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[54] SPRINKLER ACCELERATOR SYSTEM WITH PRESSURE CHANGE DETECTOR

7 Claims, 2 Drawing Figs.

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[51] Int. Cl. A62c 35/00
[50] Field of Search 239/75, 569; 169/16, 17, 19, 20, 22

[56] **References Cited**

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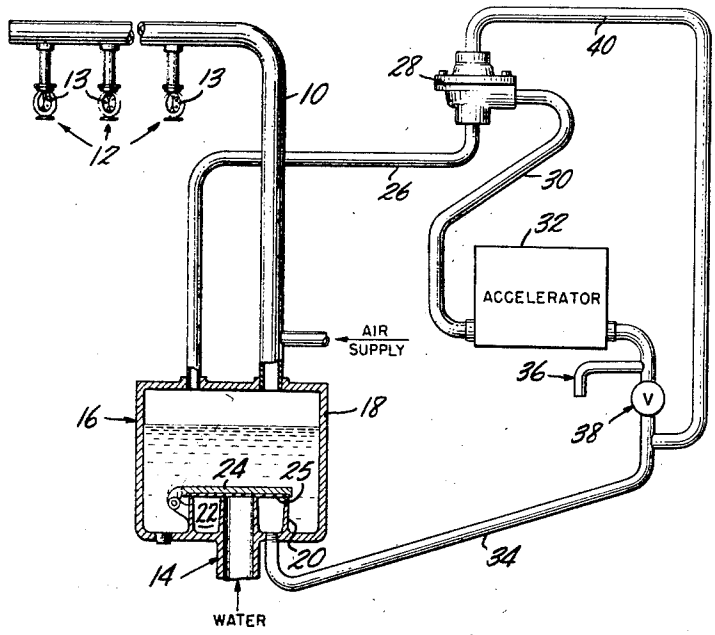
ABSTRACT: In the particular embodiment of the invention disclosed herein, a dry pipe sprinkler system comprises a sprinkler pipe communicating with a plurality of sprinkler heads and normally containing air under pressure. A water pipe normally containing water under pressure is connected to the sprinkler pipe by a dry pipe valve which normally prevents the passage of water. When a sprinkler head is actuated, the dry pipe valve opens and allows the water to flow thereto. For more rapidly opening the dry pipe valve, an accelerator valve responsive to a pressure drop in the sprinkler pipe, directs air to the dry pipe valve so as to increase the pressure on one side thereof. A pressure-responsive control valve is associated with the accelerator valve and normally allows the passage of air to the accelerator valve; however, when the dry pipe valve opens, the control valve closes, thus preventing the passage of water to the accelerator valve.



