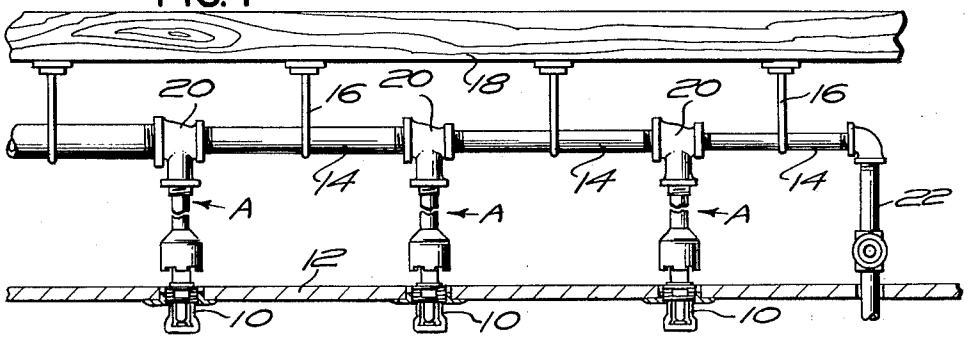
Oct. 30, 1956 P. C. SHERBURNE 2,768,696

SPRINKLER SYSTEMS

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FIG. 1



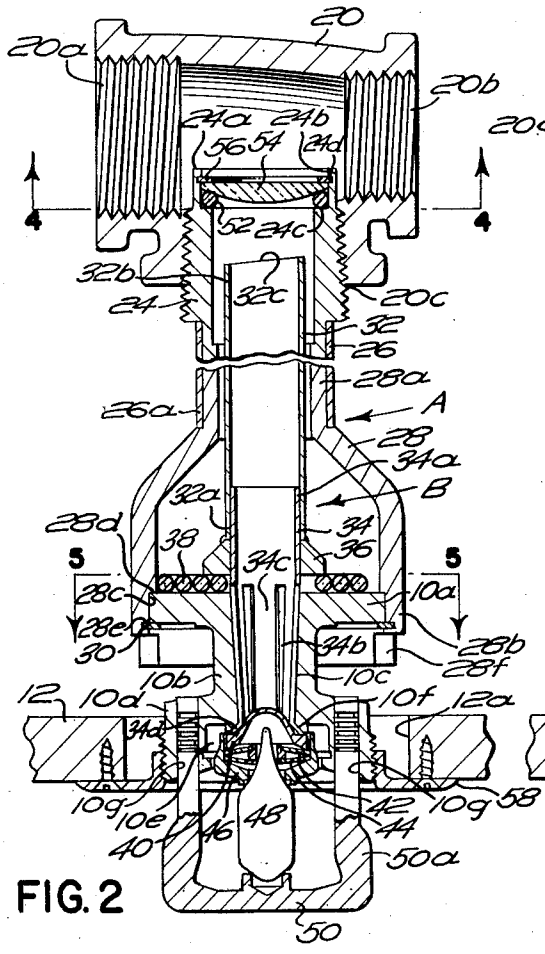


FIG. 2

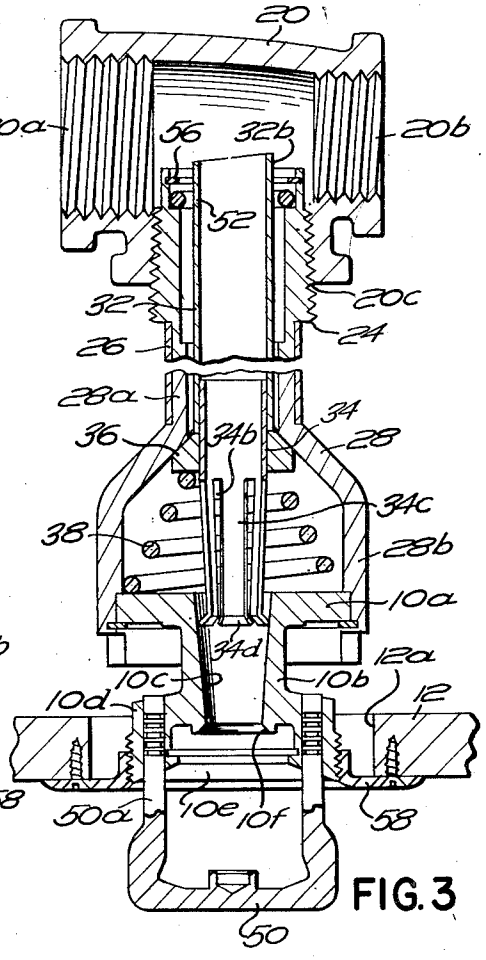


FIG. 3

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SPRINKLER SYSTEMS

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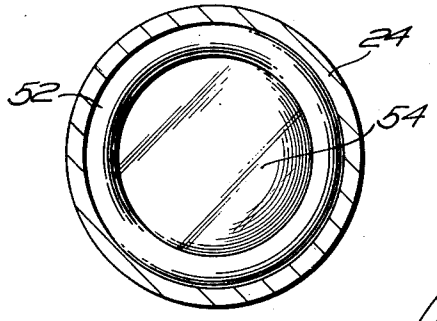


FIG. 4

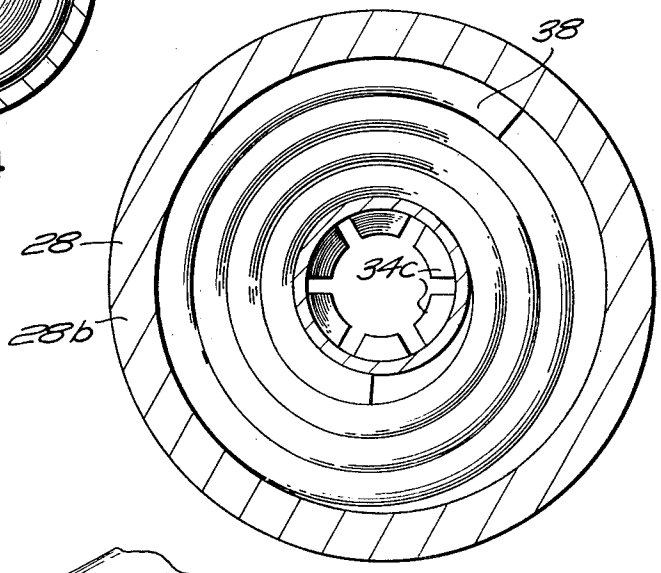


FIG. 5

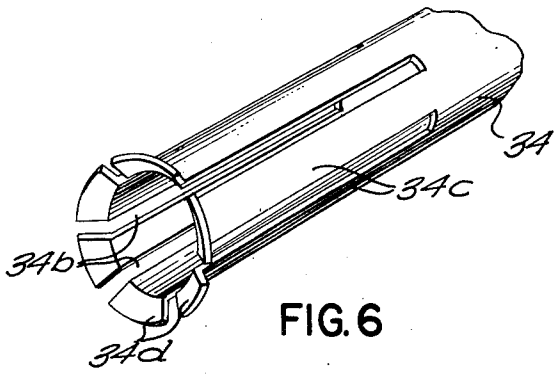


FIG. 6

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2,768,696

SPRINKLER SYSTEMS

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Application May 1, 1953, Serial No. 352,441

9 Claims. (Cl. 169—37)

This invention relates to improvements in sprinkler systems having automatic sprinkler heads. More especially it has to do with a sprinkler system in which the fluid outlets and deflectors therefor are located at the ends of conducting tubular members leading from the distributing pipes and in which novel closure means are associated with each of these tubular members to prevent a fire extinguishing medium in the pipes from entering thereinto until actuation of the thermally responsive means associated with the outlets and deflectors takes place.

The distributing pipes for bringing a fire extinguishing medium such as water to sprinkler heads are usually arranged in a generally horizontal position, and if they are kept filled with the said medium at all times the installation may be entirely conventional with the sprinkler heads screwed directly into fittings located along these distributing pipes and extending therefrom in any convenient directions. If, however, the system is liable to be subjected at any time to freezing temperatures it is necessary to employ a system of the so-called dry pipe type in which the distributing pipes are normally filled with a gas such as air and from which the water is excluded until need for it arises, as when a fire occurs or when the system is tested. Such a dry pipe system must be again restored to its normally dry condition after a test or after operation occasioned by a fire by draining off the water.

