May 21, 1968 R. C. SADDISON 3,384,123

FREEZE PROTECTOR

Filed May 27, 1966 2 Sheets-Sheet 1

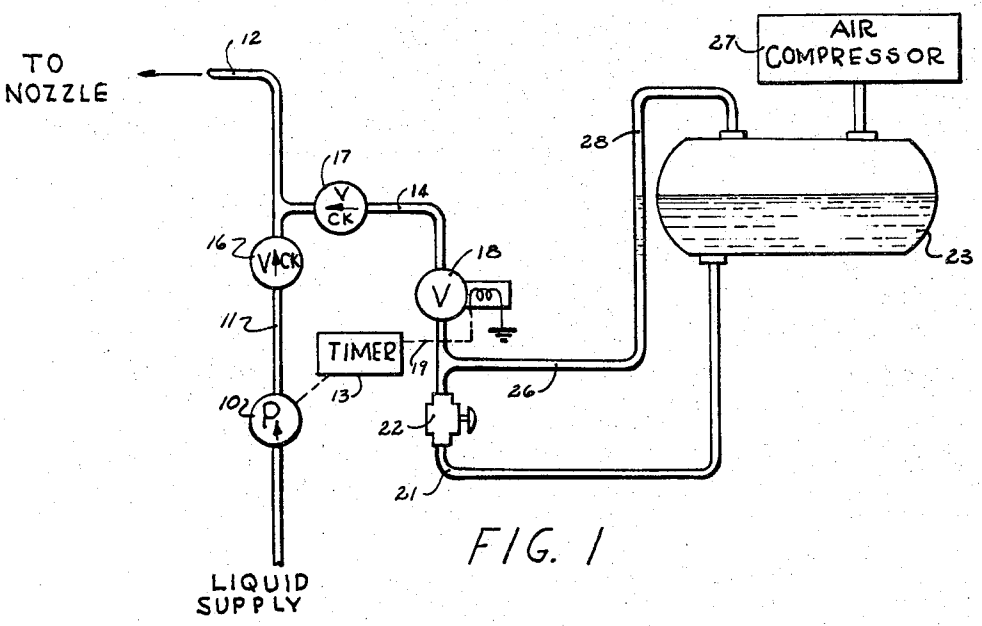

FIG. 1

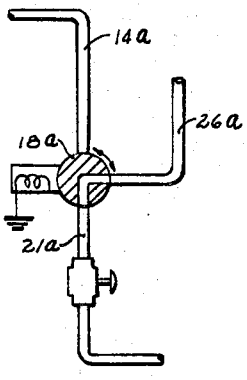

FIG. 2

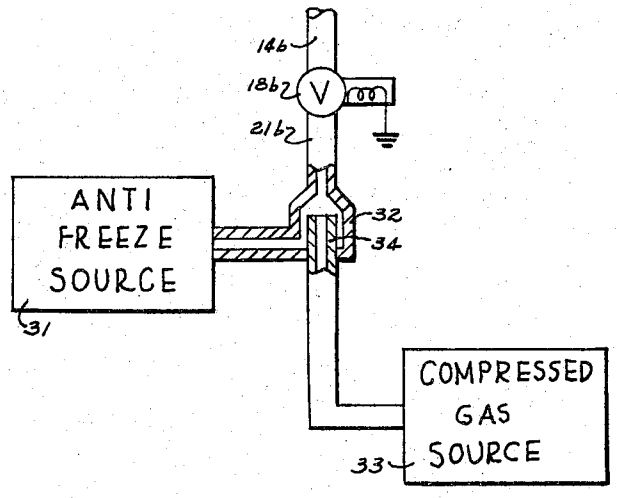

FIG. 3

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FREEZE PROTECTOR

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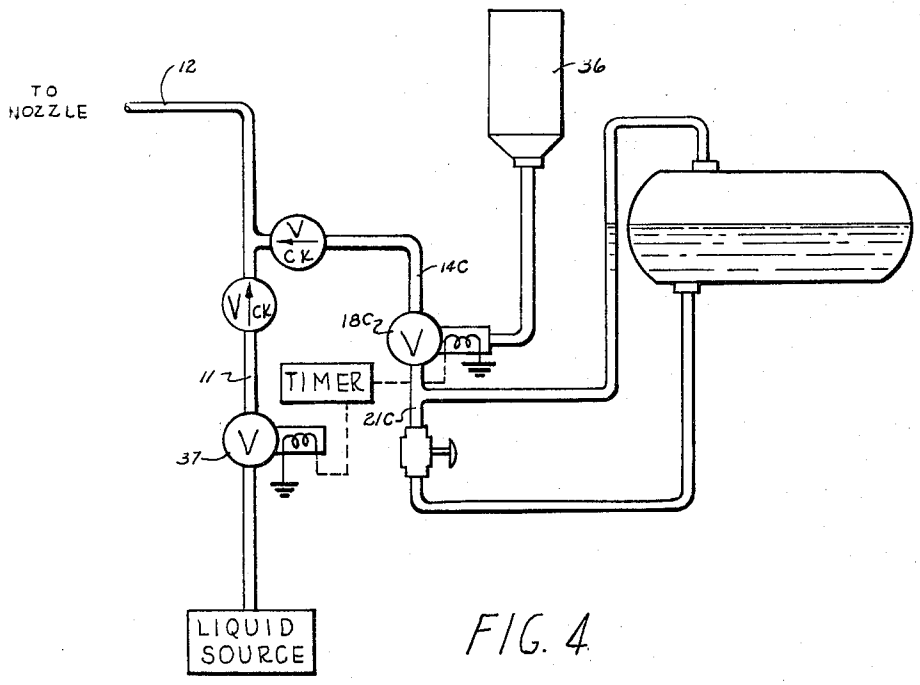

FIG. 4

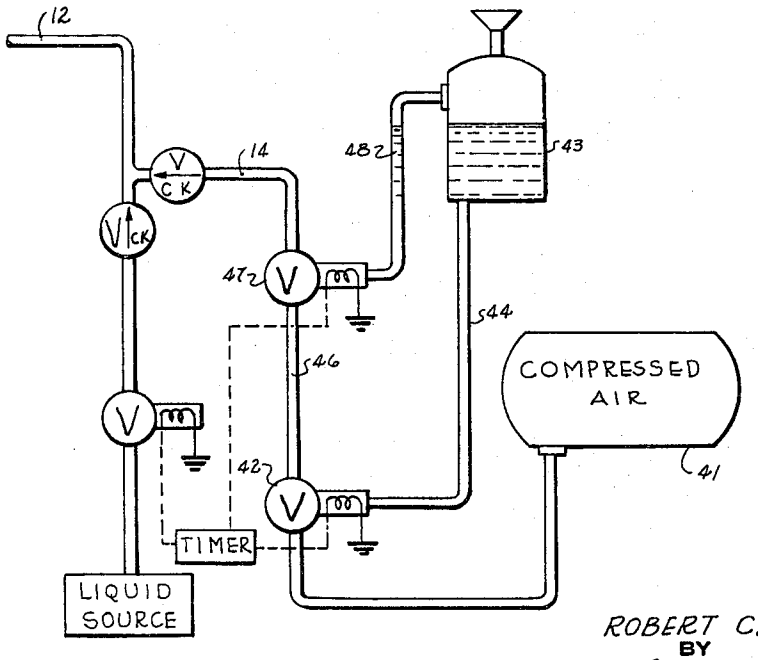

FIG. 5

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FREEZE PROTECTOR

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This invention relates to a system for preventing a freezable liquid from freezing in conduits and, more particularly, relates to a freeze protecting system for self-service car wash units, which system will prevent water from becoming frozen in conduits which are exposed to below-freezing temperature conditions.

