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[54] **PUMP FEED SYSTEM**
7 Claims, 5 Drawing Figs.

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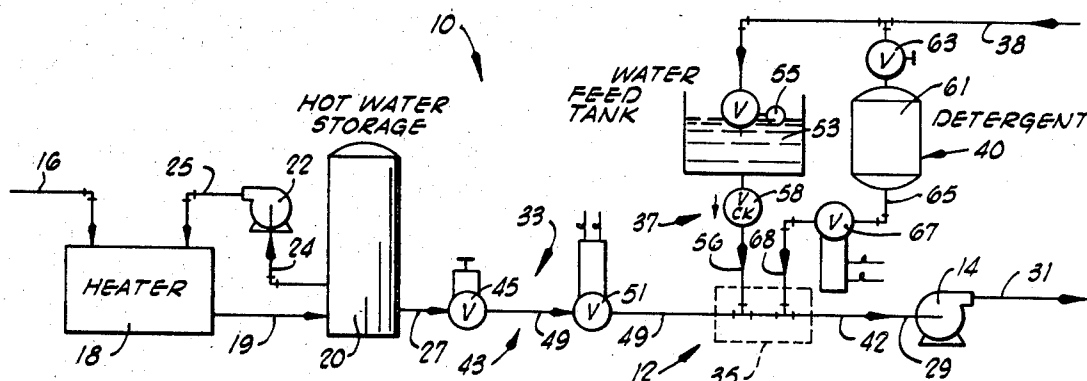
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ABSTRACT: This invention relates to a pump feed assembly operable to selectively supply various mixtures through any given pump means for discharge therefrom but specifically beneficial in carwash systems. More particularly, this invention relates to a pump feed assembly having a mixing means interconnected to hot and cold fluid supply lines operable to supply a pump means through the mixing means at all times regardless of any mechanical or electrical failure.