This draining operation presents no difficulties so far as the distributing pipes themselves are concerned, because those that are horizontal are properly "pitched" during installation to assure their complete drainage. However, where it is necessary or convenient to connect sprinkler heads to the distributing pipes so that they depend downward therefrom, it is not so easy, after a fire or test, to remove the water collected in any unactuated sprinkler heads which are thus downwardly disposed. It is clear, of course, that where there is need of a dry pipe system, because it might be subjected to freezing temperatures, water collected in such pendent sprinkler heads cannot be tolerated. Freezing of water thus collected would render the pendent sprinkler heads inoperative. It is therefore necessary in dry pipe systems either to drain each pendent sprinkler head individually after a fire or test, or to provide closure means for keeping the water out of these heads until the heads are thermally actuated by a fire occurring in this vicinity.

To avoid the laborious job of removing each pendent sprinkler head to drain it it has been customary to provide devices which have closure means to accomplish the purpose above-stated. In general each of the more successful of these earlier devices comprises a fluid conducting tubular member having one end adapted for connection to a fitting on the distributing pipe and having its other end adapted to receive what I shall call an outlet unit similar in many respects to an ordinary sprinkler head in that it has a body member with a discharge passage therethrough, a deflector and thermally responsive means. The closure means employed in each

of the more successful of these earlier devices is a frangible seal which is located at the first-mentioned end of the tubular member and which is shattered by the release of a spring loaded plunger upon thermal actuation of the thermally responsive means associated with the outlet unit.

The distributing pipes of sprinkler systems are usually located at the top of the enclosure to be protected from fire, and where the good appearance of the enclosure so demands these pipes and the tubular members extending downward therefrom are entirely concealed above the ceiling with only the outlet unit projecting therebelow. However, the vertical space above the ceiling in which the distributing pipes and tubular members must be located is frequently limited. The portion of vertical space required for the distributing pipes cannot be easily reduced, because the size of the pipe is determined by other considerations, but I have discovered that the vertical space which is required for the tubular members and which is the greater portion of the total vertical space occupied may be made very small when the force to drive the plunger is in each case derived from a helical spring of the conical type arranged in a manner that will be more particularly described. I have further discovered a novel arrangement which will also be more particularly described for latching a plunger so driven.

When the closure means at the pipe end of the tubular member is formed of a frangible material which is intended to be shattered by a spring-actuated plunger this closure means must be capable of withstanding those pressures normally encountered in the distributing pipe and at the same time must be capable of being completely shattered by the plunger when the latter is released. Complete shattering is essential so that the fragments of the closure means will pass freely through the tubular connection and be expelled from the outlet and not lodge in the connection or outlet to impede the flow therethrough. It has been my experience that a large striking force must be exerted by the plunger to properly shatter a frangible closure means which is capable of withstanding the pressures normally encountered in the distributing pipes. To achieve this large striking force a strong spring must be employed to actuate the plunger. I have discovered, however, that when the closure means has a novel configuration which will be more particularly described hereinafter, the plunger-actuating spring need not be as strong as heretofore thought necessary to effect a shattering even though the closure means is capable of withstanding distributing pipe pressures.

Accordingly, it is one object of my invention to provide in the tubular member connecting a pendent outlet unit to the distributing pipe of a dry-pipe system a helical spring of the conical type for driving the plunger against the frangible closure means, thereby permitting the location of the outlet unit very near the distributing pipe, if such location is desired.

Another object is to provide in systems of the kind being considered an improved, simple and inexpensive latching mechanism for holding the plunger at rest against the force of the spring until the thermally responsive means associated with the outlet unit is thermally actuated and for releasing the plunger upon such actuation.

Another object is to provide in systems of the kind being considered an improved frangible closure means.

Additional objects will hereinafter appear.

The best mode in which I have contemplated applying the principles of my invention is disclosed in the accompanying drawings but these are to be deemed merely illustrative because it is intended that the patent shall cover by suitable expression in the appended claims whatever features of patentable novelty exist in the invention disclosed.

In the drawings:

Fig. 1 is an elevation of a portion of a sprinkler system embodying my invention;

Fig. 2 is a vertical section showing a fitting of a horizontal distributing pipe and a fluid conducting member leading therefrom to an outlet unit, this and other structure being in accordance with my invention and the movable parts being shown in their relative positions when the system is inactive;

Fig. 3 is a vertical section like Fig. 2, but with the movable parts shown in their relative positions for fire extinguishing discharge;

Figs. 4 and 5 are horizontal sections taken as on lines 4—4 and 5—5, respectively, of Fig. 2; and

Fig. 6 is a perspective view of the lower end of the plunger used in my improved system.

