and mixing of the two input liquids.

My invention is directed to a unique selector valve which is manually operable to selectively permit water flow in either of the two passages. The valve comprises a valve housing having a single outlet and a pair of inlets for the water and cleaning concentrate, respectively. A single unrestricted passage connects the concentrate inlet with the outlet, and two parallel passages are defined between the water inlet and outlet. An elongated valve member is rotatably carried by the valve housing and projects transversely through both of the water passages. In the valve member are formed a pair of transverse bores disposed for registration with the first and second water passages, respectively, but perpendicular to each other. Thus, if the first bore is in registration with its associated passage, the second bore blocks the other passage. Rotation of the elongated valve member one-quarter turn brings about the opposite result. A variable restriction in the form of a needle valve is also disposed in the second passage to control the degree of restriction and thereby determine the relative proportion of the water and cleaning concentrate.

The rotatable valve member also includes a smaller bore which is disposed for registration with the first water passage and perpendicular to the larger first bore. Accordingly, when the mode selector valve is in the “mix” position, a small amount of water bleeds through the first passage to insure that the pump does not run dry in the event that the supply of cleaning concentrate runs out and the needle valve is closed. From the foregoing, it will be appreciated that the inventive dual mode selector valve is mechanically simple as well as easy to operate, both in selecting the “rinse” or “mix” modes and adjusting the mixed proportions. As such, it is an improvement over prior art devices which are far more complex and require electrical power for their operation.

DESCRIPTION OF THE PREFERRED DRAWINGS

FIG. 1 is a schematic representation of a high pressure washer system and dual mode selector valve which embody the inventive principles, the valve and system being in a first operational state or mode; FIG. 2 is a schematic representation of the inventive system and valve in a second operational state or mode.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the Figures, the numeral 11 generally represents a high pressure washing system 11 which employs a dual mode selector valve 12. Valve 12 includes a first inlet 13, a second inlet 14 and single outlet 16. Primary inlet 13 is adapted for connection to a continuous source of water or the like, not shown. Primary inlet 14 is connected to a source of cleaning concentrate 17 through a suitable check valve 18. Outlet 16 is connected to the inlet side of a conventional high pressure pump 19 which is preferably of the positive displacement type. The outlet side of pump 19 is connected directly to a spray gun 20, which is trigger operated by a user to control the high pressure spray toward the article to be washed. System 11 also comprises a conventional unloader valve 21 which interconnects the outlet side of pump 19 with the pump inlet through a bypass conduit 15. The purpose of unloader valve 21 is to permit water from pump 19 to be diverted through bypass conduit 15 and back to the pump under reduced pressure when spray gun 20 is closed.

Selector valve 12 itself comprises a valve housing 22 in which the aforementioned inlets 13, 14 and outlet 16 are formed. A first fluid passage 23a formed in the valve housing 22 establishes a first flow path from inlet 13 to outlet 16. A second fluid passage 23b defines a second flow path from inlet 13 to outlet 16, a portion of which is separate from that of fluid passage 23b. As is shown, the fluid passages 23a, b include portions which are disposed in parallel relation. Valve housing 22 has a third fluid passage 24 which establishes fluid communication between the inlet 14 and outlet 16.

Selector valve 12 further comprises an elongated valve member 25 which takes the form of a solid cylinder and is rotatably carried within valve housing 22. Valve member 25 projects transversely through the fluid passages 23a, b, and terminates in a knurled knob 26 which enables its rotation, as discussed in further detail below. An O-ring 27 serves as a seal to prevent the leakage of water from the bore in which valve member 25 is rotatably disposed.

Valve member 25 further comprises a pair of circular bores 28, 29, which pass transversely therethrough in mutually perpendicular directions. As shown, bore 28 is disposed for registration with passage 23a if rotated to the proper position, and bore 29 is disposed for registration with fluid passage 23b. It will therefore be ap-
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precipitated that, in the position shown in FIG. 1, valve member 25 permits fluid to pass between inlet 13 and outlet 16 through fluid passage 23c in an essentially unrestricted manner; and, in response to a one-quarter turn through manual rotation of the knurled knob 26, permits flow from inlet 13 through fluid passage 23b to outlet 16 (FIG. 2).

Selector valve 12 further comprises a variable restriction needle valve 30 which is screwed into a threaded bore within valve housing 22. Needle valve 30 includes a needle portion 31 the longitudinal position of which determines the degree of flow restriction relative to upper fluid passage 23b. The longitudinal position of needle portion 31 is controlled by rotation of a knurled knob 32 disposed at its outer end. An O-ring 33 encircling the shank of needle valve 30 precludes the leakage of water through the bore in which it is disposed.

In “rinse” mode operation of the system 11, valve member 25 is positioned as shown in FIG. 1, and water flows from inlet 13 to outlet 16 through passage 23c in an essentially unrestricted manner. As such, the inlet to high pressure pump 19 is continuously supplied, and water at high pressure is provided through the spray gun 20 for washing and cleaning purposes. In the event that spray gun 20 is closed, the output of pump 19 is diverted through bypass unloader valve 21 and bypass conduit 15 at a greatly reduced pressure; and such closed loop flow continues until a demand occurs through control of the spray gun 20. During the “rinse” mode, the flow of water through passage 23b is blocked due to the transverse position of bore 29 relative to the flow passage.