The invention was specifically developed for use in self-service car wash units and, accordingly, the following description will proceed primarily with reference thereto. However, it will be understood that the invention can be used in other environments and that the following description of one particular use of the invention is given for illustrative purposes only and is not of limiting significance.

The conduits that supply water, soap, etc., to self-service car wash units usually are exposed to the ambient air in whole or in part so that if the ambient air temperature is below freezing and if water is stationary in the conduits, freezing of the water can occur which can cause damage to the conduits and associated fittings and which at least will require unthawing of the stoppage. A common way to avoid this problem is to continuously flow water through the conduits at a slow rate when freezing conditions are likely to occur. However, this procedure wastes water and, perhaps more importantly, creates unsafe conditions because the water discharged from the conduit can freeze on the floor of the car wash unit. When the car wash unit is not used for several hours, the amount of ice thus formed can be quite substantial and can constitute a significant hazard to the users of the car wash unit. In some cases special draining arrangements are provided to remove this water and this increases the cost of the installation appreciably.

Other prior art apparatuses intended for dealing with this problem have done so by blowing air through the conduit in an attempt to discharge all of the water therefrom before freezing can occur. However, these apparatuses do not remove any ice which already may have formed in the conduit. Moreover, often not all of the water is removed from the conduit in this fashion so that the remaining water can collect in low spots and freeze so that stoppage of the conduit can take place. Also, drops of water can freeze in the nozzle when air is used to blow water out of the line.

Still other prior art apparatus use electric heating means, such as tapes wrapped around the pipes, to prevent freezing. These are not completely satisfactory because of increased installation and operation costs. Also, such installations are bulky and are easily broken. Moreover, it has not been possible to heat the nozzle which is the place where freezing is most likely to occur.

Further, since self-service car wash units usually are unattended, a freeze protecting system for use therewith must be capable of automatic operation in response to the ending of a car washing cycle without requiring intervention by the operator or user of the car wash unit.

Accordingly, it is an object of this invention to provide an improved system for preventing the freezing of a freezable liquid in conduits by which system a predetermined amount of an antifreeze liquid is forced through the conduit and also a gas, such as air, is forced through the conduit to remove substantially all of the liquid remaining therein.

It is a further object of this invention to provide an improved system, as aforesaid, in which the operation of the freeze protecting system is automatically responsive to operation of the timing control of the car wash unit and will function automatically a selectable time after completion of a car washing cycle in order to prevent freezing of the liquid in the conduit.

It is a further object of this invention to provide a freeze protecting system, as aforesaid, which does not require any major alteration of the car washing unit with which it is used so that the freeze protecting system can be added to existing car washing units or sold as an optional accessory with new car washing units.

A further object of this invention is to provide a freeze protecting system, as aforesaid, which is made of relatively inexpensive and durable components so that it can be manufactured and assembled inexpensively and so that it will operate effectively with a minimum of maintenance.

Other objects and advantages of this invention will become apparent to persons acquainted with equipment of this type upon reading the following disclosure and inspecting the accompanying drawings.

In the drawings:

FIGURE 1 is a schematic illustration of a freeze protecting system according to the invention used in conjunction with a car washing unit.

FIGURE 2 is a fragmentary schematic view of a modification of the system.

FIGURE 3 is a fragmentary schematic view of a second modification.

FIGURE 4 is a schematic view of yet another modified system according to the invention.

FIGURE 5 is a schematic view of still another modified system according to the invention.

According to the invention, there is provided a system of preventing the freezing of liquids in conduits through which a freezable liquid is adapted to flow. The system includes a source of antifreeze and a compressed gas source, such as a compressed air source, both of which are connected to the conduit through which the freezable liquid can flow in order that antifreeze and a pressurized gas can be supplied to the conduit. Suitable control means are provided for alternatively supplying freezable liquid to the conduit or connecting the antifreeze source and the compressed gas source to the conduit whereby when the flow of freezable liquid is stopped, the antifreeze and compressed gas can then be supplied to the conduit in order to remove substantially all of the liquid remaining in the conduit. A small, but sufficient, amount of the antifreeze may remain in the conduit in order to prevent subsequent freezing of any liquid remaining in the conduit after the compressed gas flow has been terminated.

