Jan. 31, 1961 W. E. AULT 2,969,842

ACCELERATOR FOR DRY PIPE SPRINKLER SYSTEMS

Filed Dec. 9, 1958 2 Sheets-Sheet 1

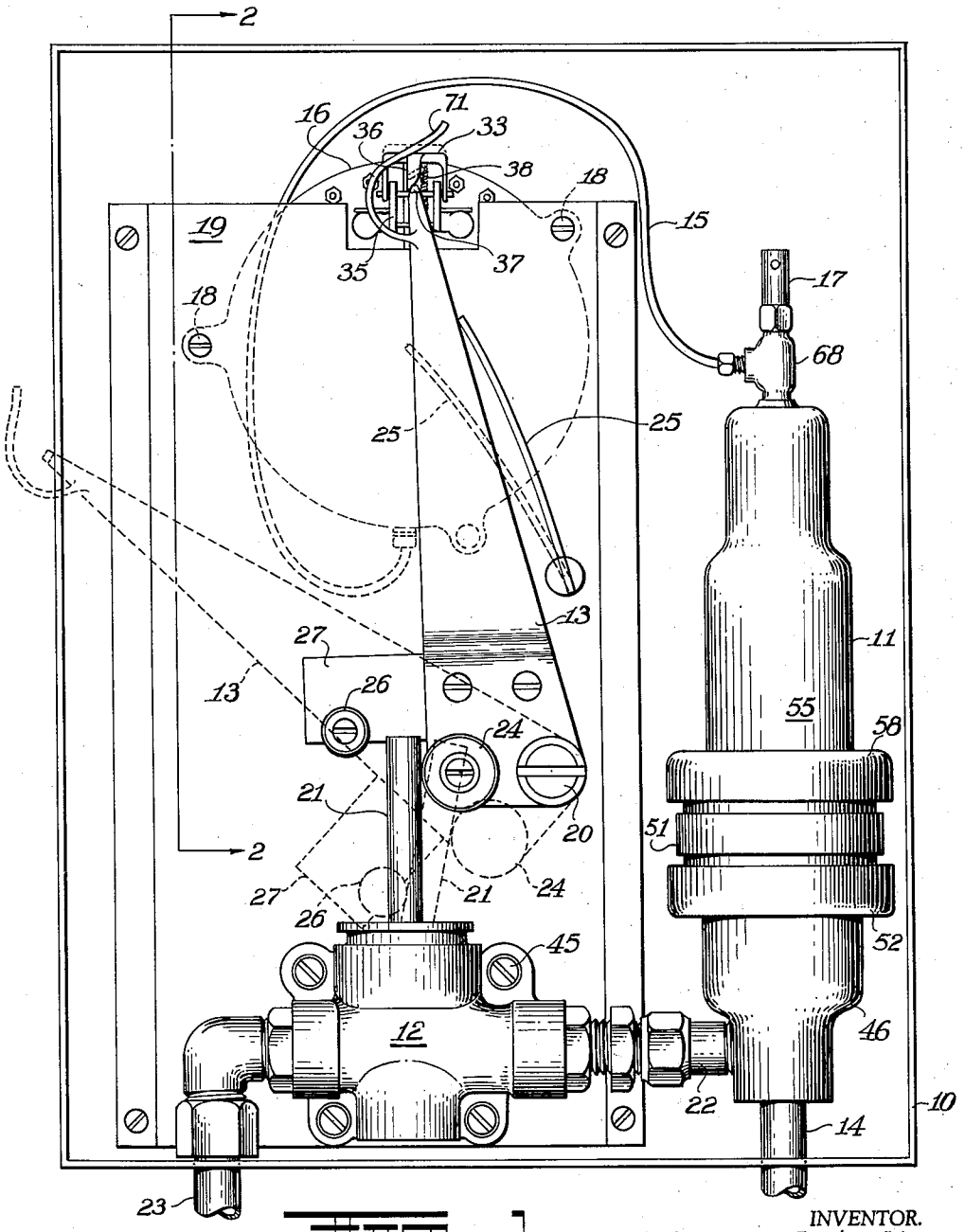


FIG. 1

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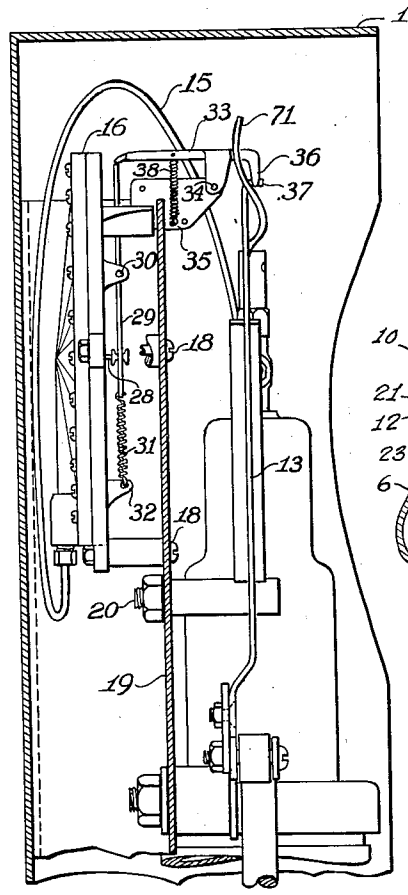


FIG. 2

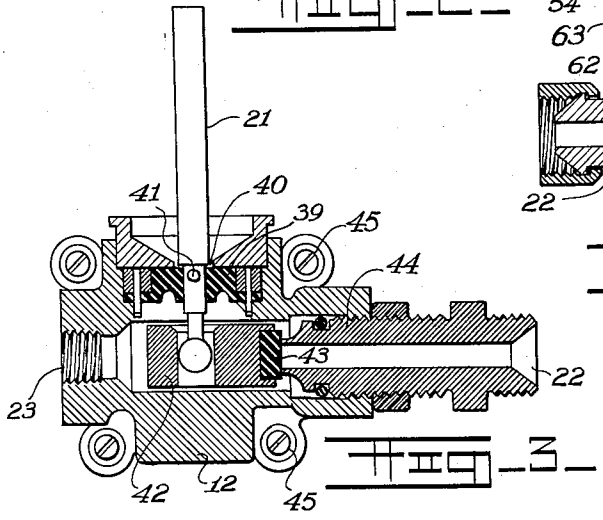


FIG. 3

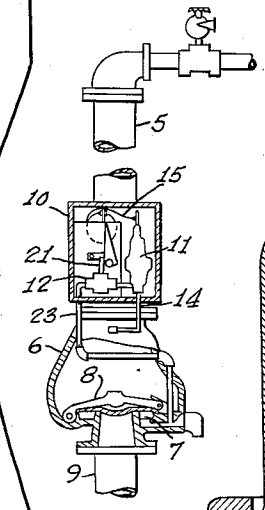


FIG. 5

FIG. 4

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ACCELERATOR FOR DRY PIPE SPRINKLER SYSTEMS

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7 Claims. (Cl. 169—17)

This invention relates to a sprinkler system for fire protection purposes and more particularly to an accelerator for differential type automatic sprinkler valves used in such systems.

The principal object of the invention is the provision of an accelerator for quickly equalizing air pressure on the opposite sides of an automatic sprinkler valve.

A further object of the invention is the provision of an accelerator mechanism incorporating a pressure translator whereby change of air pressure in the sprinkler system piping acts to effect a change in air pressure in the sprinkler valve without directly communicating therewith.

A still further object of the invention is the provision of an accelerator mechanism for a sprinkler valve in a dry pipe sprinkler system in which valve actuating air pressures are controlled by the air pressure in the sprinkler piping but separated from the valve so as to be free from contamination therefrom.

A still further object of the invention is the provision of a simple positive active air pressure operated accelerator mechanism communicating with the system piping of an automatic sprinkler system and with the intermediate chamber of an automatic sprinkler valve in said sprinkler piping and acting to open said valve upon loss of air pressure in said system piping.

The accelerator disclosed herein is an improvement in the art relating to devices for quickly releasing air pressure from sprinkler system piping in which air pressure normally acts to hold a differential type main sprinkler valve closed against a water or other liquid supply source. As known in the art, dry pipe systems are commonly used in fire protection sprinkler systems and primarily serve to eliminate the possibility of freezing of the liquid in sprinkler system piping. The piping is normally filled with air maintained at a given pressure sufficient to hold a differential type sprinkler valve clapper closed against the pressure of the water in the supply line. Fire fusing a sprinkler on the sprinkler piping opens the same and vents the air from the sprinkler piping. The volume of air in the sprinkler piping obviously requires some time to escape through the open sprinkler and therefore delays the opening of the sprinkler valve and the admission of the fire extinguishing fluid to the system piping.

Accelerators have been used with such systems in the past for quickly venting the air in the piping by bringing it into communication with the intermediate chamber in the sprinkler valve where the pressure equalizes the restraining air pressure on the clapper of the valve and thereby permits it to open rapidly. In the devices heretofore known in the art the mechanisms frequently became inoperative due to contamination of oil, water or dirt particles introduced into the mechanisms of the accelerators through their direct communication with the sprinkler piping and/or the intermediate chamber of the sprinkler valves.

