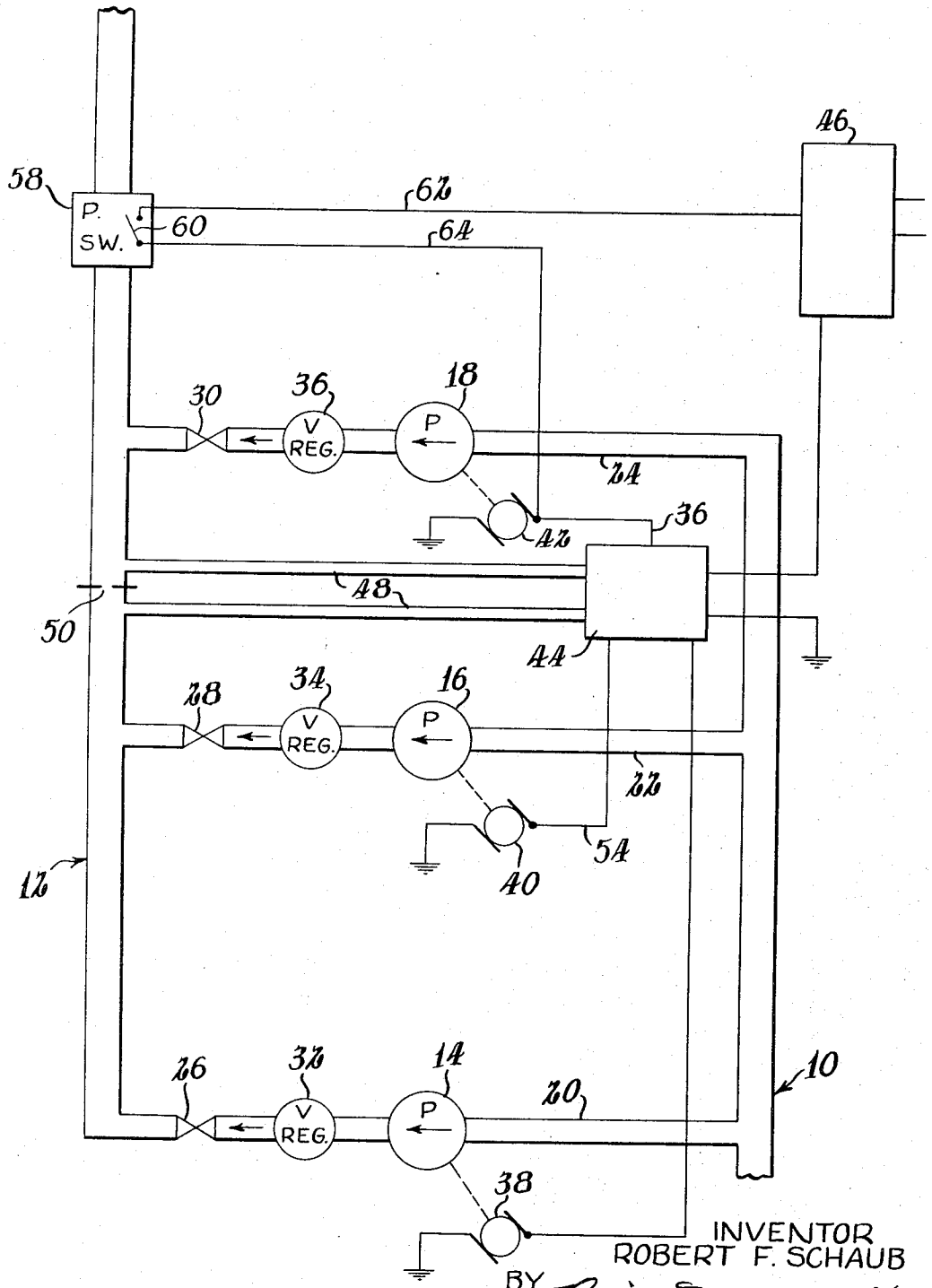
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COMBINATION FIRE AND DOMESTIC WATER SYSTEM

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COMBINATION FIRE AND DOMESTIC WATER SYSTEM

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ABSTRACT OF THE DISCLOSURE

A tankless pumping system for supplying water under both normal operating conditions and under emergency operating conditions. The system includes a water inlet line and a water outlet line. First, second, and third pumps are connected in parallel between the inlet line and the water outlet line. The first and second pumps provide for delivery of water to the outlet during normal conditions, and the third pump delivers water to the outlet line under emergency conditions. A flow sensing device senses when water passes through the first and second pumps and determines the existence of emergency flow conditions in the outlet line. A device is responsive to the flow sensing device for operating the third pump to provide sufficient water to meet the emergency flow conditions.