Referring to the drawings, and particularly to Fig. 1, there is shown a portion of a sprinkler system employing outlet units **10** located below a ceiling **12** represented in cross-section. Above the ceiling a horizontal distributing pipe **14** is carried by hangers **16** from some convenient structural support **18**. At suitable intervals along the pipe **14** there are provided fittings **20** from each of which a generally tubular member A extends downward to an outlet unit **10**. This showing in Fig. 1 is typical of a sprinkler system installed in a location where there is a likelihood that the system or the portion of it above the ceiling **12** may sometime be subjected to freezing temperatures, and accordingly the water is normally held back from the distributing pipes by some suitable form of valve (not shown). When such a dry-pipe system is tested to determine if there are any leaks by admitting thereto water under pressure, or after the system has operated to put out a fire, the water can be drained from the horizontal distributing pipes readily enough by a convenient drain connection such as a pipe **22**. However, it would not be so easy or practical to drain the numerous pendent units **10** and their associated tubular members A if they were allowed to fill with water, and consequently I have provided improved means for preventing the entrance of any water into a tubular member A until its respective outlet unit has responded to a fire started in the vicinity thereof.

In Figs. 2 to 5 inclusive are shown the details of the preferred embodiment of my improved means. The sections of the distributing pipe **14** are screwed into aligned openings **20***a* and **20***b* of the fitting **20** which has a third depending outlet **20***c*. Into this depending outlet **20***c* there is screwed a fixed sleeve **24** which preferably extends far enough up into the fitting **20** to bring its upper end **24***a* substantially above the bottom level of the flow passageway therethrough. Thus when the distributing pipe **14** is filled with water (either for test purposes or for fire extinguishing discharge) and then subsequently drained, no appreciable quantity of water is likely to stand in the fitting above the upper end **24***a* of the sleeve **24** when, for one reason or another, the removal of the water from the system is incomplete. Although it is not unusual for some small amount of water to remain in the upper end of the fixed sleeve **24** above the closure means which is located there, and which will be more particularly described presently, this is of no concern even if this water freezes because the apparatus of my improved structure will break through any such thin ice formation, as will appear.

A cylindrical extension piece **26** is brazed or otherwise secured to the lower end of the sleeve **24** and extends downward therefrom, substantially as shown, to a bell-shaped spring housing **28** which has its hollow upper neck portion **28***a* suitably fastened to the lower end **26***a* of this extension piece. As its name implies, the bell-shaped spring housing **28** flares outward from this neck portion **28***a* and has a depending cylindrical skirt **28***b* with an inside diameter considerably greater than that of the extension piece **26**. At its lower end and for a short distance upward therefrom this spring housing skirt **28***b* has its inside diameter still further increased, as at **28***c*, to form a shoulder **28***b*. A circular base plate **10***a* integrally formed on the outlet unit **10** is inserted in this lower end of the spring housing skirt **28***b* until it bears against the shoulder **28***d*, and this base plate is there held by a tapered snap ring **30** which cooperates with an annular groove **28***e* suitably located on the inside wall of the spring housing skirt.

The outlet unit base plate **10***a* has extending downward therefrom a shaft portion **10***b* which has a central passage **10***c* of circular cross-section therethrough. This central passage also extends through the base plate **10***a*, and its side walls are preferably tapered slightly as shown. At its lower end the shaft portion **10***b* widens into a body portion **10***d* having a central recess **10***e* which extends thereinto from its lower end and joins the central passage **10***c*. At the point where the central passage **10***c* opens into this recess **10***e* the above-mentioned taper in its side walls is abruptly reversed to form what substantially amounts to a bevel at **10***f*. The purpose of this bevel will presently appear.