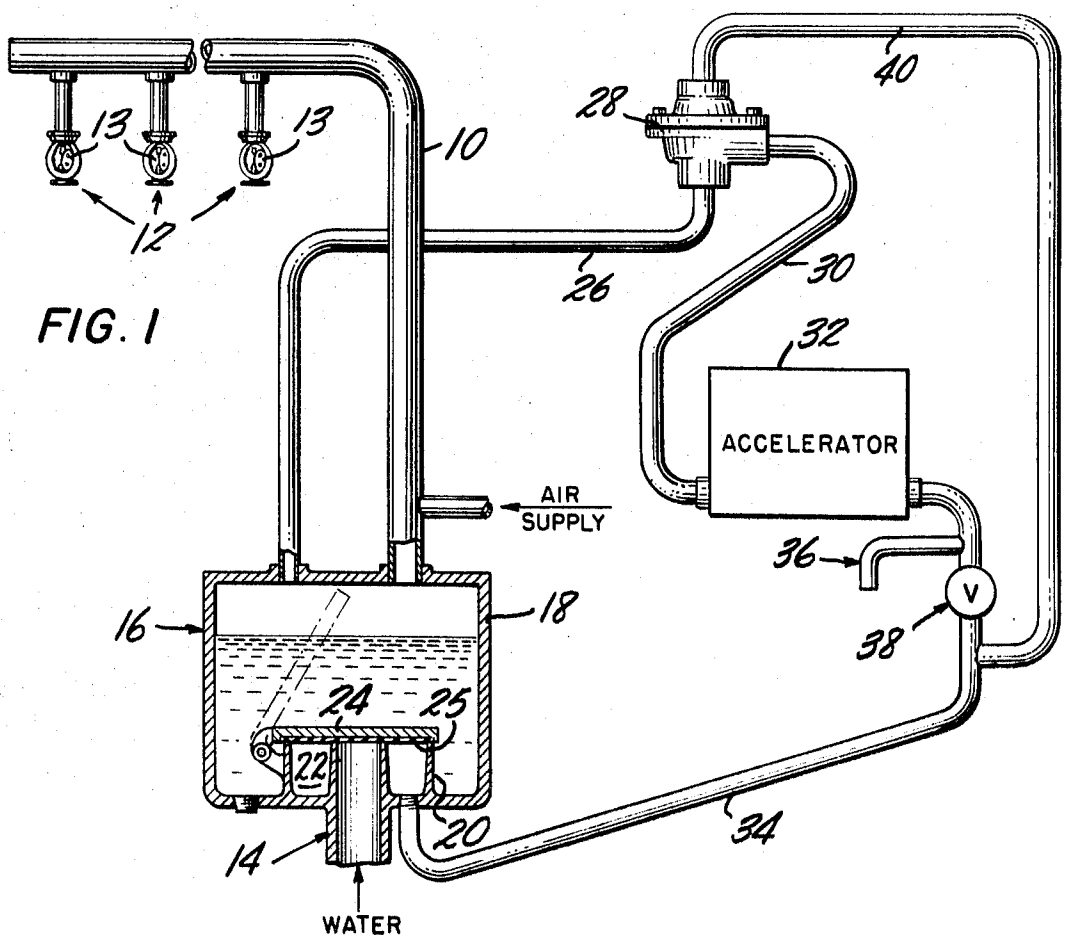


FIG. 1

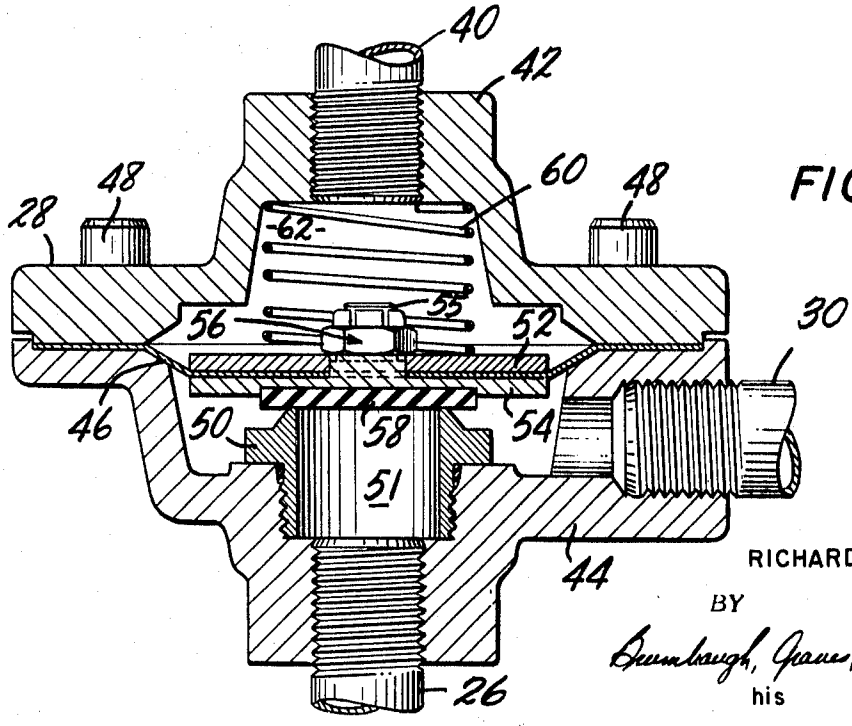


FIG. 2

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SPRINKLER ACCELERATOR SYSTEM WITH PRESSURE CHANGE DETECTOR

BACKGROUND OF THE INVENTION

In order to reduce fire insurance rates and premiums, it is usual to provide buildings with a sprinkler system so that when a fire occurs, the system is actuated and provides a water spray over the burning area. In cold climates where the ambient temperature is below freezing, it is usual to provide a dry pipe system, that is, one having air rather than water in the sprinkler pipes. This prevents water from freezing in the sprinkler pipes. Dry pipe systems are connected to a water supply by a dry pipe valve and generally utilize an accelerator valve which is responsive to a pressure drop in the sprinkler pipe to hasten the opening of the dry pipe valve and, consequently, the flow of water to the sprinkler heads. Without an accelerator valve, the dry pipe valve would open after a relatively long delay during which the fire could spread to other areas.

When the dry pipe valve opens, water flows to the accelerator valve and carries with it rust and other debris from the sprinkler pipe which is deposited on the internal parts of the accelerator valve. Since accelerator valves are usually delicate pieces of equipment, such deposits will cause future malfunctions. It is necessary, therefore, once the system has been opened, to drain the accelerator valve, disassemble and clean it, then reassemble it into its operative position. Disassembly of these valves is time-consuming and expensive because of their complex nature.

SUMMARY OF THE INVENTION

In accordance with the invention disclosed herein, a control valve mechanism is provided that allows the passage of air from the sprinkler pipe to the accelerator valve, but upon actuation of the system, will rapidly close to prevent the flow of water and debris thereto.

More specifically, this invention comprises a pressure responsive control valve that is interposed between a sprinkler pipe and an accelerator valve and which also communicates with a dry pipe valve. Normally, the control valve is held in an open position by the air pressure in the sprinkler system so that air can flow between the sprinkler pipe and the accelerator valve. When the dry pipe valve opens, the pressure differential across the control valve is reduced, causing the control valve to close thereby preventing the passage of water and debris to the accelerator valve. Since the accelerator valve is protected from debris, it is not necessary to dismantle it after the system has been used.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is made to the following specification and the accompanying drawings, in which