The invention can be embodied in a variety of modifications, several of which are described herein.

Referring to FIGURE 1, there is shown a suitable source of a liquid under pressure which is connected by a supply conduit **11** to a further conduit **12**. Here the liquid source comprises a pump **10**, although it will be understood that the liquid can be supplied under the pressure of a city water supply system or under gravity flow conditions. For illustrative purposes, the conduit **12** is here indicated as being connected to the nozzle (not shown) of a car wash unit. The conduit **12** is assumed to be exposed to the ambient air so that the liquid therein can freeze when the ambient air temperature is below freezing. It will be understood that the pump **10** can be connected to a source of hot water and a car washing agent, but these are not shown because they are conventional and form no part of the present invention. The operation of the pump is controlled by a suitable timer **13** in a conventional fashion.

The freeze protecting system includes a conduit **14** which is connected to the conduit **12**. Check valves **16**

and 17 are provided in the conduits 11 and 14 so that fluids can flow from said conduits to the conduit 12, but not in the reverse direction.

A solenoid valve 18 has an outlet port connected to the conduit 14 so that flow of fluid into and through said conduit is controlled by said valve. The operating coil of the solenoid valve 18 is connected as indicated by the broken line 19 to the timer 13 so that operation of said valve is under the control of the timer. The timer 13 normally is arranged so that the solenoid valve 18 is opened a short time after the pump 10 is turned off, as will be described in greater detail hereinbelow.

The inlet port of the solenoid valve 18 is connected to one end of a conduit 21 which has an orifice of controllable size, such as a needle valve 22, therein. The needle valve 22 permits fluid to flow through the conduit 21 at a relatively slow controllable rate as described in detail hereinbelow. The other end of the conduit 21 is connected to the lower side of a tank 23 which is partially filled with a suitable antifreeze liquid, such as an isopropyl alcohol solution. Thus, the antifreeze can flow from the tank 23 through the conduit 21 at a rate controlled by the setting of the needle valve 22.

One end of branch conduit 26 is connected to the conduit 21 at a point between the inlet port of the solenoid valve 18 and the orifice 22. The branch conduit 26 has an upright intermediate portion and its other end is connected to the tank 23 adjacent the upper end thereof. A source of a pressurized gas, such as an air compressor 27, is connected to the tank 23 so that the upper portion of the tank is filled with gas under pressure. The arrangement is such that when the valve 18 is closed, antifreeze liquid flows through the conduit 21 and orifice 22 into the branch conduit 26 and rises therein to substantially the same height, as indicated at 28, as the height of the antifreeze liquid in the tank. In effect, the antifreeze liquid in the branch conduit 26 forms a measured charge which is discharged through the conduits 14 and 12 when the solenoid valve 18 is opened.

OPERATION

While the operation of the apparatus has been indicated above, the same will be described in additional detail in order to assure a complete understanding of the invention.

When the pump 10 is operating, liquid is supplied to the conduit 12 and thence to the car washing unit under the control of the timer 13. The valve 18 is closed at this time and antifreeze liquid flows from the tank 23 through the conduit 21 and orifice 22 into the branch conduit 26 and it rises therein to the level indicated at 28.

A selected time after the timer 13 turns off the pump 10 at the end of a car washing cycle, the solenoid valve 18 is opened. The antifreeze in branch conduit 26 is under the pressure of the compressed gas in the tank 23 and it is forced through the valve 18 and conduit 14, thence into conduit 12 and through the nozzle. The antifreeze liquid is immediately followed by compressed gas from the tank 23 which removes substantially all of the liquid remaining in the conduits 14 and 12. While some of the liquid may remain in these conduits, there also will remain some antifreeze which will reduce the freezing point of any liquid remaining in the conduits so that the likelihood that the liquid will freeze is minimized.