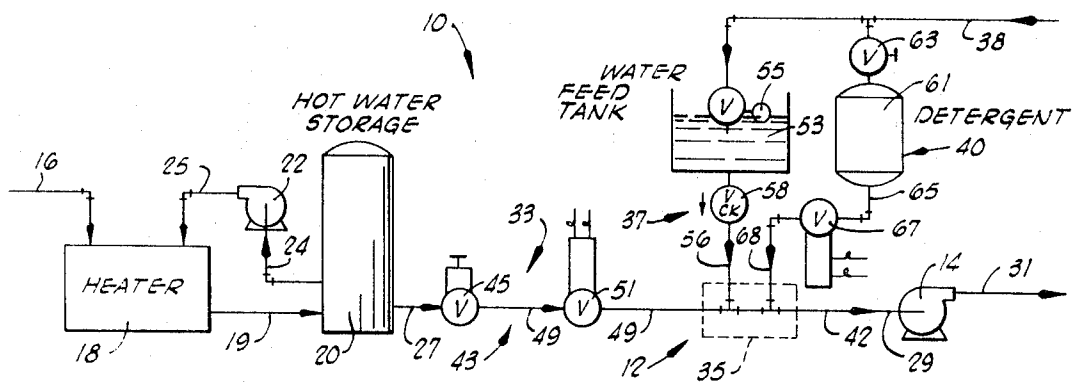


FIG. 1

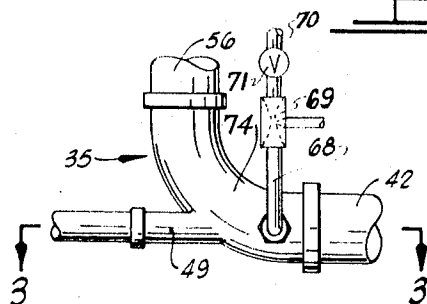


FIG. 2

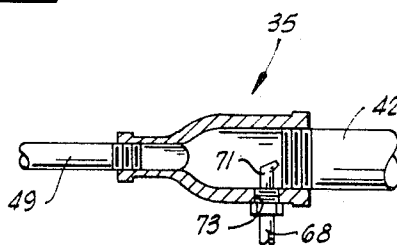


FIG. 3

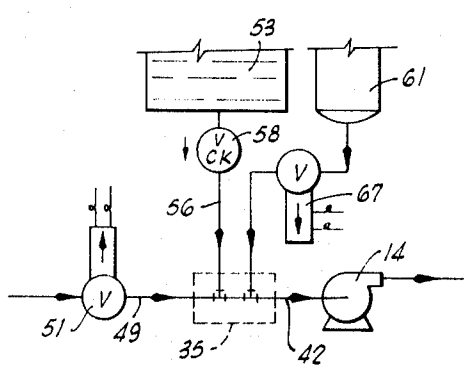


FIG. 4

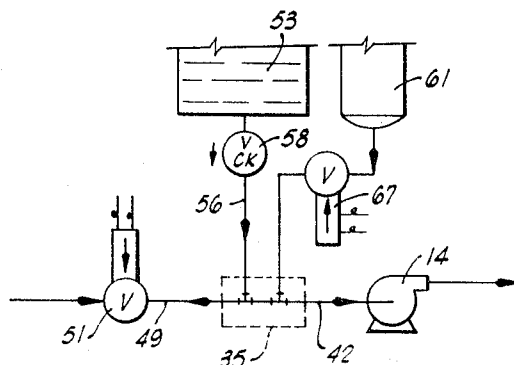


FIG. 5

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PUMP FEED SYSTEM

Numerous types of elaborate systems are known to the prior art operable to supply pump members in a car wash installation whereupon it is necessary to selectively supply under pressure a heated, detergent fluid on the wash cycle and a clear fluid on the rinse cycle. In the prior art installations, it has been necessary to provide the required supply lines for hot and cold fluid regulated through solenoid valves so as to assure that only the proper fluid is allowed to be placed within the pump means as required and at the required temperature. However, the prior art devices are inferior in that it may be possible to have a solenoid valve failure such as a restriction therein resulting in substantial fluid starvation of the pump member which is known to be extremely damaging and therefore shortens pump life. Such starvation is also harmful to the overall piping system and results in an unsatisfactory carwash.

In one preferred embodiment of this invention, a pump assembly is provided for, as shown in this example, supplying a pump means with either rinse or wash fluid in most efficient and effective manner. More particularly, the pump feed assembly may be used in an overall carwash system having heated fluid such as water supplied through the pump feed assembly initially into a first fluid supply means to be mixed with fluid from a second fluid supply means within a mixing means and thereupon supplied to the pump means. Also, the pump feed assembly includes a detergent supply means operable to selectively dispense a predetermined amount of detergent into the mixing means. The first supply means includes a control means having, successively, a pressure regulator valve or gate valve to initially receive the heated fluid and a solenoid valve operable to be selectively opened to permit fluid flow within a first inlet line to the mixing means. The second fluid supply means includes a fluid reservoir maintained at a certain level through a makeup fluid supply means and having a second fluid inlet line for conveyance of unheated rinse fluid into the mixing means. The detergent supply means is operable to supply detergent through a control valve and a detergent line into the mixing means as required. The second inlet line is provided with no restrictions except for a check valve so as to freely permit fluid flow in one direction to the mixing means and directly into the pump means regardless of the condition of operation of the first fluid supply means. The second inlet line and the discharge line from the mixing means are substantially identical size so as to provide sufficient fluid into the pump means to keep the same from being starved. The first inlet line is of substantially smaller in size than the second inlet line as the same is provided with the normal water system pressure fluid and mixed with water from the reservoir of the second fluid supply means when feeding the pump means. More particularly, the mixing means is of a generally elbow style having the hot water fluid inlet line and the detergent line connected thereto. The operation of the pump feed assembly is such that the pump means is always supplied with operative fluid regardless of any electrical or mechanical failure within the system as long as the reservoir is continually supplied with fluid from the fluid makeup supply means.

One object of this invention is to provide a pump feed assembly overcoming the aforementioned disadvantages of the prior art structures.

Another object of this invention is to provide a pump feed assembly operable to supply a pump means selectively with either a hot water detergent fluid mixture or a clear cold water rinse mixture and positively supplying the pump means at all times regardless of any electrical or mechanical failure as a safety means against damage to the pump means.

Still, another object of this invention is to provide a pump feed assembly readily mountable within any pumping system where two or more fluid mixtures are required to be fed into a pump means and achieving a safety feature assuring that such pump means will never suffer from fluid starvation which causes almost immediate and extensive damage thereto.

One other object of this invention is to provide a pump feed assembly which is simple in operation, substantially less initial cost than existing systems, maintenance free, and providing unfailling fluid supply to the pump system for safety and economical purposes.