FIG. 1 is a schematic illustration of a dry pipe sprinkler system in accordance with this invention, with parts thereof broken away for the sake of clarity; and

FIG. 2 is an enlarged cross-sectional view of the control valve shown in FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The dry pipe sprinkler system disclosed herein comprises a sprinkler pipe 10 normally containing air under pressure from a suitable air supply (not shown) and communicating with a plurality of sprinkler heads 12 which are normally maintained in a closed position. The sprinkler heads 12 may be of any suitable type and generally include a valve means with a fusible link 13. When the temperature increases above a predetermined point, a link 13 will melt and open its associated valve that water may be sprayed over the area under the sprinkler head 12.

A source of water under pressure (not shown) communicates with the sprinkler pipe 10 through a suitable water pipe 14 and a dry pipe valve 16 which normally prevents the passage of water. Any suitable dry pipe valve may be utilized and for the purpose of illustration only one such valve is disclosed herein and includes a rectangular housing 18 formed with an upstanding wall member 20 on its bottom face. The water pipe 14 and upstanding wall 20 project the same height above the bottom of the housing and are concentric so as to provide an annular chamber 22 therebetween. Pivotally mounted in the valve 16 is a clapper member 24 having a sealing membrane 25 on its under face that seats across the chamber 22 and pipe 14. Due to the air pressure in the system, the clapper member 24 is retained in its closed position. Actually, the air pressure is lower than the water pressure, but the area over which the air acts (the upper face of the clapper) is so much greater than the area over which the water acts (the area of the pipe) that the downward force on the clapper is greater than the upward force. Thus, the clapper is overbalanced in the closed position. Inside the valve housing 18, a small amount of water is provided so as to prime the system and the air pressurizes the water downwardly along the upper face of the clapper. It is to be understood, of course, that priming water need not be used.