Although the orifice 22 is continuously open, it is so arranged and adjusted that the antifreeze can flow therethrough at a slow rate. Thus, after substantially all of the anti-freeze in conduit 26 has flowed out through the valve 18, antifreeze flows at a slow rate through the orifice 22 and is picked up by the flowing gas stream and forms an antifreeze mist therein.

After the valve 18 has been open for an appropriate period of time, which usually is only a few seconds, it is then closed by operation of the timer 13. The antifreeze liquid can then flow through the orifice 22 into

the branch conduit 26 at a relatively slow rate until it reaches the level 28 therein. The apparatus is then ready to repeat the freeze protecting cycle.

MODIFICATIONS

FIGURE 2 illustrates a modification in which the solenoid valve 18*a* has three ports and the valve element is movable to connect two of the ports to each other at one time. The conduit 21*a* is connected to one port of the valve 18*a*, conduit 26*a* is connected to a second port and conduit 14*a* is connected to the third port of the valve. In the closed position of the valve 18*a* as illustrated, conduit 21*a* is connected to the conduit 26*a* so that the antifreeze liquid can flow from the conduit 21*a* to the conduit 26*a*. In the open position of the valve, conduit 26*a* is connected to the conduit 14*a*. The operation of this embodiment is the same as in the previously described embodiment but it will be noted that in this embodiment the antifreeze supply is completely isolated from the conduit 26*a* during the time that the antifreeze is being supplied to the conduits 14*a* and 12.

FIGURE 3 illustrates a further modification in which the antifreeze is supplied from a source 31 to an aspirating fitting 32 which is connected to the conduit 21*b*. A compressed gas is supplied from the source 33 to a nozzle 34 in the fitting 32. Thus, when the valve 18*b* is open so that the compressed gas can flow into and through the conduit 21*b*, droplets of antifreeze are aspirated into the flowing gas stream in the conduit 21*b* to form a mist therein which is then fed to the conduits 14*b* and 12.

FIGURE 4 illustrates another modification in which the solenoid valve 18*c* is a three-port valve. The accumulator chamber 36 is connected to one port of the valve 18*c*. Conduit 21*c* is connected to the second port of the valve 18*c* and conduit 14*c* is connected to the third port of the valve. In one position of the valve, conduit 21*c* is connected to the accumulator chamber 36 so that a charge of liquid and gas under pressure is stored in the accumulator chamber. In the other position of the valve, the accumulators chamber 36 is connected to the conduit 14*c* so that the antifreeze and liquid that accumulates in the chamber 36 can flow to the conduits 14*c* and 12.

FIGURE 4 also illustrates a modification in which the supply of the washing liquid is controlled by a valve 37 in line 11, instead of turning on or turning off a pump as is the case in the embodiment of FIGURE 1. The valve 37 can be used in any installation where a pump supplies liquid to more than one car washing unit or where the liquid is supplied by city water pressure or gravity flow, rather than by a pump.

FIGURE 5 shows still another modification in which a source 41 of gas under pressure is connected to one port of a three-way valve 42. A tank 43 of antifreeze is connected by a conduit 44 to another port of the valve 42. A conduit 46 is connected between the third port of the valve 42 and the first port of a further three-way valve 47. A second port of valve 47 is connected by a conduit 48 to the upper part of tank 43 and the third port of valve 47 is connected to the conduit 14.

When the valves 42 and 47 are positioned so that conduit 44 communicates with conduit 46 and conduit 46 communicates wtih conduit 48, the antifreeze will fill conduit 46 and part of conduit 48. When the valves 42 and 47 are shifted, air from tank 41 will flow through valve 42 and force the antifreeze present in conduit 46 through the valve 47 and thence through the conduits 14 and 12.

