

[54] **FIRE PROTECTION SYSTEM  
 UTILIZING SPRINKLER HEADS WITH  
 A PRESSURE FLOOR**

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[51] Int. Cl. ....**A62c 37/08**

[58] Field of Search.....**169/5, 16, 37, 38, 39, 42**

[56] **References Cited**

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[57] **ABSTRACT**

A fire protection system and a sprinkler head utilized in the system, wherein extinguishant is supplied to the sprinkler head which is actuated by a release of a thermal fuse to discharge the extinguishant against a deflector disc and form a hemispherical pattern of droplets. If the fluid pressure in each head does not attain a predetermined value, the head will not be actuated despite release of the thermal fuse.

**11 Claims, 4 Drawing Figures**

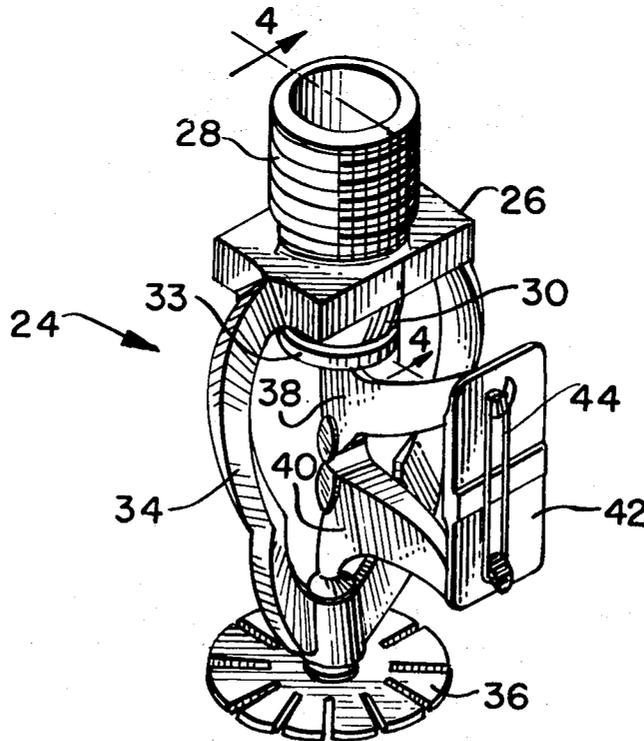


FIG. 1.