Various other objects, advantages, and features of the invention will become apparent to those skilled in the art from the following discussion, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic diagram illustrating a car wash system utilizing the pump feed assembly of this invention;

FIG. 2 is a fragmentary elevational view of the mixing means of the pump feed assembly of this invention;

FIG. 3 is a fragmentary sectional view taken along line 3-3 in FIG. 2;

FIG. 4 is a schematic diagram illustrating the use of the pump feed assembly in the wash cycle of the car wash system of this invention; and

FIG. 5 is a schematic diagram similar to FIG. 4 illustrating a rinse cycle utilizing the pump feed assembly of this invention.

The following is a discussion and description of preferred specific embodiments of the pump feed assembly of this invention, such being made with reference to the drawings, whereupon the same reference numerals are used to indicate the same or similar parts and/or structure. It is to be understood that such discussion and description is not to unduly limit the scope of the invention.

Referring to the drawings in detail and in particular to FIG. 1, a car wash system, indicated generally at 10, utilizes a pump feed assembly 12 of this invention. Although this invention will be described generally in conjunction with the carwash system 10, it is understood that the same is readily operable under various sets of conditions whereupon fluid pressure differential is used to regulate and control the supply of fluid mixtures to a pump means 14.

The car wash system 10 includes a water inlet supply line 16 fed into a heater structure 18 for heating the same and recirculating the heated fluid at a predetermined temperature through line 19 into a hot water storage tank 20 and back to a recirculating pump 22 through lines 24 and 25. It is seen that this recirculation system is operable to maintain the desired temperature and reservoir of hot water needed in the carwash system 10. From the hot water storage tank 20, the fluid is fed through an outlet line 27 into the pump feed assembly 12 which, in turn, supplies the pump means 14 through an inlet line 29 for discharge under high pressure through a pump outlet line 31.

More particularly, the pump feed assembly 12 includes a first fluid supply means 33 to receive water from the hot water storage tank 20 and supply the same into a mixing means 35; a second fluid supply means 37 operable to receive fluid from a makeup fluid supply means 38 and to direct same into the mixing means 35; and a detergent supply means 40 operable to selectively supply detergent fluid into the mixing means 35 whereupon a discharge line 42 from the mixing means 35 is connected to the inlet line 29 of the pump means 14 to supply the required fluid thereto.

The first fluid supply means 33 is provided with a control means 43 including a pressure regulator valve 45 on the output side of the hot water storage tank 20 in the line 27 which is operable to regulate the output pressure therefrom into a first fluid inlet line 49 leading to the mixing means 35. The pressure regulator valve 45 may be of a gate valve type or the adjustable diaphragm regulator type to achieve the proper fluid pressure being fed into the mixing means 35 for reasons to become obvious. The control means 43 further includes a valve member 51, preferably an electrical solenoid valve, mounted within the first fluid inlet line 49 and operable when energized to permit fluid flow therethrough and operable, when not energized, to cease such flow. The first fluid supply means 33 is connected from the solenoid valve member 51 through the first fluid inlet line 49 to the mixing means 35.

The second fluid supply means 37 includes a large reservoir tank 53 supplied with water from the makeup fluid supply means 38 through a float valve member 55. The reservoir tank 53 is thereupon continuously supplied with inlet fluid to maintain the proper amount therewithin and has a discharge opening connected to a second fluid inlet line 56 connected to the mixing means 35. It is seen that the second fluid inlet line 56 is completely unrestricted except for a check valve 58 and, therefore, always supplies fluid to the mixing means 35. The check valve 58 is a safety feature to prevent overflow of the reservoir tank 53 in case the solenoid valve member 51 would stick open with the pump means 14 not operating.

The detergent means 40 is provided with a detergent storage tank 61 selectively provided with fluid from the fluid supply means 38 as required through a gate valve 63. From the detergent storage tank 61, the detergent is fed through a line 65 and a valve member 67, preferably an electrical solenoid type, which is operable to control detergent flow therethrough. From the solenoid valve member 67, it is seen that the detergent fluid flows by gravity to a detergent inlet line 68 which is connected to the mixing means 35. It is obvious that the solenoid valve members 51 and 67 can be put upon the same electrical circuit because the detergent supply is required at the same time that heated fluid is supplied during the wash cycle as will become obvious. The detergent inlet line 68 is connected to a discharge nozzle 71 to direct detergent downstream in the mixing means 35.

In some systems, it has been found beneficial to supply detergent through a venturi valve 69 to be picked up by fluid under available fluid pressure through a supply line 70 controlled by a solenoid valve 71. This system provides a positive detergent flow for more exacting controls, and, in this case, the solenoid valve 67 could be eliminated only requiring a needle valve to regulate detergent flow.

