ALARM VALVE FOR A SPRINKLER INSTALLATION

Hendrik Nicolaas Ludolf Hoevenaar, Breda, Netherlands, assignor to Saval Apparatenfabriek C.V., Breda, Netherlands, a Dutch corporation

Filed Feb. 4, 1963, Ser. No. 255,878

Claims priority, application Netherlands, Feb. 13, 1962, 274,740

5 Claims. (Cl. 169—22)

The invention relates to an alarm valve for a sprinkler installation comprising a valve body, resting on a seat, in the pipe leading to the sprinklers, which valve body, when the liquid flows towards one or more sprinklers, is lifted off its seat by this flow and in its closed position shuts off the opening of an alarm device to be operated by the liquid flowing through it. Alarm valves of this kind are commonly known and form an essential part of sprinkler installations, intended to give a warning signal when one or more sprinklers become operative owing to the outbreak of a fire. When one of the sprinklers becomes operative, the liquid starts to flow and the valve body is lifted off its seat, while at the same time liquid can flow into the pipe leading to the alarm device, in consequence of which the latter is actuated.

With sprinkler installations the most desirable situation is for the whole installation up to the sprinklers to be filled with liquid (water). In that case liquid is present ahead of and behind the alarm valve, and this valve is retained on its seat almost exclusively by its own weight. However, if the liquid is in danger of freezing, the installation is designed in such a way that the liquid is present in the installation only up to the alarm valve and air under pressure fills the other parts of the system between alarm valve and sprinklers. When one of the sprinklers becomes operative, the pressure of the air first decreases, after which the liquid flows in the system towards the sprinklers. For such a so-called dry sprinkler installation the alarm valve has to be designed in an entirely different way, since the air pressure has to keep the valve shut against the fairly high water pressure, and a high air pressure in the sprinkler installation is not desirable, since this would only cause a delay in the operation of the sprinklers. In fact, if only one sprinkler becomes operative, a considerable time is lost before the pressure in the part of the installation between alarm valve and sprinkler has decreased and the liquid has filled the system up to the sprinkler. Alarm valves for dry installations therefore have a large surface area on the side of the air under pressure and a small surface area on the side of the liquid. Alarm valves for so-called wet installations have practically the same surface area on both sides.

As the wet system is always more economical than the dry system, but the freezing danger has to be reckoned with, most sprinkler installations are constructed with two alarm valves connected in series, the installation being changed over to the wet system in winter and to the dry system in winter. The presence of two alarm valves naturally forms an expensive complication, while it is a further disadvantage that valves of different construction are required for this.

Now it is the object of the invention to provide an alarm valve which can be used for a dry system as well as for a wet system, and this object is achieved according to the invention by the valve in its closed position shutting off a third opening which can be connected, via a cock that can be adjusted in different positions, either with the alarm device or with the liquid circuit of the installation. Because this valve shuts off, besides the pipe leading to the sprinklers and the opening towards the alarm device, also the third opening, it has a surface area which is considerably larger than the cross-sectional area of the liquid supply pipe. When the installation is changed over to the dry system therefore the area subject to the pressure of the air is considerably larger than the area subject to the pressure of the liquid, so that a small air pressure will suffice. The adjustable cock is then in a position in which, like the connection previously present, it can provide for a connection with the alarm device. When one of the sprinklers now becomes operative and the pressure of the air decreases, the valve is opened and the installation is further filled with liquid, this liquid now flowing via the said opening of the alarm device as well as via the said third opening to the alarm device and actuating the latter.

When the installation has been changed over to the wet system by the adjustment of the cock, this third opening has been connected with the liquid contents of the installation, which means at the same time that the pressure of the liquid contents is present at the site of this opening and causes a pressure compensation, so that the difference between the areas subject to the water pressure above and below the valve body is now only small. By a change of the effective valve area it has thus been ensured that the alarm valve can be used for both systems.

The connection of the third opening with the liquid contents can be effected according to the invention via a branch of the liquid supply pipe at a point ahead of the said valve, which branch may be furnished with another valve. The connection of this third opening with the liquid supply pipe may be direct and this connection may also be brought about with the space behind the said valve, since the only important thing is that the pressure of the liquid should act upon the underside of the said valve at the site of the third opening. The other valve in the branch is required to make possible a change-over to the dry system. If the connection of the adjustable cock with the liquid contents is effected by causing this connection to end in the space behind the valve, since it is advisable to couple the adjustable cock and the other valve together, so that they can be operated simultaneously.