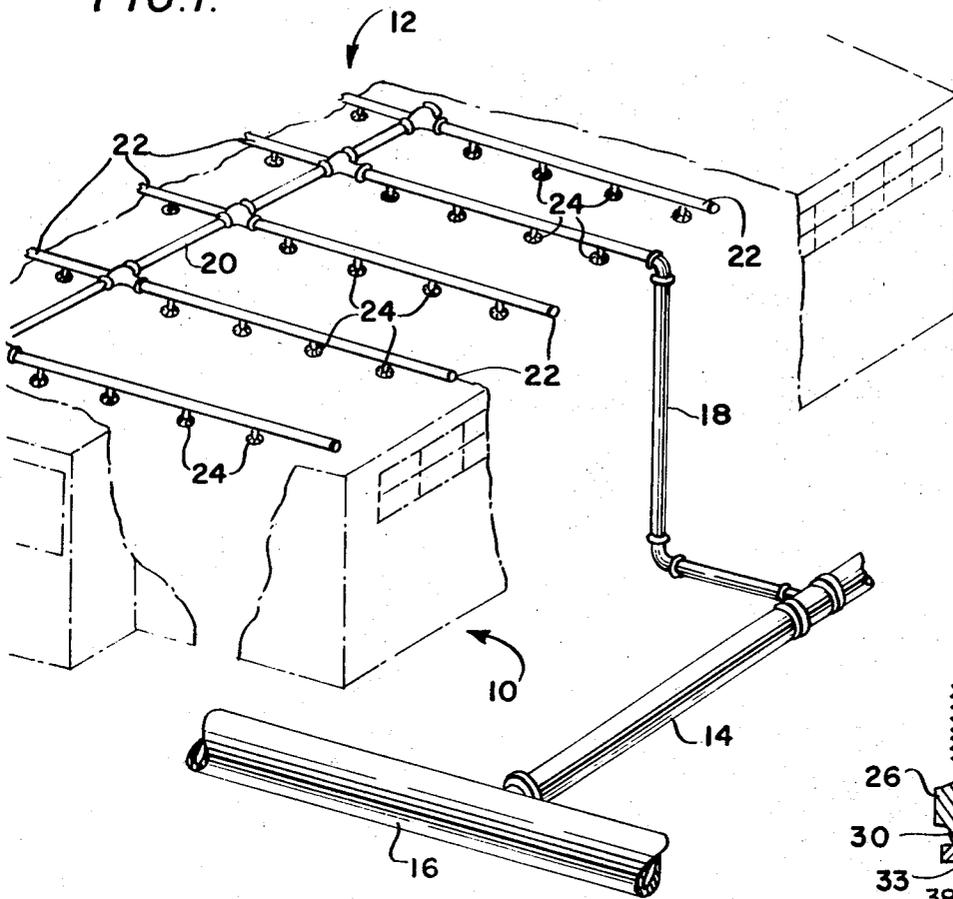


FIG. 4.

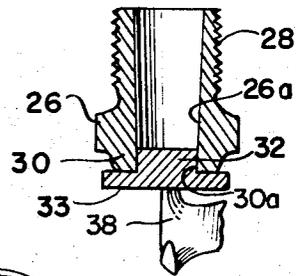


FIG. 2.

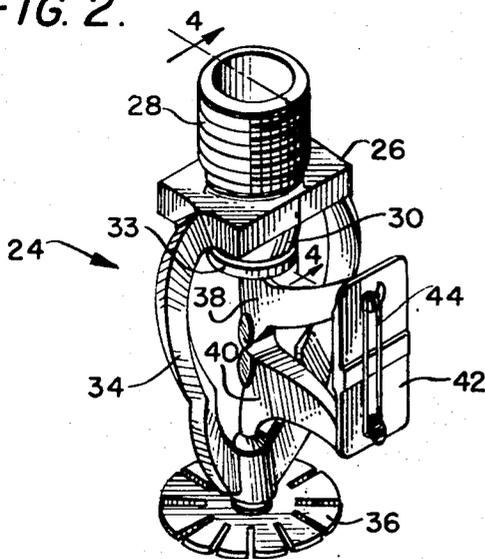
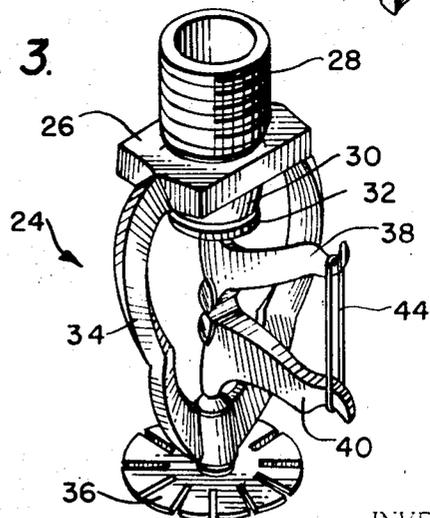


FIG. 3.



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## FIRE PROTECTION SYSTEM UTILIZING SPRINKLER HEADS WITH A PRESSURE FLOOR

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to applicant's co-pending U.S. Pat. application Ser. No. 72,333, filed Sept. 15, 1970, the disclosure of which is incorporated by reference.

### BACKGROUND OF THE INVENTION

Automatic sprinkler systems for protecting industrial and commercial properties and employing thermally releasable sprinkler heads for installation near the top of the space to be protected are well known. The sprinkler heads utilized in such systems are supplied with a suitable extinguishant, such as water, by a pipe network of mains, risers, crossmains, and branches. A majority of the sprinkler heads used in these systems have a discharge opening normally closed by a plug retained by a thermal fuse and collapsible linkage bridging an external loop or yoke. Upon actuation of the head by collapse of the linkage, the extinguishant stream issuing from the throat impinges against a serrated deflector disc to form a hemispherical pattern of droplets simulating the characteristics of rain.

However, in buildings where the heat of a localized high-challenge fire establishes a fire column or plume of heights in excess of 20 feet, the fire plume often flares out beneath the ceiling of the protected space and directly actuates numerous sprinkler heads located at such a distance from the fire that they are ineffective to deliver water or other extinguishant to the surfaces of the materials stored in the building, while the effects of convection and the circulation of hot combustion products throughout the space contribute to the actuation of still more remotely located heads. This contributes not only to redundant and flooding use of the water but, more significantly, robs water from the heads located more directly over the fire where it is much more needed.

It will be apparent, therefore, that conventional automatic sprinkler systems, though adequate for the protection of buildings and other spaces with relatively low ceilings, are less effective in high-challenge fire situations where there is adequate ceiling height for a strong, intense fire plume or column to develop.

### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a fire protection system, and discharge head utilized therein, wherein the number of heads which are actuated by fire are deliberately limited.