As shown in FIGS. 2 and 3, the mixing means 35 is similar to an elbow having the second fluid inlet line 56 and the discharge line 42 of substantially the same diameter so as to efficiently feed the pump means 14 as will become obvious. Axially aligned with the discharge line 42 is the first fluid inlet line 49 of a substantially smaller diameter than either the second fluid inlet line 56 or the discharge line 42 for reasons to become obvious. The mixing means 35 further includes a hole 73 in a sidewall 74 to receive the discharge nozzle 71. It is to be noted that the different diameters of the first fluid inlet line 49 and the second fluid line 56 are such that with the proper pressure and temperature relationships achieve the desired end result of this invention to supply (1) a detergent, heated 120° F. fluid supply during the wash cycle; and (2) a nondetergent, cold water fluid to the pump means during the rinse cycle.

Utilizing the pump feed assembly 12 of this invention in the car wash system 10 as described, let us first assume that operation under one set of conditions whereupon it is desired to have a high pressure, detergent supplied, heated, fluid discharge from the pump means 14. Under this first set of conditions the pressure regulator valve 45 is set to achieve a predetermined amount of fluid supplied to the mixing means 35. This, of course, supplies such pressure fluid to the solenoid valve member 51 which, when opened, discharges fluid therefrom into the first fluid inlet line 49 into the mixing means 35. On the hot water wash cycle, it is seen that the solenoid valve members 51 and 67 are energized through an electrical control panel (not shown) so as to be in the open condition. Whereupon, it is obvious that the hot water at, for example 180° F., is supplied to the first fluid inlet line 49 into the mixing means 35. However, the diameter of the first fluid inlet line 49 is regulated such that the fluid supplied thereto is less than that required and demanded by the pump means 14. For example, let us assume that the pump means 14 requires 50 gallons of water per minute to maintain proper operation without fluid starvation and that only 35 gallons per minute can be supplied through the first fluid inlet line 49 due to diameter and fluid pressure. Under this condition, it is obvious

that an additional 15 gallons per minute will be required to be supplied to the pump means 14 to satisfy same and prevent fluid starvation. It is seen then that such required fluid will be supplied under gravity from the second fluid supply means 37 through check valve 58 into the second fluid inlet line 56 into the mixing means 35. Additionally, it is obvious that the pump suction to achieve the 50 gallons per minute into the pump means 14 will operate to additionally pull fluid through the detergent discharge line 68 to achieve the desired fluid discharge output from the pump means 14.

In the rinse condition of the carwash system 10, it is seen that the solenoid valve members 51 and 67 are placed in the nonenergized or closed condition. In this instance, it is seen that no water can be supplied through the first fluid inlet line 49 due to the solenoid valve member 51 being closed. However, there is still a requirement for 50 gallons per minute into the pump means 14 which is supplied to the second fluid inlet line 56 from the reservoir tank 53. Due to the large diameter of the second fluid inlet line 56, it is obvious that the same is capable of providing the desired and necessary 50 gallons per minute into the pump means 14 to assure its proper operation.

Assuming that the pump feed assembly 12 is operating under the heated, detergent wash cycle, let us again assume that there would be a failure in the solenoid valve member 51 thereupon ceasing fluid flow to the pump means 14. Under such conditions in a conventional system this would cease all fluid flow into the pump means 14 which would cause cavitation and fluid starvation with excessive damage to the pump means 14 itself. However, under the pump feed assembly 12 of this invention, it is seen that such cannot happen as fluid is continuously supplied to the pump means 14 regardless of failure of the control means 43 of the first fluid supply means 33. Also, on failure of the solenoid valve member 51 in the control means 43 to close, it is obvious that the check valve within the second fluid supply means 37 is operable to prevent fluid flow in the upper direction so as to overflow the reservoir tank 53.

Under particular conditions, it has been found that the combination of providing heated fluid through the pressure regulator valve 45 at a pressure of 75±5 p.s.i. at a temperature of 180±20° F. into the mixing means 35 through the first fluid inlet line 49 of one inch inside diameter has been satisfactory when also supplying fluid at a temperature of substantially 50° ±10° F. into the second fluid inlet line 56 as such achieves a fluid mixture through the discharge line 42 at a temperature of 120±10° F. which is extremely desirable for carwash installations. It is seen, therefore, that the diameter of the first inlet fluid line 49 must be related to its pressure as permitted through the pressure regulator valve 45 so as to achieve a desired fluid volume output to be fed into the pump means 14 to achieve the desired result. In other words, in a 50 gallons per minute pump means 14, it is found that supplying 180° F. fluid through the first fluid supply means 33 at a pressure of approximately 75 p.s.i. will achieve the desired result of 35 gallons per minute. Thereupon, it is found that 15 gallons of fluid supplied from the second fluid supply means 37 at its temperature of approximately 50° F. results in a fluid mixture having a temperature of approximately 120° F. sufficient to maintain the required fluid within the pump means 14.