With the conventional alarm valves for the wet system it is known to provide the valve body with a non-return valve with a narrow passage for the compensation of changes in pressure in the liquid supply, by which means the risk is avoided that such changes in pressure might cause movements of the valve body itself, and the alarm device might thus be actuated. In accordance with the invention this non-return valve may be fitted in the branch of the supply pipe leading to the third opening, so that pressure compensation can take place via this branch leading to the third opening and thence via the adjustable cock to the space behind the valve.

Finally the branch of the supply pipe may have a connection with the pipe leading to the alarm device, in which case a valve is present at the site of this connection. In this way it is possible to test the alarm device in the wet as well as the dry system, the latter being of particular importance for the dry system, since in that system testing of the alarm device by causing a decrease of pressure behind the alarm valve entails many complications.

The invention will now be explained more fully with reference to the drawings.

FIGURE 1 is a longitudinal section of the alarm valve according to the invention.

FIGURE 2 is a diagram of the alarm valve with accessory switching members according to the invention in the position for the dry system.
FIGURE 3 shows the same diagram as FIGURE 2 in the position for the wet system.

The alarm valve illustrated in FIGURE 1 comprises a casing 1, on the lower side of which is the opening 2 for the connection to the water supply and which at 3 has a discharge opening for connection to the pipe leading to the sprinklers. The casing 1 has a lid 4, through which passes the valve 5 by means of which the valve can be locked by means of a locking mechanism 7 in the uppermost position, so as to ensure that the valve remains in the opened position once it has been placed in this position by the flow of the liquid. On the underside the valve body 8 has a rubber diaphragm 8, which forms the sealing member proper. In the closed position of the valve 5 the rubber diaphragm 8 shuts off not only the opening 2 of the water supply, but also the chambers 9 and 10, which end via annular openings in the sealing surface of the valve. The opening 2 and casing 1 are furthermore provided with the connections 11, 12 and 13, the purpose of which will become evident from the description of FIGURES 2 and 3 below.

FIGURE 2 is a diagrammatic illustration of the alarm valve according to the invention, viz. in the position in which air under pressure is present above the valve. The water supply is designated by 2 again and in this water supply a main valve 14 is shut off by the rubber diaphragm 8, which also extends over the chambers 9 and 10. The chamber 9 is connected in the conventional way via the pipes 15, 16 and 17 with an alarm device, which may have the form of a hydraulic motor actuating a bell or gong. The chamber 10 is also connected with the alarm device via the pipe 18, the adjustable cock 19, and the pipes 16 and 17. At 3 the connection with the sprinklers is shown and at 20 there is a wide drain pipe 20 with a valve 21. Pipe 20 communicates with connection 13. Between the cock 19 and the space 22 above the valve 8 there is another pipe 23, which communicates with part of compartment 12.

At 26 a branch of the water supply 2 is shown, in communication with connection 11, which pipe 26 is connected via the valve 27, the non-return valve 28, and the pipe 29 with the chamber 10.

The pipe 26 also has a branch 30 leading to a cock 31, which is adapted to bring about a connection with the pipe 17 leading to the alarm device.

The installation according to FIGURE 3 is similar to that of FIGURE 2, the difference being that the cock 19 and valve 27 are in a different position. 32 is a discharge port with a throttled outlet.

In FIGURE 2 the installation is shown for the so-called dry system, in which air under pressure is present in the part of the piping behind the alarm valve, the piping behind the alarm valve. This air pressure has to keep the valve 8 on its seats against the pressure of the water in the supply pipe 2. Because the air acts upon the considerably larger area, a pressure that is lower than the pressure of the water in the pipe 2 will suffice. When a fire breaks out and the pressure consequently drops in the pipe leading to the sprinklers and thus in the space 22, the valve 8 is lifted off its seat and the liquid emerges from the pipe 2 in the remaining part of a sprinkler installation, while at the same time the liquid flows into the chambers 9 and 10, and via the pipes 15 and 18, 16 and 17 respectively to the alarm device. If it is desired to check in this position whether the alarm device operates properly, this can be done by adjustment of the cock 31, by which water from the pipe 2 is supplied via the branch 26 and 30 to the alarm device. For this pressure of the air therefore need not be lowered.

FIGURE 3 shows the position for the so-called wet system, and upon simple comparison it appears at once that the only difference from FIGURE 2 is that the cock 19 and the valve 27 have been adjusted. When the valve 27 is opened, the pressure of the water in the pipe 2 can enter the chamber 10 via 26, 28, 29, while via the pipe 18, cock 19, and pipe 23 a connection has also been brought about with the space above the valve 8. Because the chamber 10 is filled with liquid of the same pressure as in the remainder of the liquid system, above and below the valve 8 the same pressure prevails over the surface area occupied by the opening of the cock 19, so that the force which the force that opposes the valve in the closed position has been reduced to an extremely low value, so that the certainty has been gained that at a decrease of the pressure the flow of the water is able to open the valve.

