

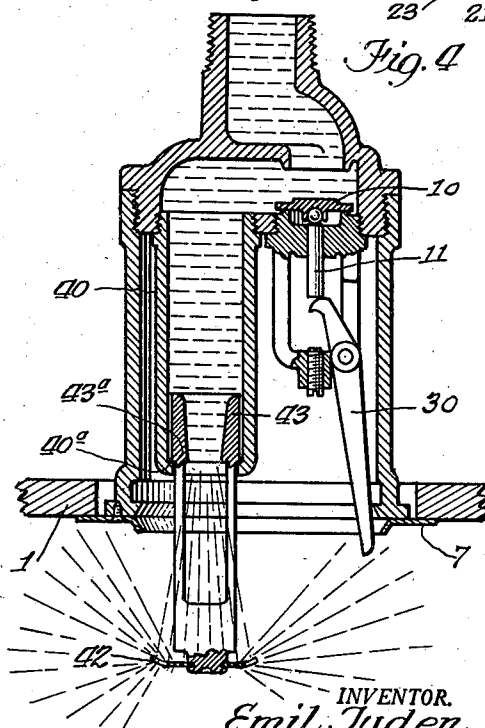
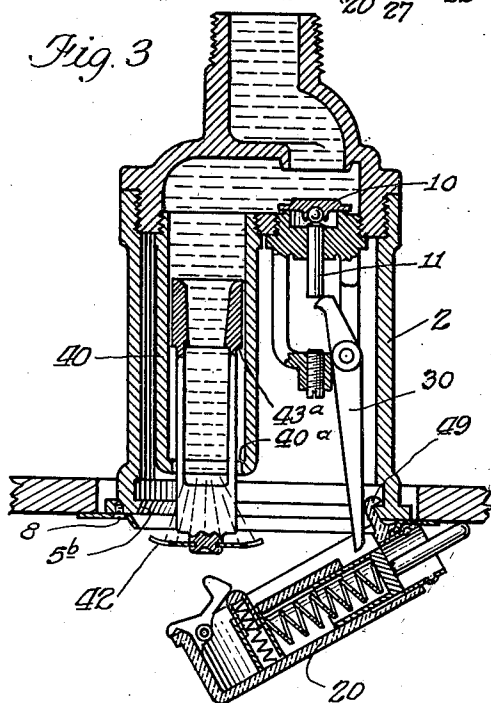
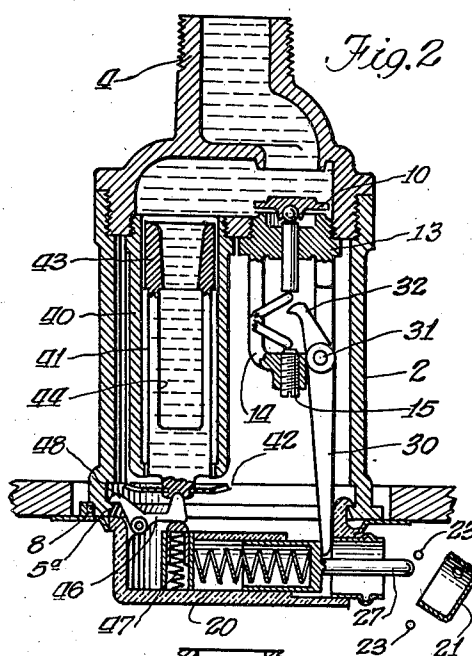
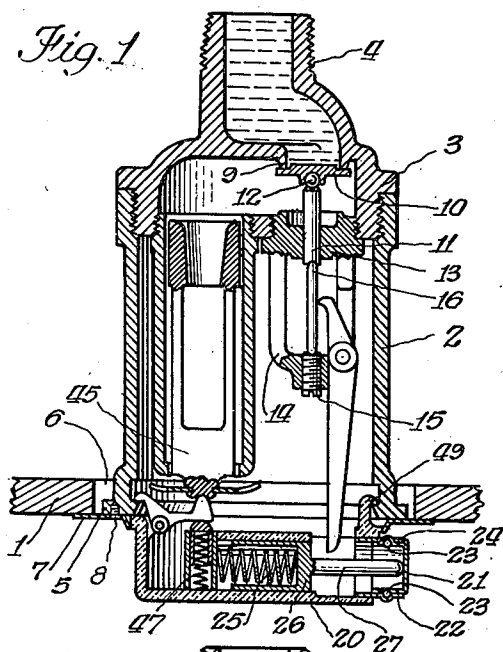
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SPRINKLER HEAD