A conduit 26 extends from the upper face of the housing 18 and communicates with the sprinkler pipe 10 and the air therein. Of course, conduit 26 could communicate directly with the sprinkler pipe 10, but in the interest of economy, communicates with the housing 18. At its other end, the conduit 26 is connected to a control valve 28, the purpose of which will be fully explained hereinafter. Another conduit 30 extends from the control valve 28 and communicates with an accelerator valve 32 which in turn communicates with the intermediate chamber 22 of the dry pipe valve by a conduit 34. It is to be understood that the accelerator 32 is responsive to a pressure drop in the sprinkler pipe 10 caused by the opening of a sprinkler head 12 and causes an air flow through conduit 34 to the intermediate chamber 22 of the dry pipe valve 16 where it exerts a force on the underside of the clapper 24.

Any suitable accelerator valve may be used, one such device being described in U.S. Pat. No. 1,913,245 issued on June 6, 1933 to Rowley. In that patent there is disclosed a device capable of operating as either an "exhauster" or an "accelerator"and for the purpose of this invention, the latter function is intended.

A restricted vent member 36 and a suitable check valve 38 are provided at the outlet side of the accelerator valve 32 for a purpose to be fully explained hereinafter. Extending from an upper portion of the valve 28 is a conduit 40 connected to the conduit 34 at the downstream side of the vent 36 and check valve 38 so as to communicate with chamber 22 of the dry pipe valve 16.

In accordance with the invention, the control valve 28 is operative to allow the passage of air between the sprinkler pipe 10 and the accelerator valve 32, but to prevent the passage of water and debris thereto. In the embodiment of the invention disclosed herein, the control valve is pressure responsive and comprises an upper housing 42 and a lower housing 44 secured together by suitable fasteners 48. Carried in the lower housing 44 are the conduits 26 and 30 and a valve seat 50 having a central passage 51 across which the conduits communicate. Clamped between the housings 42 and 44 is a flexible diaphragm 46, the central portion of which is sandwiched between stiffener plates 52 and 54. The lower stiffener plate 54 has a projecting stud 55 that is received in an opening in the diaphragm 46 and upper stiffener plate 52. A nut member 56 is threaded on the stud 55 to secure the plates together. Carried on the lower face of the stiffener plate 54 is a suitable seal member 58 that cooperates with the top of the valve seat 50 to prevent the passage of water. Biasing the diaphragm 46, plates 52 and 54, and the seal member 58 downwardly against the seat 50 is a spring member 60 carried in the upper housing. Of course, other biasing arrangements

could be provided, but a spring is preferred because of its economy and simplicity. The conduit **40** is connected to the upper housing portion **42** and communicates with a control chamber **62** formed between the diaphragm **46** and the upper housing.

The sprinkler system operates in a manner described hereafter. The clapper member **24** is pivoted to its closed position as shown in FIG. **1** and a small amount of priming water is introduced into the dry pipe valve **16**. Air is then introduced into the sprinkler pipe **10** at a pressure sufficient to retain the clapper **24** in the closed position and, also, to bias the plate members **52** and **54** against the spring **60** to an open position. Thereafter, water is introduced into the water pipe **14** at a pressure, as pointed out previously, much higher than the pressure of the air. The system is now operative.