In this position too the alarm device can be tested by adjustment of the cock 31, but it can also be done by adjustment of the valve 25, by which, via the pipe 24 and 23, a pressure drop is brought about in the part of the sprinkler installation behind the valve and thus the opening of a sprinkler is initiated.

The drain pipe 20 with valve 21 is required to empty the part above the valve 8, with a view to changing over from the wet to the dry system. In that case first the valve 14 is closed, subsequently the valve 21 is opened, so that the liquid can flow off, and then the valve 21 is closed again, air under pressure is supplied, and the valve 14 is opened again.

The non-return valve 28 ensures that when according to the wet system changes in pressure occur, the rise of pressure in the part 2 of the piping are propagated in the part behind the valve without the valve 8 being opened, which might indeed result in a false alarm. Because the alarm valve according to the invention can be used for the dry as well as for the wet system, checking is simplified considerably. For example, if an increase in pressure is felt in the inlet pipe 2, this increase in pressure is delivered through connection 11, conduit 26, valve 27, one-way valve 23, line 18, cock 19, conduit 23, connection 12 to the space on the opposite side of valve 8. This equalization of pressure prevents communication between compartments 9 and 10 and the inlet pipe 2 so that false alarms are prevented. Moreover, if there is a sudden decrease in pressure in the input line 2, one-way valve 23 immediately closes so that no water is drained from the space above valve 8.

With the conventional alarm valves with many cocks and manometers, usually located at a considerable distance from each other, checking calls for great expert knowledge. Since not every superintendent or owner is able to perform this job, he cannot be satisfied that everything is all right.

With the alarm valve according to the invention, owing to the compact construction it is possible to mount and mark the operating members in such a simple way that one can tell at a glance whether the cocks are in the proper position. This will be clear from a study of FIGURES 2 and 3. The two lowermost cocks 25 and 31 are testing cocks, the levers of which normally have to be placed in a downward direction, for instance. The two uppermost cocks 19 and 27 either in the position of FIGURE 2 or in that of FIGURE 3. For the adjustment a turn through 90° is sufficient and the two cock levers may be coupled with each other for this purpose. On a plate behind the cock levers the position can be indicated by the words “Wet” and “Dry” respectively. It is quite simple for everyone to check the position and to operate the system.

1. A sprinkler system comprising a main inlet conduit connected to a source of extinguishing liquid under pressure, sprinkler heads located in the area to be protected, a main control valve actuated by the opening of said sprinkler heads, main sprinkler conduit means connecting said main control valve to said sprinklers, an alarm device and a discharge outlet, said main control valve having a casing including a main inlet port connected to said main inlet conduit, a main outlet port connected
to said main sprinkler conduit means and first and second ports; valve means within said casing for normally sealing said main inlet port and first and second ports when in a closed position and for enabling said first and second ports to communicate with said main inlet port when in an open position; a first conduit connected between said first port and the alarm device; said casing further defining a space on the opposite side of said valve means from said main inlet port; said space communicating with said main outlet port; said space further communicating with said main inlet port when said valve means is in an open position; a second conduit having one end connected to said second port; a pipe having one end connected to said space; cock means connected to the other end of said second conduit for alternately connecting said second conduit with either the other end of said pipe or with the discharge outlet; whereby the system acts as a dry system when said second conduit communicates with said discharge outlet and said system acts as a wet system when said second conduit communicates with said pipe.

2. A sprinkler system as set forth in claim 1, further comprising a third port communicating with said main inlet port; a third conduit having one end connected to said third port; one-way valve means adapted to be alternatively set in a first and a second position connected between the other end of said third conduit and said second conduit for sealing said third conduit when in the first position and enabling liquid to flow from said main inlet port to said second conduit when in said second position; and said valve means being set in the second position when said cock means connects said second conduit with said pipe.

3. A sprinkler system as set forth in claim 2, wherein said one-way valve means comprises a two-way valve adapted to assume an on and off position and a one-way, non-return valve in series with said two-way valve.

4. A sprinkler system as set forth in claim 2, said system further comprising draining means communicating with said space adapted to controllably drain liquid therefrom.

5. A sprinkler system as set forth in claim 2, further comprising a conduit having one end connected to said space, an on-and-off test valve having one side connected to the other end of said last-mentioned conduit, and a drain connected to the other side of said on-and-off test valve.

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M. HENSON WOOD, Jr., Primary Examiner.

EUGENE F. BLANCHARD, RAPHAEL M. LUPO,
EVERETT W. KIRBY, Examiners.