All of the embodiments of the invention provide for the supply of antifreeze and a compressed gas to a conduit in order to remove stoppages in the conduit and in order to remove substantially all of the liquid remaining in the conduit. If any liquid remains in the conduit after the pressurized gas stops flowing therethrough, there will also remain some antifreeze which will remain in the

liquid to lower its freezing point and thus, minimize the likelihood of a further stoppage occurring.

It will be understood that the freeze protecting system can be disabled, for example, when freezing conditions are not likely to occur, by disconnecting the control for the solenoid valve of the freeze protecting system from the timing control of the car wash unit. Also, the time period between the end of a car wash cycle and operation of the freeze protecting system can be adjusted as needed in view of the ambient temperature conditions and the expected frequency of use of the car wash unit.

While particular preferred embodiments of the invention have been described, the invention contemplates such changes or modifications as lie within the scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A system for preventing the freezing of liquids in conduits, comprising:

first conduit means and supply means for effecting the supply of a freezable liquid to said first conduit means;

a second conduit means connected to said first conduit means;

a source of an antifreeze and a compressed gas source, both of which are connected for supplying antifreeze and pressurized gas to said second conduit means;

control means for alternatively connecting (1) said supply means, and (2) said antifreeze source and said compressed gas source, to said first conduit means.

2. A system according to claim **1**, in which said control means includes valve means for controlling the flow of gas and antifreeze through said second conduit means to said first conduit means, timing means connected for operating said supply means and said valve means alternatively so that compressed gas and antifreeze is supplied to said first conduit means a selected time after said supply means terminates supply of the freezable liquid to the first conduit means.

3. A system according to claim **1**, in which said sources of antifreeze and compressed gas comprise a tank partially filled with antifreeze liquid and the remainder of the tank being filled with compressed gas, further conduit means defining a circuit extending between the liquid-containing portion of the tank and the gas-containing portion of the tank, means defining a restricted orifice in said further conduit means whereby the liquid in the further conduit means can reach substantially the same height therein as the height of the liquid in the tank at a controllable rate, said second conduit means being connected to said further conduit means at a position between said orifice and the level the liquid reaches in the further conduit means.

4. A system according to claim **3**, in which said control means includes a valve in said second conduit means at a position spaced from the connection of the further conduit means to said second conduit means.

5. A system according to claim **3**, in which said control means includes a valve connected at the juncture of said further conduit means and said second conduit means, said valve being adapted alternatively to connect (1) the two sections of the further conduit means on opposite sides of said valve, and (2) the upper section of said further conduit means to said second conduit.

6. A system according to claim **1**, in which said compressed gas source is connected to said second conduit means by a third conduit, the antifreeze source being connected to said third conduit and there being an aspirating fitting means at the position where the antifreeze source is connected to said third conduit so that flow of compressed gas through said third conduit will aspirate antifreeze into the flowing gas stream so that it forms a mist therein.

7. A system according to claim **4**, in which the valve has a first port connected to the further conduit means, a second port connected to an accumulator and a third port connected to the second conduit, said valve being movable between a first position in which said first and second ports are connected and a second position in which the second and third ports are connected.

8. A system according to claim **2**, in which said valve means comprises a pair of valves, one valve having first port connected to a source of compressed gas, a second port connected to a supply of antifreeze and a third port, the other valve having a first port connected to the third port of said one valve, a second port connected to the antifreeze supply and a third port connected to said second conduit, means for moving said valves simultaneously between first positions in which the first and second ports of each valve are connected to each other and second positions in which the first and third ports of each valve are connected to each other.

References Cited

UNITED STATES PATENTS

2,172,882	9/1939	Watkins	138—34 X
2,229,498	1/1941	Farmer	138—34 X
3,140,720	7/1964	Griswold	137—59

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