It is a further object of the present invention to provide a system and head of the above types in which each head will open only upon a predetermined extinguishant pressure being present therein.

Towards the fulfillment of these and other objects, the sprinkler head utilized in the system of the present invention comprises a hollow body member having an inlet for connection to a source of fluid under pressure and an outlet for discharging said fluid, plug means cooperating with said body member for controlling the flow of fluid through said body member, control means

normally engaging said plug means to retain said plug means in a fluid-discharge-preventing position relative to said body member, said control means being responsive to a predetermined fluid pressure in said body member for releasing said engagement and permitting the release of said plug means from said position and the discharge of extinguishant from said outlet, and means for deflecting the extinguishant discharge from said heads in a manner to create a mist-like spray at least a portion of which extends in a substantially radial direction relative to said outlet.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic perspective view of a building having the sprinkler heads forming the system of the present invention installed therein;

FIG. 2 is a perspective view of a sprinkler head utilized in the present invention;

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 2; and

FIG. 4 is a view similar to FIG. 2, but depicting the sprinkler head in a different operative mode.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 of the drawings, a building 10 is shown in phantom lines which is equipped with an automatic fixed fire protection system 12 embodying features of the invention. The system comprises a buried feed main 14 connected to a municipal water supply line 16 for delivering the extinguishant, in this case water, to a riser 18. The riser 18 is connected to a crossmain 20 which, in turn, is connected to a plurality of branch lines 22. Each branch line has a plurality of sprinkler heads 24 mounted thereon which are operated automatically in response to a fire, as will be described, to deliver a spray of water to the fire. The buried feed main 14 extends beyond the riser 18 and can be connected to risers of other buildings or, in the case of a large building, to other risers in the same building. The crossmain 20 and the branch lines 22 are suspended near the ceiling of the building in a conventional manner.

The details of each sprinkler head 24 are shown in FIGS. 2 and 3. Each head consists of a base member 26 having an externally threaded nipple 28 projecting from the upper surface thereof as viewed in FIG. 2, and a lower tubular portion 30 projecting from the lower surface thereof and defining a discharge opening 30a at its free end. The base member 26 has a through opening 26a which provides for registration between the nipple 28 and the tubular member 30. A cylindrical plug 32 extends in the discharge opening 30a and is integral with a disc 33 which extends over the latter opening. A yoke 34 is supported by the base member 26 and, in turn, supports a serrated deflector disc 36 at its apex.

A collapsible linkage assembly, comprising two substantially T-shaped lever arms 38 and 40, is supported by the yoke 34. One projecting portion of the lever arm 38 engages the disc 33 to maintain it and the plug member 32 in the position shown in FIGS. 2 and 3, while one projecting portion of the lever arm 40 is supported by the apex of the yoke 34. The other projecting portions of the lever arms 38 and 40 engage each other,

while the ends of the lever arms are engaged by a fusible link 42 extending thereover in a manner to apply a force to the lever arms 38 and 40 of a sufficient amount to maintain the lever arms in the position shown. The fusible link 42 may be of any standard material which is adapted to fuse, or melt, at a predetermined elevated temperature, and release itself from the engagement with the lever arms 38 and 40.

According to a particular feature of the present invention, a thread 44 extends around the projecting ends of the levers 38 and 40 in a manner to apply a redundant force to the levers. As a result the thread will maintain the levers 38 and 40 in the position shown despite the fact that the fusible link 42 has fused. The thread 44 may be of any material which is relatively insensitive to heat.

In operation, the heads 24 are installed in the position shown in FIG. 1, with the pressure of the extinguishant supplied to each head being insufficient to discharge its plug 32 from the outlet opening 30 due to oppositely directed force applied to the plug 32 and the disc 33 by the lever arm 38. Upon the temperature in the vicinity of one or more of the heads 24 reaching the fusible temperature of its link 42 which, for the purposes of example, is 286° F., the link 42 will fuse and fall downwardly by gravity away from the head. In this manner the head 24 will attain the position shown in FIG. 4, i.e., with the thread 44 providing the only force maintaining the lever arms 38 and 40 in the position shown. If the tension applied to the thread 44 via the lever arms 38 and 40 as a result of the extinguishant pressure acting on the plug 32 is of a magnitude to break the thread 44, the linkage assembly formed by the arms 38 and 40 will collapse and the plug 32 will be freed for discharge from the discharge opening 30a under pressure of the extinguishant. The resulting stream of extinguishant issuing from the discharge opening 30a will impinge against the serrated deflector disc 36 to form a hemispherical pattern of droplets a portion of which will extend in a radial direction relative to the discharge opening and eventually fall onto the fire, simulating the characteristics of rain.