When a fire occurs, one or more of the sprinklers **12** will open causing a pressure drop in the pipe **10**, housing **18** and pipes **26** and **30**. This pressure drop will decrease the force on the upper face of the clapper **24** and also actuate the accelerator **32** causing air to flow through the conduit **34** to the intermediate chamber **22** of the dry pipe valve **16**. During this time, the plate members **52** and **54** are retained in an open position since the pressure drop is not sufficient to allow the spring **60** to bias them to a closed position. As air from the accelerator **32** is fed into the intermediate chamber **22** and as the pressure drops inside the housing **18**, a point will be reached, rather rapidly, wherein the force on the bottom of the clapper **24** exceeds that on the top thereof. At this time, the clapper will be pivoted to its dotted line position allowing water from the pipe **14** to flow through the pipe **10** to the appropriate sprinkler head **12**. Of course, water will also flow through pipe **26** toward the accelerator **32**. Simultaneous with the opening of the clapper **24**, the pressure differential between the conduits **26** and **40** is equalized. Because of the pressure drop across the valve seat **50** resulting from the flow of air, the pressure in the conduit **30** is lower than the pressure in conduits **26** and **40** and the spring **60** causes the plate members **52** and **54** to move downwardly across the seat **50**. Since all of the above happens simultaneous with the opening of the clapper **24**, no water can pass through the control valve **28**, thus the accelerator **32** is protected from water and debris. Check valve **38** prevents the backup of water or air to the accelerator and any air remaining in the accelerator and the conduit **30**, is bled out through the vent **36**.

When the fire is extinguished, the system may be reset as described previously and there is no need to dismantle and clean the accelerator valve **32**.

While in the foregoing there has been disclosed an illustrative embodiment of this invention, various modifications will occur to those skilled in the art to which this invention pertains. Accordingly, it is not desired to limit the invention to the exact features disclosed, but to encompass all modifications that fall within the scope of the appended claims.

I claim:

1. A dry pipe sprinkler system comprising dry pipe valve means communicating with a source of water under pressure and a sprinkler pipe containing air under pressure, the dry pipe valve means being normally retained in a closed position by the air pressure in the sprinkler pipe, accelerator means connected to the sprinkler pipe and responsive to a reduction in air pressure therein to supply air to the dry pipe valve means to accelerate the opening thereof, and pressure-responsive control valve means for sensing accelerator means actuation and an air-pressure drop across said control valve means as the dry pipe valve means opens, to shut off communication between the accelerator means and the sprinkler pipe.

2. A sprinkler system as defined in claim **1** wherein the control valve means is connected to the dry pipe valve means so that the pressure increase in said sprinkler pipe caused by the opening of the dry pipe valve means will be transmitted to the control valve means to cause the closing thereof.

3. A sprinkler system as defined in claim **1** wherein the control valve means is interposed in the connection between the sprinkler pipe and the accelerator means.

4. A sprinkler system as defined in claim **3** wherein the control valve means is also connected to the dry pipe valve means.

5. A sprinkler system as defined in claim **4** wherein the control valve comprises a housing divided into first and second chambers by a flexible diaphragm, the first chamber allowing communication between the sprinkler pipe and the accelerator means and the second chamber communicating with a portion of the dry pipe valve means connected with the accelerator means output.

6. A sprinkler system as defined in claim **1** wherein the accelerator means is connected to the dry pipe valve means and wherein the connection includes a restricted vent and a check valve.

7. A dry pipe sprinkler system comprising a sprinkler pipe including sprinkler heads and normally containing air under pressure and a water pipe containing water under pressure, a dry pipe valve means interposed between the sprinkler pipe and the water pipe for controlling the flow of water from the water pipe to the sprinkler pipe, an accelerator valve means communicating with the sprinkler pipe and an intermediate portion of the dry pipe valve means for more rapidly opening the dry pipe valve means, a control valve means communicating with the sprinkler pipe and the accelerator valve means and having an opening position allowing the passage of air between the sprinkler pipe and the accelerator valve means, the control valve means also communicating with the intermediate portion of the dry pipe valve means and being responsive to two conditions for moving to a closed position preventing the passage of water to the accelerator valve means, said to conditions being a pressure increase at the dry pipe valve intermediate portion and air movement past the control valve means toward the accelerator.