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SPRINKLER HEAD

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12 Claims. (Cl. 169—37)

This invention relates to sprinkler heads designed for use in a fire extinguishing system, and one object of the invention is to provide a new and improved sprinkler head which avoids certain objections to the types heretofore employed. The usual practice has been to mount sprinkler heads so that they extended some distance below the ceiling of the room, but in some cases, particularly where indirect lighting was employed, the projecting sprinkler heads tended to cause unsightly shadows on the ceiling. They have also been considered objectionable where special attention was paid to the finish and decoration of wall surfaces, as, for example, in stores and office buildings.

It is therefore an object of the invention to provide a sprinkler head of relatively simple construction adapted to be installed with its lower end substantially flush with the ceiling of the room.

A further object of the invention is to provide a flush mounted sprinkler head having a spreader or water deflecting device which is automatically lowered below the plane of the ceiling when the sprinkler becomes operative by reason of fire conditions.

It is also an object of the invention to provide a sprinkler head having its operative mechanism disposed above the lower surface of the ceiling but with its fusible element carried slightly below the plane of the ceiling to insure exposure thereof to currents of heated air flowing across the ceiling under fire conditions.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawing in which:

Fig. 1 is a vertical sectional view taken axially through the housing of a sprinkler head embodying this invention and showing the parts in normal position with the valve closed and with the spreader carried at its inoperative position above the plane of the ceiling.

Fig. 2 is a similar sectional view showing the parts as disposed in the initial stage of operation, with the fusible element disengaged and with the valve opened by the breaking of the frangible rod which normally holds it in closed position.

Fig. 3 is another sectional view taken similarly to Figs. 1 and 2 and showing the next step in the operation whereby the spreader has been released to be lowered by the water pressure to its operative position.

Fig. 4 is also a sectional view at the same plane as the other views showing the spreader fully

lowered to operative position, with the sprinkler head in operation.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and re-arrangements of the parts may be made without departing from the spirit and scope of the invention and that the same is not limited to the particular form herein shown and described except as indicated by the appended claims.

Fig. 1 indicates a fragment of the ceiling of the room at 1, and shows the cylindrical housing 2 of the sprinkler head provided with a cap 3 which includes a nipple portion 4 threaded for attachment to a supply pipe. The nipple 4 is axially located with respect to the body 2 so that the entire fitting may be easily detached or remounted when occasion requires. At the lower end the housing includes a terminal flange 5 which may be non-circular in outline or which may include lugs engageable by a special socket wrench for screwing the head in place or removing it. This requires a clearance space 6 to be formed in the ceiling around the lower end of the housing 2, and to avoid the possibility of a fire spreading into the space between the ceiling and the next floor this clearance 6 is normally closed by an annular member 7 of fibre or similar material secured to the end of the housing 2 by small screws 8.

The water supply passage formed by the nipple 4 terminates in a valve seat 9 which is normally closed by a valve member 10 having a stem 11 connected to the valve by a ball-and-socket joint at 12 to insure proper seating of the valve. The stem 11 is slidably mounted in a guide plug 13 having a depending yoke 14 and a set screw 15 aligned with the valve stem 11. A frangible rod 16 of glass or like material is interposed between the set screw 15 and the stem 11, and the set screw is adjusted so that the rod 16 shall serve to hold the valve 10 in seated position.

A trip mechanism is supported in a case 20 which is detachably engaged with the lower portion of the housing 2 and which supports externally a fusible element shown as a flanged cap 21 telescoped within a sleeve 22 and interengaged therewith by small metallic balls 23. These parts are held in connected relation by a film of fusible material, such as solder, at 24 interposed between the flange of the cap 21 and the surface of the sleeve 22 and incidentally holding the balls 23 in place. While thus positioned, the balls 23 resist pressure of a spring 25 which reacts against a

plunger 26 having a stem 27 engaging the cap 21. Upon a rise of temperature, as in the case of fire conditions in the space adjacent the sprinkler head, the fusible material at 24 is melted, releasing the balls 23 and permitting the pressure of the spring 25 to force the cap 21 out of the sleeve 22. In the resulting movement the plunger 25 engages the lower end of a lever arm 30 which is fulcrumed at 31 on the yoke 14. This swings the short upper end 32 of the lever against the frangible rod 16, causing it to break, as shown in Fig. 2, and permitting the valve 10 to descend to open position.