This invention relates to a novel tankless pumping system useful for both domestic and emergency use.

In my co-pending application Ser. No. 276,328 entitled "Combination Domestic and Firewater Pumping System," there is disclosed a tankless pumping system for both domestic use and fire and/or emergency use. Although the system described in said application is highly satisfactory and reliable in use, one disadvantage of the system is that two substantially separate plumbing systems are required for fire control use and for domestic use.

The requirement of two completely separate plumbing systems is disadvantageous primarily because the overall cost of the system is significantly increased by the requirement of having two separate plumbing arrangements which actually carry water to the same general area. For example, in a multi-story building, separate piping is normally used for both the fire system and for the domestic system although the water is carried to the same floors; the economic disadvantage of such an arrangement is obvious. Furthermore, the use of two separate plumbing or piping systems has a further significant disadvantage since the water in the fire system becomes stagnant after a period of time and if there is any backflow of the stale water through a faulty check valve, for example, the stagnant or stale water mixes with the fresh water in the domestic system thereby causing fouling thereof, which adversely affects the taste of the drinking water.

It is therefore an important object of the invention to provide an improved combination domestic and emergency pumping system wherein substantially the same plumbing is utilized for both domestic use and for emergency use.

It is also an object of this invention to provide an improved tankless pumping system for both domestic and emergency use, including fire control use, wherein the problem of water stagnation in a fire water line is overcome by using the same line for both fire use and for domestic use.

It is a further object of this invention to provide an improved combined domestic and emergency water pumping system wherein a multiplicity of various size pumps are connected between a water inlet source and a pressurized water outlet which is used for ordinary domestic purposes and for emergency and/or fire control use.

It is another object of this invention to provide a tankless pumping system useful for both ordinary domestic use and for emergency use wherein the plumbing arrangement is characterized by its simplicity and economy of construction and manufacture.

It is still a further object of this invention to provide an improved tankless pumping system for domestic and emergency or fire control use wherein a single large pump is utilized only for emergency conditions, that is, when another pump in the system fails or when there is a high water flow rate required for a fire.

Further purposes and objects of this invention will appear as the specification proceeds.

The accompanying schematic diagram illustrates a particular embodiment of my novel tankless pumping system used for both domestic use and for emergency and fire control use.

Referring to the drawings, the pumping system shown takes water from an inlet conduit **10** which may be the main of a city water system or which may lead to a tank or well which may or may not use a separate pump. The water which passes from the water supply **10** is pumped to an increased pressure into a water supply conduit **12**. The single water supply conduit **12** is useful for both emergency use and for ordinary domestic conditions and the means used so that only a single conduit is required will be described hereinafter in detail.

In the particular pumping system illustrated, three pumps are shown, although more or less pumps may be used, as desired. Pumps **14**, **16** and **18** are connected in parallel between the water inlet conduit **10** and the pressurized water supply conduit **12**. Each of the pumps **14**, **16** and **18** is sized in accordance with the needs of the particular system.

The first pump **14** at the beginning of the conduit **12** is a low capacity pump and is used the vast majority of the time during which the system is in use. The second or intermediate pump **16** is desirably larger and, for example, may be approximately twice as great in capacity as the first pump **14** and has a capacity sufficient to meet all demands of domestic use even at relatively high flow requirements. In one particular embodiment, the first or lead pump **14** is rated at 55 gallons per minute while the second or intermediate pump **16** is rated at 105 gallons per minute.