The sleeve **24**, extension piece **26** and spring housing **28** comprise the tubular member A hereinbefore referred to, and within the vertical flow passage which these elements form from the fitting **20** to the unit **10** there is located a hollow cylindrical plunger B. Preferably this plunger is made up of three pieces, an upper tube **32**, a lower tube **34** and a shoulder piece **36**. The upper tube **32** is vertically disposed so that its lower end **32***a* is located in the spring housing **28** and its upper end **32***b* extends part way up into the sleeve **24**. The outside diameter of this tube is small enough so that the tube is capable of free movement with respect to the elements by which it is enclosed, and the rim **32***c* of the top end of the tube lies in a plane which is not perpendicular to the tube axis. The lower tube **34** is also vertically disposed and has its upper end **34***a* brazed or otherwise suitably secured to the bottom end **32***a* of the tube **32**, substantially as shown. This lower tube **34** has an outside diameter only slightly smaller than the diameter of the upper end of the tapered central passage **10***c* in the outlet unit **10**, and deep longitudinal slots **34***b* are formed in this tube from the bottom thereof to provide a plurality of depending flexible segments **34***c* (see Fig. 6). Because each of these segments may be deflected inwardly toward the axis of the tube **34** they may be inserted down through the tapered central passage **10***c*, as illustrated, until the outwardly bent tip **34***d* on each springs out and lies against the beveled surface **10***f* at the bottom end of this central passage. The shoulder piece **36** is preferably an annular ring which fits nicely around the lower tube **34** and is located thereon so that its upper side is abutted against and welded to the bottom rim of upper tube **32**. From this last-mentioned weld the upper side of shoulder piece **36** slopes downward at an angle which is substantially the same as the angle at which the upper portion of the spring housing flares outward from its hollow neck **28***e*.

The lower side of the shoulder piece **36** extends radially outward and overlies the central winding of a helical spring **38** of the compression type which, in its unflexed condition, assumes the conical shape shown in Fig. 3. In this unflexed condition only the outside winding rests on the upper side of the outlet unit base plate **10***a*.

Referring now particularly to Fig. 2, my improved device is prepared for installation, or "loaded," by thrusting the plunger downward until the outwardly bent tips **34***d* on the segments of the lower tube **34** emerge from the outlet unit central passage **10***c* and snap out to lie against the bevel **10***f*. Thereupon, these tips are held in these positions and are prevented from being drawn inward and upward by the insertion of a hemispherical cup **40** up into the segmented bottom end of tube **34**

and the forcible holding of this cup in this described position. Otherwise stated, the outside rounded surface of the cup 40 prevents the segment tips 34*d* from moving inward, as they must before they can clear the bevel 10*f* and be drawn up the central passage 10*c* by the spring 38.

The lower edge of the cup 40 is pressed upward by its engagement with the outside edge of a spring washer 42 whose downwardly extending hollow hub portion is, in turn pressed upward by the engagement of its lower end with the inside edge of a second spring washer 44. The outside edge of this latter washer is pressed upward by an annular shoulder on a cap member 46, and a frangible thermally responsive bulb 48 having its lower end fixed relative to the outlet unit body portion 10*d* seats against this cap member 46 and presses it upward. In this manner the cup 40 is held in position to latch the plunger.

The seat provided to hold fixed the lower end of the frangible bulb 48 also serves as a deflector 50 for the water which discharges from the outlet unit, and this deflector is secured to the body portion 10*d* by arms 50*a*. Suitable holes 10*g* are provided in this body portion and when these arms have been inserted far enough therein to assure that the cup 40 is properly held in place the body portion is crimped around the holes 10*g* to seize the arms.

The length of the lower tube 34 and the location of the shoulder piece 36 thereon are such that when this lower tube is latched as above described the spring 38 is compressed until all of its coils are pressed against the base plate 10*a*. Consequently, the spring, though occupying a minimum amount of vertical space, has considerable force stored up in it and is ready to drive the plunger upward when the latter is released.

For a short distance downward from its upper rim the sleeve 24 has its inside diameter somewhat increased, as at 24*b*, to form a shoulder 24*c* on which there is located a sealing ring 52. This sealing ring is of resilient material, preferably has a circular cross-section and serves as a seat for the edge of a frangible disc 54 which is held thereon by a tapered snap ring 56 cooperating with an internal sleeve groove 24*d*. The underside of the frangible disc 54 is substantially convexed as shown, and since this disc must be depressed somewhat and the sealing ring 52 squeezed before the snap ring 56 may be set in place, the resilient material of this sealing ring is pushed largely outward against sleeve wall 24*b* as well as downward against the shoulder 24*c*. Thus by this convex disc shape the prevention of leakage past the disc 54 is assured. Later herein other advantages derived from the convex disc shape will be explained.

Considering now the operation of my improved system, assume first that normal conditions prevail, no fire has started and the water is kept out of the distributing pipes 14 and their fittings 20 by a valve (not shown). Under these circumstances the parts are in the positions shown in Fig. 2. The frangible bulb 48 is intact, the plunger B is spring loaded down and latched; and the frangible disc 54 seals off the sleeve 24 from the flow passageway through the fitting 20.