For “mix” mode operation of system 11, valve member 25 is rotated one-quarter turn to the position shown in FIG. 2 and the flow of water from inlet 13 to outlet 16 is through fluid passage 23b. However, this flow is restricted by needle valve 30, and the amount of water reaching the inlet of pump 19 is below its capacity. As a result, continued operation of pump 19 gives rise to a negative pressure in fluid passage 24c than on the upstream side of check valve 18, and cleaning concentrate is thus drawn into the inlet 14 from the source 17. The mixed proportion of water and cleaning concentrate is determined by the degree of restriction within fluid passage 23b, which in turn is dependent on the adjustment of needle valve 30.

As described, it would be possible for pump 19 to be damaged by running dry should valve member 25 be rotated to the position shown in FIG. 2, and at the same time needle valve 30 is closed and the source 17 of cleaning concentrate runs out. To eliminate this possibility of damaged pump 19, a small bleed hole 34 is formed in valve member 25 for registration with fluid passage 23a, but perpendicular to the larger bore 28. Thus, the bleed hole 34 aligns with bore 29, and permits a minimum flow of water to pump 19 through the passage 23a, even under the aforementioned conditions.

I claim:
1. A dual mode valve for providing a selected fluid output of one of two input fluids or a predetermined mixture of said fluids, comprising:
   a. a valve housing defining a first inlet adapted for connection to a first fluid source, a second inlet adapted for connection to a second fluid source, and an outlet;
   b. a first passage within the valve housing establishing fluid communication between the first inlet and the outlet;
   c. a second passage within the valve housing establishing fluid communication between the first inlet and the outlet separate from the first passage;
   d. a third passage within the valve housing establishing fluid communication between the second inlet and the outlet;
   e. valve means commonly disposed in the first and second passages and rotatable between first and second positions, the valve means having first and second fluid openings formed therein relatively disposed to respectively permit and block fluid flow in the first and second fluid passages with the valve means in said first position, and to respectively block and permit fluid flow in the first and second fluid passages with the valve means in said second position;
   f. and means for restricting flow in the second passage.
2. The valve means defined by claim 1, wherein the first and second passages are disposed in essential alignment, and the valve means comprises:
   a. an elongated valve member rotatably carried by the valve housing and projecting transversely through the first and second passages;
   b. the first and second fluid openings comprising mutually perpendicular bores formed through said elongated valve member.
3. The valve defined by claim 2, wherein the valve member projects outwardly from the valve housing and terminates in a manually rotatable portion.
4. The valve defined by claim 2, wherein the elongated valve member comprises a solid cylinder.
5. The valve defined by claim 2, and further comprising a bleed hole formed in the elongated member for registration with the first passage, the bleed hole being perpendicular to said first bore to permit a minimum fluid flow through the first passage when fluid flow is established through the second passage.
6. The valve defined by claim 1, wherein the restriction means is variable.
7. The valve defined by claim 1, wherein the restriction means comprises a needle valve disposed in the second passage in variable restrictive relation therewith.
8. The valve defined by claim 7, wherein the needle valve is threadably received by the valve housing, and terminates in a manually rotatable portion disposed outside the valve housing.
9. A dual mode pressure washing system, comprising:
   a. high pressure pumping means having an inlet and an outlet;
   b. a spray nozzle connected to the pumping means outlet;
   c. and a mode selector valve for providing a selected fluid output of one of two input fluids or a predetermined mixture of said fluids, comprising
      i. a valve housing defining a first inlet adapted for connection to a first fluid source, a second inlet adapted for connection to a second fluid source, and an outlet connected to the pumping means inlet;
a first passage within the valve housing establishing fluid communication between the first inlet and the valve outlet;

iii. a second passage within the valve housing establishing fluid communication between the first inlet and the valve outlet, the second passage being separate from the first passage;

iv. a third passage within the valve housing establishing fluid communication between the second inlet and the valve outlet;

v. valve means commonly disposed in the first and second passages and rotatable between first and second positions, the valve means having first and second fluid openings formed therein relatively disposed to respectively permit and block fluid flow in the first and second fluid passages with the valve means in said first position, and to respectively block and permit fluid flow in the first and second fluid passages with the valve means in the second position;

vi. and means for restricting flow in the second passage.

10. The pressure washing system defined by claim 9, wherein the first valve inlet is connected to a source of water, and the second valve inlet is connected to a source of cleaning concentrate.

11. The pressure washing system defined by claim 10, and further comprising check valve means disposed between the second valve inlet and the source of cleaning concentrate for permitting the flow of concentrate only toward said second valve inlet.

12. The pressure washing system defined by claim 9, and further comprising unloader valve means disposed in a bypass conduit downstream of said pumping means and in parallel with the spray nozzle, the bypass conduit communicating with the pumping means inlet, the unloader valve means being constructed and arranged to divert fluid from the spray nozzle when pressure downstream of the pumping means reaches a predetermined limit.

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