Each of the pumps **14**, **16** and **18** is connected in parallel between the conduits **10** and **12** in the conduits **20**, **22** and **24**, respectively. Desirably, pressure regulators or constant pressure regulating valves **32**, **34** and **36** are connected in the conduits **20**, **22** and **24** intermediate the respective pumps and their conduit connections to the main water conduit **12**. Also, hand valves **26**, **28** and **30** are desirably provided in the conduits **20**, **22** and **24** intermediate the pressure regulators **32**, **34** and **36** and the conduit connections to the water supply line **12**. The pumps **14**, **16** and **18** are each operated by electric motors **38**, **40** and **42**, respectively. One side of each motor is grounded while the other side of each is electrically connected to a flow regulator switch arrangement **44**. The flow regulator switch arrangement **44** is grounded on one side and on another side receives electrical power from an electrical source or control board **46**. The flow regulator switch mechanism **44** is connected through a pair of conduits **48** to the opposite sides of a flow orifice or restriction **50** located in the water supply conduit **12**.

In my pumping system, the third pump **18** is a high capacity pump and is designed to operate only under emergency conditions, that is, when one of the pumps **14** and/or **16** fails or when there is high flow requirement, such as would occur when water is required for controlling a fire. As an example, when the lead pump **14** is rated at 55 gallons per minute and when the intermediate

pump **16** is rated at 105 gallons per minute, the emergency pump **18** in my system is rated at 350 gallons per minute, which is more than twice the capacity of the first two pumps combined. Because of the exceedingly high flow rate of the third pump, discharge from or intake of the third pump should not pass through the orifice **50** because of the excessive pressure drop which would occur across the orifice. Therefore, it is an important feature of my system to connect the large emergency pump **18** to the water supply conduit **12** and to the inlet conduit **10** in such a way that the pump **18** does not discharge across or intake from the plate, while at the same time only the smaller pumps discharge across or intake from the orifice plate **50**.

The flow regulating switch mechanism **44** is responsive to flow through the water supply conduit **12** from the two lead pumps only, through the conduits **48** which are connected to opposite sides of the orifice plate **50**. Thus, when the flow rate through the water supply conduit **12** is below a first predetermined value, the flow rate through the orifice **50** is sensed by the flow mechanism **44** through the conduit **48**. The switches of the flow mechanism **44** permit the electrical power to pass only through the electrical connection **52** to the lead pump motor **38** for operating the pump **14**. When the flow exceeds the first predetermined value, the flow regulator switch mechanism **44**, by sensing the flow through the conduit **12**, cuts off electricity to the electrical line **52** and thereby motor **38** and provides electrical power only for electrical line **54** so as to operate the second pump motor **40** for the intermediate flow pump **16**. Pump **16** continues to operate alone until the flow drops below the first predetermined flow rate or increases above a second predetermined flow rate, which would be required, for example, for an excessively high domestic system demand. When the flow past the orifice **50** exceeds the second predetermined value, the switch mechanism **44** provides power for the electrical motor connections **52** and **54** so that both motors **38** and **40** operate the pumps **14** and **16**. When the flow through the orifice plate **50** finally exceeds a third predetermined value, which would be required, for example, for fire control, the flow regulator switch mechanism **44** provides power for all electrical motor connections **52**, **54** and **56** so that all three pump motors **38**, **40** and **42** operate the pumps **14**, **16** and **18** to provide the necessary water flow. Thus, even at high flow rates, the required flow and pressure are maintained in the conduit **12** for domestic use as well as for emergency use. Once the high capacity pump starts, it is locked in and must be manually reset.

In my system, it is preferred that a pressure switch **58** be connected in the conduit **12**, as upstream of the connection of the discharge side of the pump **18** to the line **12**. The particular location of the pressure switch **58** is not greatly important as long as it is responsive, without significant delay, to the pressure in the conduit **12**. The purpose of the pressure switch **58** is to activate the emergency pump **18** in the event that the pressure drops below a predetermined value. This may occur, for example, when the flow past the orifice **50** does not exceed the first or second predetermined values, but the pressure in the conduit **12** may drop to an undesirably low level due to failure of the first and/or second pump. When the pressure in the conduit **12** drops below the predetermined value, the pressure switch **58** closes a switch **60** which permits electrical power to pass through the control panel **46**, through the switch connection **62**, through the switch **60**, and through the motor connection **64** to the pump motor **42** so as to operate the emergency pump **16**.