Now assume that a fire breaks out in the vicinity of this device. The thermally responsive bulb 48 shatters because of the expansion of the heated liquids and gases therein when the air around this bulb reaches a predetermined temperature. Thereupon, the force which was previously transferred to the cup 40 and held it in place is removed. The segment tips 34*d*, urged inward and upward by the force of spring 38, are then able to eject the cup 40 downward by their contact on the hemispherical upper surface thereof, and simultaneously these tips are pulled off the bevel 10*f* and into the central passage 10*c*. The plunger is thus released and driven upward to shatter the frangible disc 54, and communication is established between the now-open outlet unit 10 and the fitting 20 (see Fig. 3).

Either by this release of the gas (air) in the pipes 14 (which gas may be under pressure) or by separate thermally responsive means (not shown) the valve which is holding back the water may be opened, and water is appropriately discharged on the fire. Obviously, those pendent devices which are remote from the fire and do not respond to the heat therefrom need not be replaced or individually drained when the fire is extinguished and the water is drawn from the system.

It should be noted that upward movement of the plunger is arrested and its top end prevented from damaging the fitting 20 by the engagement of the sloped shoulder piece 36 against the correspondingly sloped spring housing 28. Likewise it should be understood that the function of the spring washers 42 and 44 is to provide a small amount of resiliency in the confinement of bulb 48, thus reducing bulb breakage from rough handling, and to further provide a certain positive spring force which helps to eject the cap member 46 when the bulb shatters.

The bottom end of the housing skirt 28*a* is provided with notches 28*f* to receive a special tool (not shown) for screwing the sleeve 24 into and out of the fitting 20. It will be noted that ceiling holes 12*a* through which the outlet units extend are large enough to pass the spring housing skirt 28*a*. Consequently, when it is necessary to repair a depending unit or reset it after the extinguishment of a fire in which it was actuated, a hole cover 58 may be unscrewed from the ceiling 12 and the unit taken down through the hole 12*a* therein by application of the special tool referred to. In this manner the depending units are made readily accessible without the need for disturbing or removing the ceiling.

The advantage of employing a helical spring of the conical type to drive the plunger completely through the frangible closure lies in the fact that the space required between the outlet unit and distributing pipe for accommodating the spring is kept at a minimum. Systems of the general type described herein are least expensive and involved when the springs employed to drive the plunger are of the coiled type and act directly upon the plunger without the benefit of force direction changing linkage. This being so the axes of such coil springs will generally coincide with, or be parallel to, the axes of the tubular members connecting the outlet units to the distributing pipes. It follows that there must be between the outlet unit and the distributing pipe at least enough space to accommodate the spring deflection necessary to produce the proper force, and by using my conical-type, helical spring the additional space needed to accommodate the spring, above that required for the spring deflection, may be very small. In my preferred form, for example, this additional space may be no greater than one diameter of the wire from which the spring is made. This is illustrated in Fig. 2 of the drawings.

Because my frangible disc closure means has the convex shape hereinbefore described, that outer portion of it which is adjacent its supported edge and against which the open end of the cylindrical plunger strikes is substantially thinner than its center portion. At the same time however, this outer portion is fully capable of withstanding the static pressures normally encountered in the distributing pipes, for though it is thinner than the center portion, its location near the supporting member makes it as adequate in its pressure withstanding function as the thicker center portion more remote from that member. It is apparent, therefore, that the force exerted by the spring to drive the plunger against the disc's outer portion and effect a proper shattering is kept at a minimum when my convex disc shape is employed, and as a result less strong springs may be used, with consequent reduction in expense, than have been possible hitherto with frangible disc closure means of other configurations.

Another advantage of my convex disc shape is that it appears to contribute to a very complete shattering of the disc material when the plunger strikes it. Thus, it is customary to form this kind of frangible disc of a glass material which is tempered to provide therein appreciable internal strains. Such strains increase the ability of the disc to withstand static pressures and at the same time cause it to shatter into very small pieces when struck a sharp blow, as by the plunger. It appears that many of these shattering pieces are provided an opportunity to escape from the disc more rapidly when the disc surface from which they originate is convex rather than flat.

Though I prefer to employ a frangible disc of the kind described and shown in the drawings, namely, a disc with a convex side which is remote from the contents of the distributing pipe, it will be understood that any frangible disc which is substantially thinner at the outer portion engaged by the plunger than at the center will have the benefits set forth and is within the scope of my invention.

