This invention relates to a pendant sprinkler head for a dry pipe system such as is employed in buildings for the automatic extinguishment of fires. A dry pipe system in which the system is normally full of air under pressure and to which water is only admitted upon the occurrence of fire is installed in buildings where the system is subject to freezing temperatures which prevent the maintenance of water therein. It is frequently desirable in buildings employing the dry pipe system that the piping be concealed in the walls and ceilings of the building for aesthetic and other reasons. When the piping is thus concealed, the sprinkler heads connected to the system must depend therefrom and extend a substantial distance through the ceiling structure. When, as in the case of the occurrence of a fire, water has been admitted to the system and then is subsequently drained off to restore the system to normal condition filled with air, if any water remains pocketed in the system, it may freeze and result in serious damage.

The object of the present invention is to provide a pendant sprinkler head for use in dry pipe systems so constructed as to prevent water being pocketed therein and yet so constructed as to enable a free flow therethrough so that any substance drawn into, or collecting in, the pipe system may pass through the pendant head with the same facility as through a standard sprinkler head.

The object of the invention is further to provide a construction of pendant sprinkler head in which the distance from between the lower end of the body or casing of the head and the spreader or water distributing element may be retained standard so that a standard form of toggle and fusible link or other equivalent temperature release construction may be employed and so that the dispersion of the water by the spreader shall be unchanged from that secured by a corresponding standard sprinkler head.

The object of the invention is further to provide a pendant sprinkler head in which the valve shall be at the top of the casing of the head where it is connected to the piping system and in which, when the valve is open, there shall be an unobstructed passage for the water from the inlet port to the spreader.

These and other objects and features of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

As the general construction and operation of a dry pipe sprinkler system and as the general construction of standard forms of sprinkler head are well known and familiar to those skilled in the art, it is only necessary here to illustrate and describe in detail those features with which the invention is particularly concerned.

The broad principles of the present invention are herein illustrated as embodied in two forms, each of which contains in addition novel specific features.

In the drawings:

Fig. 1 is a view in vertical cross section of one form of pendant sprinkler head embodying the invention shown in position connected to a piping system and with the parts in normal closed position.

Fig. 2 is a view in transverse cross section taken on the line 2—2 of Fig. 3.

Fig. 3 is a view similar to a portion of Fig. 1 showing the parts in open position as when the water is discharging through the head.

Fig. 4 is a view similar to Fig. 1 of another form of pendant sprinkler head embodying the invention with the parts also shown in closed position and with certain of the parts shown in dotted lines to indicate their open position.

Fig. 5 is a detail looking toward the right of Fig. 4 illustrating the valve and upper struts member in open position.

Fig. 6 is an enlarged detail in transverse cross section of the valve employed in both forms shown in Figs. 4 and 5.

In Figs. 1 and 4 there is indicated a small portion of the piping of a dry pipe system, two sections of the pipe 1 and 2 being shown as threaded into a connecting union 3. This piping system is assumed to be properly supported and mounted above and concealed by a ceiling structure indicated at 4.

Referring to the construction shown in Figs. 1, 2, and 3, there is provided an elongated tubular two-part casing 5 and 6 of suitable metal. This casing may be of any desired length, as determined by the position of the piping system with respect to the ceiling. At its upper end the casing is exteriorly threaded at 7 and is screwed into the piping system as into the union 3 so as to bring its upper end as high as the bore of the pipe. While this may leave small pockets at the sides of the casing where it projects into the system, any slight amount of water collecting therein and freezing does no damage and has no effect upon the operating elements of the sprinkler head.

At its lower end the part 5 of the tubular casing has depending therefrom and preferably
formed integral therewith a yoke 8 having a central internally threaded boss 9 aligned with the axis of the casing. This boss is threaded to hub 10 of a spreader or water distributor 11, the yoke and spreader being preferably of one of the standard forms commonly employed in sprinkler heads.

At its upper end the tubular casing is partially closed by a disk 12 threaded into the casing and flush with the upper end thereof. In this disk centrally thereof is formed the circular inlet port 13. On the lower surface of the disk 12 surrounding the port is a rib 14 forming a valve seat. A valve 15 of circular cross section is provided at one side with a lug 16 pivoted at 17 to lugs depending from the disk 12 so that the valve is thereby flexibly connected to the casing at one side thereof and arranged under normal conditions to seat upwardly against the valve seat 14 and close the inlet port and, when open, to swing downward out of alignment with the inlet port and remain in such position attached to the casing, as shown in Fig. 3. Preferably the valve is provided with a projection 18 substantially filling the inlet port 13 when the valve is closed. This projection is also grooved 19 so that no portion of the valve when it stands in open position will be in alignment with the open port 13. The valve is also preferably reduced at its opposite sides, as at 20, to enable it to fit up close against the interior wall of the casing when standing in open position that the small space in the port above the valve or, when the projection 18 which fits loosely in the port is preferably employed, the space surrounding this projection within the port is filled with grease or a suitable filler substance readily forced out by the water upon the opening of the port, thus preventing any slight collection of water therein under normal conditions.

A gasket 21 of suitable material, such as copper, is preferably secured to the valve to coat with the seat 14 and secure a tight closure. Such gasket is shown more in detail in Fig. 6 and is secured to the valve so as not to become detached therefrom as by indentations 22 in a depending flange thereof driven into the valve.