The present invention eliminates the possibility of malfunction due to such contamination by introducing a pressure translator into the system whereby the air pressure in the sprinkler piping serves to actuate the device but is not actually in communication therewith.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a front view of the accelerator mechanism.

Figure 2 is a side elevation of a portion of the mechanism shown in Figure 1 and taken on line 2—2 thereof.

Figure 3 is a vertical section of the valve portion of the mechanism shown in Figure 1.

Figure 4 is a vertical section of the pressure translator portion of the mechanism shown in Figure 1 and on an enlarged scale.

Figure 5 is a fragmentary schematic view of a dry pipe sprinkler system having a dry pipe valve including the accelerator mechanism disclosed herein.

By referring to the drawings and Figures 1 and 2 in particular it will be seen that an accelerator mechanism is disclosed which is positioned in a housing **10** and comprises a pressure translator **11**, a valve **12** and a diaphragm operated release mechanism including a principal operating lever **13**. The translator **11** communicates with the normally closed piping **5** of a dry pipe sprinkler system above the sprinkler valve **6** thereof by way of pipe **14** and another portion of the accelerator **11** communicates by means of air tubing **15** with one side of a diaphragm case **16**, a calibrated vent **17** being incorporated in the communication tubing **15** so that atmospheric pressure normally exists in the tubing **15** and in the diaphragm case **16**. The diaphragm case **16** is mounted by means of fasteners **18** on a panel **19** located within the housing **10** and the panel **19** pivotally mounts the operating lever **13** by means of a pivot **20**.

The valve **12** has an inlet **22** and an outlet **23**. The inlet **22** communicates with the translator **11** and therethrough with the pipe **14** which in turn, communicates with the normally closed sprinkler piping **5**. The outlet **23** of the valve **12** communicates with an intermediate chamber **7** of the sprinkler valve **6** which is, as known in the art, on the lower or opposite side of the clapper **8** thereof with respect to the sprinkler piping **5** and it will thus be seen that as long as the valve **12** is closed differential air pressure may exist in the sprinkler valve so as to maintain the clapper **8** thereof closed position against fluid in the supply line **9** communicating therewith and that when the valve **12** is opened the differential air pressure is immediately equalized between the one part of the dry pipe sprinkler valve **6** and the intermediate chamber **7** thereof thereby permitting the fluid to open the clapper **8** and enter the sprinkler piping.

In order that the valve **12** may be held in closed position a roller **24** is mounted on the operating lever **13** and adjacent one side of the valve stem **21** so that when the operating lever **13** is in vertical position, as shown in solid lines in Figures 1 and 2 of the drawings, the roller **24** will engage and hold the valve stem **21** as shown. When the operating lever **13** is released by means hereinafter described it moves to the position shown in dotted lines in Figure 1 by reason of its weight and a spring **25** so that a secondary roller **26** on a sideward extension **27** of the operating lever **13** engages the valve stem **21** and

moves it to the right as shown in dotted lines in Figure 1 of the drawings, thereby opening the valve 12. When the operating lever 13 is moved back to vertical position as in resetting the mechanism the roller 24 engages the valve stem 21 and moves it back to vertical position as shown in solid lines in Figure 1 thereby closing the valve 12.

In order that the valve 12 can be opened quickly and automatically upon a drop of air pressure in the sprinkler piping as occasioned by the opening of a sprinkler thereon a diaphragm operated release mechanism including the diaphragm case 16 having a diaphragm therein is employed. A diaphragm pin 28 engages the diaphragm in the case 16 and extends outwardly through an opening in the case 16 and is engaged on a lever 29 which is pivoted as at 30 to a projection on the diaphragm case 16. A spring 31 connected to one end of the lever 29 and to a secondary projection 32 on the diaphragm case 16 normally holds the lever 29 in substantially vertical position as seen in Figure 2 of the drawings. A secondary lever 33 is pivoted on offset portions thereof by pivots 34 to projections 35 on the diaphragm case 16 and arranged so that an offset end thereof overlies the upper end of the lever 29 and the secondary lever 33 is thus held in substantially horizontal position thereby. The opposite or right end of the secondary lever 33 is downturned as at 36 and positioned immediately adjacent one side of a forwardly extending end portion 37 of the operating lever 13 as seen in Figures 1 and 2 of the drawings.