I claim:

1. In a sprinkler system including a fixed distributing pipe, a tubular connection adapted at one end to be connected with the distributing pipe, a cylindrical plunger having a substantially unobstructed passageway therethrough and located within said connection and axially movable with respect thereto, closure means at said one end of the connection adapted to be opened by axial movement of said plunger, spring means interposed between the connection and the plunger and encircling the latter for normally urging such axial movement of the same, said plunger having deformable end portions, said connection having a surface adjacent said end portions when said plunger is in its retracted position, a thermally responsive means normally holding the plunger deformable end portions against said surface and thereby from movement by the spring means until a predetermined thermal condition actuates the thermally responsive means to release the plunger end portions and thus the plunger for spring-urged movement to open the closure means.

2. In a sprinkler system including a fixed distributing pipe, a tubular connection adapted to be extended from the pipe, a movable plunger located in the connection, a plurality of flexible, longitudinally extending segments formed in the plunger end which is remote from the pipe, closure means normally closing the pipe end of the connection and adapted to be opened by movement of the plunger toward the pipe, spring means interposed between the connection and the plunger for moving the latter toward the pipe, a fixed annular surface on said connection which surface is opposite the segment end portions when the plunger is positioned to deflect the spring means and against which these ends are adapted to lie when the plunger is so positioned, a member adapted to hold the segment end portions against the fixed annular surface when pressed theretoward to prevent plunger movement, a fixed outlet unit located at the extended end of the connection and having thermally responsive means for exerting a force to press the member toward the fixed surface until a predetermined thermal condition actuates the responsive means, said actuation causing removal of the force and permitting the spring means to draw the segment end portions from the fixed surface.

3. In a sprinkler system including a distributing pipe, a sprinkler assembly comprising a tubular connection adapted to extend from the pipe, a movable plunger located in the connection, spring means interposed between the connection and the plunger for moving the latter, closure means normally closing the pipe end of the connection and adapted to be opened by plunger movement caused by the spring means, an outlet unit at the extended end of the connection and having thermally responsive means which hold the plunger and prevent movement thereof by the spring means until a predetermined thermal condition actuates the thermally responsive means to release the plunger, said closure means being a frangible disc which is supported at its edge adjacent the pipe end of the tubular connection and which is progressively substantially thicker toward its center.

4. In a sprinkler system including a fixed distributing pipe, a sprinkler assembly comprising a fixed tubular connection adapted to extend from the pipe, a movable plunger located in the connection, spring means of the helical, conical type interposed between the connection and the plunger for moving the latter, closure means normally closing the pipe end of the connection and adapted to be opened by plunger movement caused by the spring means, an outlet unit at the extended end of the connection and having thermally responsive means which hold the plunger and prevent movement thereof by the spring means until a predetermined thermal condition actuates the thermally responsive means to release the plunger, said helical, conical type spring means having its coils substantially all in one plane when the plunger is held by the thermally responsive means, whereby the space required between the pipe and the unit to accommodate the spring means is substantially equal to the space provided for the movement of the spring means.

5. In a sprinkler system including a fixed distributing pipe, a sprinkler assembly comprising a fixed tubular connection adapted to extend from the pipe, a cylindrical plunger located within the connection and movable axially with respect thereto, a plurality of flexible, longitudinally extending segments formed in the end of the plunger which is remote from the pipe and having their ends bent laterally outward, closure means normally closing the pipe end of the connection and adapted to be opened by movement of the plunger toward the pipe, spring means interposed between the connection and the plunger for moving the latter toward the pipe, an outlet unit at the extended end of the connection having a fixed, laterally extending annular surface which the bent segment ends are opposite when the plunger is positioned to deflect the spring means and over which these ends are adapted to lie when the plunger is so positioned, a wedging cup-like member adapted to enter part way into the segmented end of the cylindrical plunger and hold the segment ends outward against the fixed surface when pressed theretoward, thermally responsive means associated with the unit for exerting a force to press the wedging cup-like member toward the fixed surface until a predetermined thermal condition actuates these responsive means, said actuation causing removal of the force and permitting the spring means to draw the segment ends from the fixed surface to release the plunger.