As the valve 10 opens, the water from the supply pipe flows through the nipple 4, filling the space in the cap 3 of the housing 2 and flowing from the cap into a cylinder 40 which is connected therewith inside the housing 2. This cylinder serves as a guide for a frame or yoke 41 which carries the spreader or deflector 42 at its lower end. The upper portion of the frame 41 is shown as a sleeve 43 through which the water flows downwardly within the cylinder 40 while the lower portion of the frame comprises similarly a pair of narrow arms 44 and a flat cross-bar 45 which does not reduce the capacity of the cylinder 40 as a flow passage below the capacity of the sleeve 43. As the water pressure strikes the spreader disk 42 it depresses the hook lever 46 which is normally upheld against the lower end of the carrier frame 41 by a spring 47, and such depression of the lever 46 releases its catch arm 48 from the upwardly facing shoulder 5^a of the flange 5. This allows the entire trip mechanism in its case 20 to swing downwardly, as shown in Fig. 3, so that presently its hook 49 also becomes disengaged from the shoulder 5^a of the flange 5 at the opposite side of the housing 2, and the trip mechanism with its case 20 falls away from the housing. This complete detachment of the trip mechanism is practically assured by the descent of the spreader 42 under impact of the water flowing through the cylinder 40. To limit the descent of the spreader 42 at a proper distance below the ceiling 1 for correct operation of the sprinkler head, the sleeve portion 43 of the carrier frame 41 has a shoulder 43^a which engages the returned flange 40^a of the cylinder 40 at the lower end of the latter, as seen in Fig. 4.

With the parts in this position the sprinkler head continues to operate for distributing water to a predetermined space below it until the fire has been extinguished and the water supply has been shut off. Thereafter, the cover disk 7 is removed by releasing the screws 8, and a special wrench or tool is applied to the flange 5 of the housing for unscrewing the entire sprinkler head at the nipple 4. This allows the valve 10 to be reset in closed position by the provision of a new frangible rod 16. At the same time, a new or reconditioned trip mechanism will be supplied, with its plunger 26 locked in retracted position by a cap 21 secured in the sleeve 22 by fusible material 24. Such a trip mechanism is readily applied to the lower end of the housing 2 by engaging its hook 49 with the flange 5^a and then swinging the case 20 upwardly to force the catch 48 past the inclined face 5^b of the flange 5 until the spring 47 finally throws the catch into holding engagement with the shoulder 5^a, as shown in Fig. 1. This replacement of the trip mechanism, of course, raises the spreader 42 to its upper position, as shown in Fig. 1, and closes the housing 2, leaving only the trip mechanism case depending below the plane of the ceiling 1. This

case may be made as a cylinder of relatively unobtrusive design, which will not be objectionable from the standpoint of appearance while it will still support the fusible element in a position adjacent the plane of the ceiling at which it will be readily exposed to currents of heated air in the event of fire conditions.

When preferred, it is possible to replace the frangible rod 16 and reset the spreader 42 and trip mechanism case 20 without detaching the housing 2 from the supply pipe. Ordinarily, it will be preferable to remove the entire sprinkler head so that it may be reconditioned and inspected before being placed in service; but the construction is such that if it is installed in a location remote from the factory or service station it can be put back into service without delay incident to factory inspection. If it is considered desirable to inspect the valve 10 itself before replacing the sprinkler head in service this can be done whether the housing 2 is left in position or is disconnected from the supply pipe by unscrewing its nipple 4 therefrom. The valve 10 is attached to its stem 11 and the stem is slidably engaged in the guide plug 13 which forms a portion of the lower wall of the horizontal part of the flow passage. The guide plug 13 is threaded so that it may be unscrewed from the cap portion 3 of the housing and when thus unscrewed it brings with it the valve 10 and its stem 11. If the valve has become unreliable for any reason it can be readily replaced before the plug 13 is screwed back into position. The plug includes as an integral portion the depending yoke 14 which supports the set screw 15 and fulcrums the lever 30, but, obviously, the plug 13 must be replaced in position before the frangible rod 16 can be replaced and the valve adjusted to seating position by means of the set screw 15.