It will thus be seen that when the lever 29 is moved it will move out from in under the offset end portion of the secondary lever 33 and permit a spring 38 connected between the secondary lever 33 and projection 35 of the diaphragm case 16 to move one end of the secondary lever 33 downwardly and hence move the downturned outer end 36 thereof upwardly whereby the upper end 37 of the operating lever 13 is freed. The spring 25 thereupon moves the operating lever 13 to the left, as shown in Figure 1, and its weight continues such movement causing the valve 12 to be opened as heretofore described.

The valve 12 includes a flexible sealing member 39 around the fulcrum of the valve stem 21 wherein it is pivoted to valve 12 in an opening 40 thereof by a pivot 41 passed therethrough. A valve element 42 is reciprocally mounted in the valve 12 between the inlet 22 and outlet 23 thereof and includes a valve seat member 43 which normally engages and closes an end opening of tubular member 44 which defines the inlet opening 22 of the valve 12. The valve 12 is mounted on the panel 19 by fasteners 45.

The translator 11 which controls the operation of the diaphragm operated mechanism just disclosed, as well as the valve 12 is best illustrated in the sectional view comprising Figure 4 of the drawings and by referring thereto it will be seen that it comprises a cylindrical body member 46 having an outturned annular flange 47 around its upper end and the lower portion thereof is of reduced diameter and defines a chamber 48 having openings 49 and 50 communicating therewith. The opening 49 in operation communicates with the pipe 14 and the opening 50 communicates with the inlet opening 22 of the valve 12, as best seen in Figure 1.

An annular body member 51 is positioned on the outturned annular flange 47 and clamped in position thereon by a threaded clamping ring 52 so that an O-ring 53 which has an integrally formed thin wall bellows-like diaphragm 54 closing the area defined by the O-ring 53 is held in sealed relation to the body members 46 and 51. An inverted secondary cylindrical body member 55 having an outturned annular flange 56 on its lowermost end is mounted on the upper surface of the body member 51 by a mounting ring 57 and the assembly is held in place by a secondary clamping ring 58. A secondary bellows-like diaphragm 59 having an O-ring 60 defining its peripheral edge is positioned with the O-ring 60 between the ring 57 and the body member 51.

A cross sectionally circular body member 61 is positioned within the body member 46 and within the bellows-like diaphragm 54 therein and a disc 62 is secured to the bottom thereof by a fastener 63 so as to clamp the central portion of the bellows-like diaphragm 54 between the disc 62 and the body member 61. The body member 61 is of lesser diameter than the body member 46 and provides adequate space for the progressive folding action of the diaphragm 54 when the body member 61 moves vertically with respect to the body member 46. An elongated body member 64 of reduced diameter as compared with the body member 61 has a threaded extension 65 which passes through an apertured annularly flanged disc 66 and is engaged in a threaded opening in the body member 61 so as to clamp the center portion of the secondary diaphragm 59 between the flanged disc 66 and the body member 61. The annular flanged disc 66 is of lesser diameter than the inner diameter of the body member 55 and thereby provides adequate space for the progressive folding action of the secondary diaphragm 59 when the body members 61 and 64 move vertically in the body members 46, 51 and 55.

A coil spring 67 is positioned on the flanged disc 66 around the body member 64 and extends upwardly into the uppermost area of the body member 65 which is reduced in diameter at its uppermost end, and normally urges the body members 61 and 64 and their connected parts into the lowermost portions of the body members 46, 51 and 55 as shown in Figure 4 of the drawings. The uppermost end of the body member 55 communicates with a fitting 68 which in turn has an opening 69 which communicates with the tubing 15 as seen in Figure 1 of the drawings and incorporates a calibrated vent 17 by means of which the air pressure within the body member 55 and the tubing 15 and the diaphragm case 16 will normally remain at atmospheric level.