6. A sprinkler system comprising a distributing pipe carrying a fluid under pressure, a tubular connection extending therefrom, a movable cylindrical plunger located in the connection, spring means interposed between the connection and the plunger for driving the latter, a frangible closure disc normally closing the pipe end of the connection and adapted to be engaged and shattered by one end of the plunger to open the pipe end of the connection when the plunger is driven by the spring means, an outlet unit at the extended end of the connection and having thermally responsive means which latch the plunger and prevent movement thereof by the spring means until a predetermined thermal condition actuates the thermally responsive means to release the plunger, the frangible closure disc being supported at its edge adjacent the pipe end of the tubular connection, the end of cylindrical plunger which shatters the closure disc being concentric thereto and being open so that it engages the closure disc at a portion near the supported disc edge, and the closure disc being of tempered glass and having the side facing the pipe convex and the other face flat, whereby the portion of the disc engaged by the plunger is thin and easily shattered and at the same time capable

of withstanding the pressures in the pipe by reason of its proximity to the supported disc edge.

7. A sprinkler system comprising a fixed distributing pipe, a fixed tubular connection extending therefrom, a movable cylindrical plunger located in the connection, a plurality of flexible, longitudinally extending segments formed in the plunger end which is remote from the pipe and having their ends bent laterally outward, a frangible closure disc normally closing the pipe end of the connection and adapted to be engaged and shattered by one end of the plunger to open the pipe end of the connection when the plunger is moved theretoward, spring means of the helical, conical type interposed between the connection and the plunger for moving the latter toward the pipe end of the former, the spring means being deflected when the plunger is in a predetermined position, a fixed outlet unit at the extended end of the connection having a discharge opening and a laterally-extending, annular surface therearound which the bent segment ends are opposite and over which these ends are adapted to lie when the plunger is in the predetermined position, a wedging cup-like member adapted to enter part way into the segmented end of the cylindrical plunger and hold the segment ends outward against the fixed surface when pressed theretoward, thermally responsive means associated with the unit for exerting a force to press the cup-like member toward the fixed surface until a predetermined thermal condition actuates these responsive means, said actuation causing removal of the force and permitting the spring means to draw the segment ends from the fixed surface to release the plunger, the frangible closure disc being supported at its edge adjacent the pipe end of the connection and being progressively substantially thicker from the edge toward the center.

8. A sprinkler system comprising a fixed distributing pipe carrying a fluid, a fixed tubular connection extending therefrom, a movable cylindrical plunger concentrically located within the connection and movable axially, a plurality of flexible, longitudinally extending segments formed in the end of the plunger which is remote from the pipe and having their ends bent laterally outward, a frangible closure disc normally closing the pipe end of the connection and adapted to be engaged and shattered by one end of the plunger to open the pipe end of the connection when the plunger is moved theretoward, spring means of the helical, conical type interposed between the connection and the plunger, said spring means being deflected when the plunger is held in a predetermined position and being capable of moving the plunger toward the pipe end of the connection when the plunger is released, a fixed outlet unit at the extended end of the connection having a passage through which the fluid is discharged from the connection when the closure disc is pierced and through which the segments extend when the plunger is in its predetermined position, a laterally-extending, annular, beveled surface surrounding the exterior end of the passage which surface the bent segment ends are opposite and over which these segment ends are adapted to lie when the plunger is in the predetermined position, a wedging cup-like member adapted to enter part way into the exterior end of the passage and hold the segment ends outward against the surface when pressed theretoward, thermally responsive means associated with the unit for exerting a force to press the cup-like member toward the surface until a predetermined thermal condition actuates these responsive means to cause removal of the force and permit the spring means to draw the segment ends from the surface to release the plunger, the frangible closure disc being supported at its edge adjacent the pipe end of the connection and being progressively substantially thicker from the edge toward the center.

9. A sprinkler system comprising a distributing pipe, a tubular connection extending therefrom, a tubular, movable plunger located within the connection and being of slightly smaller size than said tubular connection, spring means interposed between the connection and the plunger for moving the latter toward the pipe end of the connection, closure means normally closing the pipe end of the connection and adapted to be opened by plunger movement caused by the spring means, an outlet unit at the extended end of the connection and having thermally responsive means which hold the plunger and prevent movement thereof by the spring means until a predetermined thermal condition actuates the thermally responsive means to release the plunger, said closure means being a frangible disc which is supported at its edge adjacent the pipe end of the tubular connection and which is progressively substantially thicker toward its center whereby said plunger when moved engages the thinner, more fragile peripheral portion of said disc.

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