As indicated, the trip mechanism case 20 is constructed of non-metallic material, such as a plastic or fibre composition, which is a poor conductor of heat, so that when the temperature of the air surrounding the case 20 rises to a dangerous degree the heat will not be conducted away to the metallic housing 2 by the casing 20, but will remain available to affect the fusible material at 24 so as to insure prompt release of the plunger 25 and opening of the valve 10.

I claim as my invention:

1. A sprinkler head for a fire extinguishing system, comprising a housing with its lower end disposed substantially flush with a ceiling, a closure for said lower end of the housing releasably secured thereto, a downwardly open flow passage within the housing, a valve controlling said passage, a fusible element carried by said closure, means whereby the valve is opened upon fusing of said element, admitting water to the flow passage, a spreader disposed adjacent the lower end of the flow passage in position to be forced downwardly by the flow of water, means actuated by the downward movement of the spreader to release said closure, and means arresting said spreader at a suitable distance below the plane of the ceiling for performing its spreading function.

2. A sprinkler head for a fire extinguishing system, comprising a housing with its lower end disposed substantially flush with a ceiling, a closure for said lower end of the housing releasably secured thereto, a downwardly open flow passage within the housing, a valve controlling said passage, a fusible element carried by said closure, a frangible member holding the valve seated, means

including a stressed spring arranged to break the frangible element upon release of said spring, said fusible element holding the spring stressed and releasing it when fused, whereby the valve is opened admitting water to the flow passage, a spreader disposed adjacent the lower end of the flow passage in position to be forced downwardly by the flow of water, means actuated by the downward movement of the spreader to release said closure, and means arresting said spreader at a suitable distance below the plane of the ceiling for performing its spreading function.

3. A sprinkler head for a fire extinguishing system, comprising a housing disposed with its lower end substantially flush with a ceiling, said housing having a nipple at its upper end for connection to a supply pipe and formed with a valve seat within the housing, a valve seated thereon, a flow passage within the housing leading downwardly from said valve seat, a spreader carried at the lower end of said flow passage by means which is slidable in said passage, a closure for the lower end of the housing, a fusible element carried by said closure, means whereby the valve is opened upon fusing of said element admitting water to said flow passage, said closure including means upholding the spreader, and a spring catch retaining said closure on the housing, together with means operable by the pressure of the water against the spreader to release said catch and the closure, permitting the spreader to descend to a position below the plane of the ceiling, and means to arrest the spreader at a predetermined position.

4. A sprinkler head for a fire extinguishing system, comprising a housing disposed with its lower end substantially flush with a ceiling, said housing having a nipple at its upper end for connection to a supply pipe and formed with a valve seat within the housing, a valve seated thereon, a flow passage within the housing leading downwardly from said valve seat, said flow passage including a laterally leading portion directly below said valve seat, the valve having a depending stem, a guide plug removably screwed into the wall of said passage opposite the valve seat and having a guide bore for said valve stem, said plug including a depending support with a set screw adjustable therein and a frangible member interposed between the set screw and the valve stem holding the valve in seated position, means including a fusible element at the lower end of the housing operable upon the fusing of said element to break the frangible member, thereby releasing the valve, and a spreader normally carried within the housing at the lower end of said flow passage with holding means for the spreader which is released by the pressure of water admitted to the passage, whereby the spreader is lowered to an operative position below the plane of the ceiling.

5. A sprinkler head for a fire extinguishing system, comprising a housing positioned with its lower end substantially flush with a ceiling, a flow passage within said housing, a normally closed valve controlling said passage, means including a fusible element and operable upon fusing of said element to open the valve, a spreader disposed normally within the housing, and holding means independent of said fusible element retaining said spreader within the housing but releasable by the force of water admitted to the flow passage upon opening of said valve to allow the spreader to descend to its operative position below the plane of the ceiling.

6. A sprinkler head for a fire extinguishing system, comprising a housing with its lower end disposed substantially flush with a ceiling, a closure for said lower end of the housing releasably secured thereto, a downwardly open flow passage within the housing, a valve controlling said passage, a fusible element carried by said closure in an exposed position below the plane of the ceiling, means whereby the valve is opened upon fusing of said element, admitting water to the flow passage, a spreader disposed adjacent the lower end of the flow passage in position to be forced downwardly by the flow of water, means actuated by the downward movement of the spreader to release said closure, and means arresting said spreader at a suitable distance below the plane of the ceiling for performing its spreading function.