It is obvious that various diameters of the first and second fluid inlet lines 49 and 56 and the discharge line 42 may be regulated to achieve the desired end result as required on various capacities of pump means 14.

It is seen that the pump feed assembly 12 of this invention provides a simplified means of selectively supplying various fluids into a common mixing center to achieve the desired end result while having means preventing fluid starvation due to mechanical or electrical failures which is an important consideration in the carwash industry. The pump feed assembly of this invention is simple to install, easy to understand and operate, and is positive in operation whereby providing safety and economical protection to fluid pumping systems.

While the invention has been described in conjunction with preferred specific embodiments thereof, it will be understood that this description is intended to illustrate and not to limit the scope of the invention, which has been defined by the following claims.

I claim:

1. A pump feed assembly, comprising;
 - a. a pump means,
 - b. a fluid mixing means having first and second fluid inlets and a discharge line connected to said pump means,
 - c. a first fluid supply means connected to said first inlet having a control means therein,
 - d. a second fluid supply means connected to said second inlet above said fluid mixing means having an unrestricted fluid flow channel under gravity to said fluid mixing means regardless of the status of said first fluid supply means,
 - e. said pump feed assembly operable under one set of conditions to supply a mixture of fluid from said first supply means and said second supply means to said pump means, and operable under a second set of conditions to supply fluid from said second supply means and operable under both said first and second set of conditions to supply fluid from said second fluid supply means whereby said pump means is always assured of fluid supply, and
 - f. a detergent means having a supply line connected to said mixing means operable under said one set of conditions to supply detergent to said discharge line through a discharge tube directed downstream.
2. A pump feed assembly as described in claim 1, wherein;
 - a. said control means including a valve member selectively movable from opened to closed conditions and a pressure regulator valve maintaining constant fluid pressure from said first fluid supply means to assure proper mixing with said second fluid supply means.
3. A pump feed assembly as described in claim 1, wherein;
 - a. said first fluid supply means connected to a fluid heater to supply fluid to said mixing means at a temperature of $180^{\circ}\text{F.} \pm 20^{\circ}\text{F.}$,
 - b. said second fluid supply means to supply fluid at a temperature of $50^{\circ}\text{F.} \pm 10^{\circ}\text{F.}$, and
 - c. said discharge line from said mixing means supplying said

fluid mixture at a temperature of $120^{\circ} \pm 20^{\circ}\text{F.}$ to said pump means under said one set of conditions.

4. A pump feed assembly as described in claim 1, wherein;
 - a. said control means having a pressure regulator valve to maintain a predetermined fluid pressure into said first fluid inlet means regardless of fluid demand of the overall system,
 - b. said second fluid supply means having a reservoir positioned above said mixing means to supply fluid under gravity to said mixing means, and
 - c. said mixing means having said first inlet of a size substantially smaller than said second inlet and said discharge line to achieve the desired fluid mixing.
5. A pump feed assembly as described in claim 1, wherein;
 - a. said pump means having a requirement of x gallons per minute,
 - b. said first inlet of a diameter to supply fluid to said mixing means less than x gallons per minute, and
 - c. said second inlet of a size to supply fluid to said mixing means at x gallons per minute less than supplied by said first inlet to assure at least x gallons per minute flow to said pump means.
6. A pump feed assembly as described in claim 1, wherein;
 - a. said second inlet and said discharge line have the same cross-sectional area,
 - b. said first inlet having a cross-sectional area of approximately 10 percent of the area of said second inlet to achieve the proper mixing function of this invention,
 - c. said first inlet to supply a first fluid at 180°F. and 75 p.s.i. to said mixing means,
 - d. said second inlet to supply a second fluid under gravity at 50°F. to said mixing means, and
 - e. said mixing means operable to discharge a fluid mixture at 120°F. to said pump means from mixing of said first and second fluids.
7. A pump feed assembly as described in claim 1 wherein;
 - a. said detergent means having said supply line connected to a venturi valve to direct detergent into said discharge line, and a pressure fluid supply line connected to said venturi valve operable under said one set of conditions to supply detergent to said fluid mixing means at a predetermined constant rate to achieve constant car washing results.