In my improved pumping system, the lower capacity pumps **14** and **16** together with the emergency pump **18** provide a high flow rate for fire service. The emergency pump **18** actually has a dual purpose since it acts as a standby for the domestic system in the event that one of the other pumps fails. In the case of pump failure, only the emergency pump **18** operates in response to the pressure switch **58** detecting low pressure in the system.

It is preferred that a pressure regulator valve **36** be utilized on the discharge side of the pump **18** so as to avoid excessive pressure in the conduit **12** when the required emergency flow rate is below the total capacity of the three pumps which operate at the same time for fire control use.

It is seen that our single loop tankless pumping system has significant advantages since it is highly economical because of the single water supply conduit **12** being used for both domestic and emergency or fire control use, whereas in previous systems, two separate piping systems were required. Also, there is no problem of water stagnation in my system since the water supply conduit **12** is used at all times and fresh water is always being pumped through the conduit.

While in the foregoing, there has been provided a detailed description of a particular embodiment of the present invention, it is to be understood that all equivalents obvious to those having skill in the art are to be included within the scope of the invention as claimed.

What I claim and desire to secure by Letters Patent is:

1. A tankless pumping system for supplying water under both normal and emergency conditions, said system comprising a water inlet conduit, a water supply conduit, first pump means and second pump means connected in parallel between said water inlet conduit and said water supply conduit, said first pump means providing pressurized water to said water supply conduit under normal conditions while said second pump means provides water to said water supply conduit only under emergency conditions, a flow indicator including an orifice in said water supply line and being positioned intermediate the connections of said first and second pump means to said water supply conduit, means responsive to said flow indicator when said indicator determines the existence of emergency flow conditions so as to operate said second pump means and provide sufficient fluid to said water supply conduit, means for sensing the existence of emergency pressure conditions in said fluid supply line, and means responsive to said sensing means for operating said second pump means when said sensing means indicates the existence of emergency pressure conditions in said water supply conduit.

2. The system of claim **1** wherein a pressure regulator is connected between said second pump means and said water supply conduit.

3. A tankless pumping system for supplying fluid under normal conditions and under emergency conditions, said system comprising a water inlet conduit, a water supply conduit, first, second, and third pumps connected in parallel between said conduits, said first pump operating when the flow of water in said water supply conduit is below a first predetermined value, said second pump operating when the flow in said water supply conduit is above said first predetermined value and below a second predetermined value, and said third pump operating only when said flow is above said second predetermined value indicating the existence of emergency flow conditions, a flow orifice plate in said water supply conduit and being connected in said water supply conduit downstream of the connection of said third pump to said water supply conduit and upstream of said second pump so that only water from said first and second pumps passes through said orifice plate, means associated with said orifice plate for determining the flow in said water supply conduit, and means responsive to said determining means for stopping said first pump and starting said second pump when the flow is above said first predetermined value and for operating all three pumps when the flow is above said second predetermined value so that sufficient water is provided to said water supply conduit to meet emergency flow conditions.

4. The system of claim 3 wherein a pressure switch is connected in said water supply conduit for determining the existence of emergency pressure conditions in said conduit, and means responsive to said pressure switch for operating said third pump so as to provide sufficient water to meet emergency pressure conditions in said water supply conduit.

5. The system of claim 3 wherein a pressure regulator valve is connected between said third pump and said water supply conduit.

6. A tankless pumping system for supplying water under both normal conditions and emergency conditions, said system comprising a water inlet conduit, a system pressurized supply conduit, first, second and third pumps connected in parallel between said conduit, said first and second pumps providing for the delivery of water to said system during normal flow conditions, said third pump providing for the delivery of water to said system supply conduit only under emergency conditions, flow sensing means located in one of conduits so that only water passing through said first and second pumps passes therethrough, said flow sensing means determining the existence of emergency flow conditions in said supply conduit, and means responsive to said sensing means for operating said

third pump so as to provide sufficient water to meet the emergency flow conditions.

7. The system of claim 6 wherein pressure switch means are in said water supply conduit for sensing the existence of emergency pressure conditions, and means are provided for operating said third pump in response to an indication from said pressure sensing means that emergency conditions exist in said pressurized supply conduit.

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