It is thus seen that according to the present invention each head can be designed to respond to a predetermined temperature and pressure depending on the fusion temperature of the link 42 and the pressure that will cause a breaking of the thread 44. In this manner, the system can be designed to insure that after a predetermined number of sprinkler heads have been opened by virtue of the fusing of their thermal links and the breaking of their threads 44, any other additional heads will not be opened despite the fusion of their fusible links 42. As discussed above, this eliminates the redundant and flooding use of water and prevents heads located a fairly remote distance from the actual location of the fire from being opened and therefore robbing water from the heads directly over the fire in the area where it is critical that they have sufficient pressure.

Of course, other variations of the specific construction and arrangement of the fire protection system utilizing sprinkler heads with a pressure floor disclosed above can be made by those skilled in the art without departing from the invention as defined in the appended claims.

I claim:

1. A discharge head for use in a fire protection system, comprising a hollow body member having an inlet for connection to a source of fluid under pressure and an outlet for discharging said fluid, plug means cooperating with said body member for controlling the flow of fluid through said body member, means external of said body member adapted to attain an operative position relative to said body member in which it retains said plug means in a fluid-discharge-preventing position relative to said body member, said external means adapted to move to an inoperative position in which it releases said plug means to permit the discharge of said plug means and said fluid from said outlet, fusible means engaging said external means in a manner to maintain said external means in said operative position, said fusible means adapted to fuse in response to a predetermined fire condition and release said engagement, and pressure-responsive means engaging said external means in a manner to maintain said external means in said operative position, said pressure-responsive means being responsive to the presence of a predetermined pressure in said head for releasing said engagement upon said fusion of said fusible means and permitting the movement of said external means to said inoperative position.

2. The head of claim 1 wherein said plug means extends in said outlet orifice, and wherein said external means comprises two levers, the first lever normally engaging said plug means and the second lever normally engaging said first lever to support said first lever relative to said body member, and wherein said fusible means comprises a fusible link engaging both of said levers to maintain said first lever in engagement with said plug means and said second lever in engagement with said first lever.

3. The head of claim 2 wherein said control means is responsive to the presence of a predetermined fluid pressure at said head and comprises a thread connecting said levers to maintain said first lever in engagement with said plug means and said second lever in engagement with said first lever.

4. The head of claim 1 wherein said plug means is released from said fluid-discharge-preventing position under the force of the fluid pressure in said body member.

5. A sprinkler head comprising a hollow body member having an inlet for connection to a source of fluid under pressure and an outlet for discharging said fluid, plug means cooperating with said body member for controlling the flow of fluid through said body member, control means normally engaging said plug means to retain said plug means in a fluid-discharge-preventing position relative to said body member, said control means being responsive to a predetermined fluid pressure in said body member for releasing said engagement and permitting the release of said plug means from said position and the discharge of extinguishant from said outlet, and means for deflecting the extinguishant discharge from said outlet in a manner to create a mist-like spray at least a portion of which extends in a substantially radial direction relative to said outlet.

6. The head of claim 5 further comprising additional control means normally engaging said plug means in a manner to retain said plug means in said extinguishant-discharge-preventing position, said additional control

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means being responsive to a predetermined fire condition for releasing said engagement and permitting the removal of said plug means from said position.

7. The head of claim 5 wherein said plug means is released from said position under the force of the fluid pressure in said body member.

8. An automatic fixed fire extinguishing system for buildings and the like comprising a plurality of sprinkler heads located in a space to be protected, delivery means to deliver extinguishant from a source of supply to each of said heads, fire responsive means automatically responsive to a fire developing in said space for actuating the heads in a sequence dictated by the information received from the fire to permit the discharge of extinguishant from said heads towards the fire, means for deflecting the extinguishant discharged from said heads in a manner to create a mist-like spray at least a portion of which extends in a radial direction relative to

said outlet, and control means for reducing the number of heads which will be opened to discharge extinguishant to the fire as compared to the number of heads which would be opened by the same fire acting on the same system without said control means.

9. The system of claim 8 wherein said control means includes means operatively connected to each head for controlling the opening of the head with which it is associated.

10. The system of claim 9 wherein said control means is responsive to the static pressure of the extinguishant at each unopened head.

11. The head of claim 1 further comprising means for deflecting the extinguishant discharge from said outlet in a manner to create a mist-like spray at least a portion of which extends in a substantially radial direction relative to said outlet.

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