In operation the opening 50 in the body member 46 of the translator 11 is in communication with the inlet 22 of the valve 12 which is closed by the valve seat member 43 and the opening 49 therein is in communication by way of the pipe 14 with the sprinkler piping so that air pressure in the sprinkler piping which is acting to hold the clapper of the sprinkler valve closed enters the chamber 48 in the translator 11 and moves the body members 61 and 64 upwardly therein compressing the coil spring 67. The air from the sprinkler system does not pass the diaphragms 54 and 59. It will be observed that the body member 51 has an atmospheric vent passage 70 therein. The body members 61 and 64 are thus normally positioned in the upper portion of the body member 55 and the chamber 48 extends upwardly out of the body member 46 and through the body member 51 into the lower portion of the body member 55. The air in the body member 55 exhausts slowly through the calibrated vent 17 so that the air pressure in the uppermost part of the translator 11 and in the tubing 15 and in the diaphragm case 16 is maintained at atmospheric level. The operating lever 13 is moved to set position, as shown in solid lines in Figures 1 and 2, and a rigid wire like extension 71 thereof engages the secondary lever 33 and moves it into set position where the upper end of the lever 29 can be engaged beneath the offset portion thereof as heretofore described. As long as the sprinkler piping remains intact the condition just described exists and at such time as a sprinkler on the sprinkler piping opens, as from the heat of a fire, the immediate reduction in air pressure in the sprinkler piping permits the coil spring 67 in the translator to move the body members 61 and 64 downwardly creating a partial vacuum within the body member 55, the fitting 68, the tubing 15 and the diaphragm case 16 whereupon diaphragm and pin 28 moves and in moving urges the lever 29 from its normal vertical position and thereby

out from in under the offset end of the secondary lever 33. The coil spring 38 moves the secondary lever 33 elevating the downturned outer end 36 thereof and disengaging the outturned end 37 of the operating lever 13 whereupon the previously described action of the operating lever 13 occurs, acting to open the valve 12 and establish communication between the intermediate chamber of the sprinkler valve and the piping of the sprinkler system which allows the fire extinguishing fluid to open the sprinkler valve and flow into the sprinkler piping and to the open sprinkler.

The action just described takes place in less than a second after the opening of a sprinkler on the sprinkler piping and the accelerator is therefore responsible for the immediate opening action of the sprinkler valve. It will be seen that the operating portions of the diaphragm case and the translator 11 are never in direct communication with either the sprinkler piping or the intermediate chamber of the sprinkler valve and that as a result of their freedom from contamination they are capable of operation when necessary.

It will thus be seen that a sprinkler system valve accelerator incorporating a pressure translator has been disclosed which meets the several objects of the invention, and having thus described my invention, what I claim is:

1. An accelerator for use in a dry pipe sprinkler system comprising in combination a valve, a diaphragm operated mechanism operatively engaging said valve and acting to move the same to open and closed position and an air pressure translator comprising a hollow body member having at least one diaphragm thereacross dividing said hollow body member into two portions, said air pressure translator having one portion thereof in communication with said dry pipe and said valve and the other portion thereof in communication with said diaphragm operated mechanism and spring urged movable means in said pressure translator between said portions.

2. An accelerator for use in a dry pipe sprinkler system; comprising in combination a stem actuated valve, a diaphragm operated mechanism engaging said stem of said stem actuated valve and acting to move the same to open and closed position and an air pressure translator having one portion thereof in communication with said dry pipe and said valve and another portion thereof in communication with a diaphragm case in said diaphragm operated mechanism and movable means in said air pressure translator separating said portions.

3. The accelerator set forth in claim 1 wherein the movable means in said air pressure translator comprises a piston like body member engaged on said diaphragm thereof.

4. The accelerator set forth in claim 1 and wherein said diaphragm operated mechanism comprises a diaphragm case in communication with said air pressure translator, a diaphragm in said case, a pin on said diaphragm extending outwardly of said case, a lever positioned for movement by said pin, a secondary lever normally held against movement by said lever, an operating lever and means on said operating lever engaging said valve and acting to move the same to open and closed position.

5. The accelerator set forth in claim 2 and wherein said diaphragm operated mechanism comprises a diaphragm case in communication with said air pressure translator, a diaphragm in said case, a pin on said diaphragm extending outwardly of said case, a lever positioned for movement by said pin, a secondary lever normally held against movement by said lever, an operating lever and means on said operating lever engaging said stem of the valve and acting to move the same to open and closed position.

6. The accelerator set forth in claim 2 and wherein the air pressure translator comprises a pair of superimposed cylindrical body members and means for joining the same to one another, at least one diaphragm secured by the said cylindrical members and dividing the area therein into said two portions, and at least one piston like body member positioned in one of the cylindrical body members and secured to said diaphragm and movable relative to said cylindrical body members, and a spring in said cylindrical body members normally urging said piston like body member into the portion of said cylindrical body members communicating with said dry pipe and said valve.

7. The accelerator set forth in claim 1 and wherein a calibrated vent to atmosphere is in communication with that portion of the air pressure translator in communication with the diaphragm operated mechanism.

References Cited in the file of this patent

UNITED STATES PATENTS

2,349,464	Rider et al.	May 23, 1944
2,713,916	Muckenfuss	July 26, 1955
2,822,052	Herkimer	Feb. 4, 1958