7. A sprinkler head for a fire extinguishing system, comprising a housing with its lower end disposed substantially flush with a ceiling, a closure for said lower end of the housing releasably secured thereto, a downwardly open flow passage within the housing, a valve controlling said passage, a fusible element carried by said closure, the closure being formed of non-metallic material which is a relatively poor conductor of heat, means whereby the valve is opened upon fusing of said element, admitting water to the flow passage, a spreader disposed adjacent the lower end of the flow passage in position to be forced downwardly by the flow of water, means actuated by the downward movement of the spreader to release said closure, and means arresting said spreader at a suitable distance below the plane of the ceiling for performing its spreading function.

8. A sprinkler head for a fire extinguishing system, comprising a housing with its lower end disposed substantially flush with a ceiling, a closure for said lower end of the housing releasably secured thereto, a downwardly open flow passage within the housing, a valve controlling said passage, a fusible element carried by said closure, a frangible member holding the valve seated, a plunger carried by said closure, a spring reacting against said plunger and held compressed by the fusible element, the fusing of said element releasing said spring and plunger, means operable by said plunger when released to break the frangible element, whereby the valve is opened, admitting water to the flow passage, a spreader disposed adjacent the lower end of the flow passage in position to be forced downwardly by the flow of water, means actuated by the downward movement of the spreader to release said closure, and means arresting said spreader at a suitable distance below the plane of the ceiling for performing its spreading function.

9. A sprinkler head for a fire extinguishing system, comprising a housing with its lower end disposed substantially flush with a ceiling, a closure for said lower end of the housing releasably secured thereto, a downwardly open flow passage within the housing, a valve controlling said passage, a fusible element carried by said closure, a frangible member holding the valve seated, a plunger carried by said closure, a spring reacting against said plunger and held compressed by the fusible element, the fusing of said element releasing said spring and plunger, a lever fulcrumed between its ends with one end adjacent the frangible element and the other end positioned for actuation by the plunger, whereby release of the plunger causes the lever

to break the frangible element, permitting the valve to open and to admit water to the flow passage, a spreader disposed adjacent the lower end of the flow passage in position to be forced downwardly by the flow of water, means actuated by the downward movement of the spreader to release said closure, and means arresting said spreader at a suitable distance below the plane of the ceiling for performing its spreading function.

10. A sprinkler head for a fire extinguishing system, comprising a housing disposed with its lower end substantially flush with a ceiling, said housing having a nipple at its upper end for connection to a supply pipe and formed with a valve seat within the housing, a valve seated thereon, a flow passage within the housing leading downwardly from said valve seat, a spreader carried at the lower end of said flow passage by means which is slidable in said passage, a closure for the lower end of the housing, a fusible element carried by said closure, means whereby the valve is opened upon fusing of said element, admitting water to said flow passage, said closure including spring catch means yieldingly retaining said closure on the housing and including an arm engaging the spreader and yieldingly upholding it, whereby the pressure of the water against the spreader releases said catch, disengaging the closure from the housing and permitting the spreader to descend to a position below the plane of the ceiling, and means to arrest the spreader at a predetermined position.

11. A sprinkler head for a fire extinguishing

system, comprising a housing positioned with its lower end substantially flush with a ceiling, a flow passage within said housing, a normally closed valve controlling said passage, means including a fusible element and operable upon fusing of said element to open the valve, a closure releasably secured to the lower end of the housing and supporting said fusible element in an exposed position below the plane of the ceiling, said closure serving to uphold the spreader adjacent the lower end of said flow passage, whereby the force of the water admitted to the flow passage upon opening of said valve acts against the spreader, separating said closure from the housing and allowing the spreader to descend to its operative position below the plane of the ceiling.

12. A sprinkler head for a fire extinguishing system, comprising a housing positioned with its lower end substantially flush with a ceiling, a flat annular shield secured to the lower end of the housing and overlapping the ceiling adjacent the housing, a flow passage within said housing, a normally closed valve controlling said passage, means including a fusible element and operable upon fusing of said element to open the valve, a spreader disposed normally within the housing, and holding means independent of said fusible element retaining said spreader within the housing but releasable by the force of water admitted to the flow passage upon opening of said valve to allow the spreader to descend to its operative position below the plane of the ceiling.

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