The valve is held seated against the valve seat in closed position by displaceable means normally rigid but collapsible when subjected to a predetermined degree of temperature such as one of the standard forms of toggle members 23 and fusible link 24 construction employed in standard sprinkler heads. This displaceable means comprises a device normally rigid but collapsible when subjected to a predetermined degree of temperature such as one of the standard forms of toggle members and fusible link construction employed in standard sprinkler heads. This displaceable means comprises a multi-part strut extending from the aforesaid device to the seated valve. In the construction here illustrated, the strut is in two parts, the lower part being a metal ferrule 25 closed at its lower end engaging one of the toggle members, the other end engaging the hub of the spreader. This ferrule fits loosely within the lower part 26 of the casing and is of such a length and size as readily to drop clear of the casing when the device such as the toggle and link construction is displaced under the attainment of temperature. The upper part of the strut consists of a tube 26 presenting at its lower end a discharge port 27 of standard diameter and this tube is provided with radial flanges 28 acting to maintain the tube centered in the casing and by engagement with the shoulder 29 formed by the upper end of the casing member 6 to determine the lower position of the tube with the discharge port 27 at the bottom of the casing and with the upper position of the valve, all as shown in Fig. 3.

It will thus be seen that under normal conditions with the parts in the position shown in Fig. 1, the valve is held firmly seated regardless of the length of the sprinkler head casing and that no opportunity for the collection of water subject to freezing is afforded by the construction. When, now, the predetermined temperature is reached around the exposed portion of the sprinkler head below the ceiling and the device such as the toggle and fusible link construction is released, the parts of this device fall away, the lower part of the strut 25 drops clear of the head and falls away, the upper part of the strut 26 drops to the open position shown in Fig. 3 and the valve swings to its open position, as shown in Fig. 3. With the parts thus in open position, there is presented an unobstructed cylindrical space of a cross sectional area at least that of the inlet port extending from the inlet port to the lower end of the casing so that a direct, unobstructed free flow of water may take place through the casing member 6 to the discharge port 27 at the bottom of the casing in the same facility as takes place in an ordinary standard sprinkler head. Even if the valve is not provided with the groove 19 or for any reason projects slightly into alignment with the periphery of the port 13, it is still far below the port when in open position that there is an unobstructed space extending from the inlet port to adjacent the lower end of the casing, which space at all points throughout its length has at least a circular cross sectional area no smaller than that of the inlet port, thus providing the required unobstructed water passage from the inlet port to the spreader.

In the form embodying the invention illustrated in Figs. 4 and 5, the general principles are the same as those already described, except that in this case the two-part strut, instead of being of the tubular form, comprises a lower member having a head 30 loosely fitting the standard discharge opening in the lower member 31 of the casing and an upwardly extending stem 32, while the upper part of the strut is a rod 33 interlocking at its lower end as by a pin and recessed between the spreader and the valve rod 33 at its upper end normally holds the valve seated. This rod is hingedly connected at its upper end to the casing to swing to and remain in position close to the casing wall out of the direct path of flow from the inlet port to the discharge port when the displaceable means is displaced. For this purpose the rod at its upper end is provided with a logitudinal slot 35 and a pair of arcuate links 36 is secured at one end to a pivot 37 riding in the slot 35 and at the other end is pivoted on the pivot 38 on which the valve pivots, which pivot, as in the previous form, is shown passing through lugs depending from the disk in the upper end of the casing. When the displaceable means is displaced, the lower part 30, 32 of the strut, which is of less length than the distance between the spreader and the lower end of the pot the rim of the pot rises and falls away and the upper part or the rod 33 and the valve swing into the dotted line position. In this position the arcuate shape of the links 36 embraces the valve, as shown in Fig. 5.

It will thus be seen that in this form of construction, the same principles of operation are secured as in the form first described and that
again with the parts in open position there is presented an unobstructed, cylindrical space of a cross sectional area of at least that of the inlet port extending from the inlet port to the lower end of the casing so that a direct, unobstructed, free flow of water may take place through the inlet port to the spreader with the said facility as taken place in an ordinary standard sprinkler head. Even if the valve is not provided with the groove 19 or for any reason projects slightly into alignment with the periphery of the port 13, it is still so far below the port when in open position that there is an unobstructed space facility as taken place in an ordinary standard sprinkler head.

3. A pendant sprinkler head comprising the construction defined in claim 1, in which the valve is provided with a projection substantially filling the inlet port when the valve is seated.

4. A pendant sprinkler head having the construction defined in claim 1, in which the valve is flexibly connected to the casing at one side thereof to swing downward out of alignment with the inlet port and remain in such position attached to the casing.

5. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system with its upper end as high as the bottom of the pipe bore, a circular inlet port in the upper end of the casing, a valve seat for said port, a valve seating upwardly against said seat, a spreader supported from the casing beneath and spaced from its lower end, and displaceable means normally extended between the spreader and the valve acting to hold the valve seated and movable when displaced to present an unobstructed space extending from the inlet port to the lower end of the casing which space at all points throughout its length has at least a circular cross sectional area no smaller than that of the inlet port and to clear the space between the lower end of the casing and the spreader thus to provide an unobstructed water passage from the inlet port to the spreader having throughout a circular cross sectional area no smaller than that of the inlet port.

6. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system with its upper end as high as the bottom of the pipe bore, a circular inlet port in the upper end of the casing, a valve seat for said port, a valve seating upwardly against said seat, a spreader supported from the casing beneath and spaced from its lower end, and displaceable means normally extended between the spreader and the valve acting to hold the valve seated and movable when displaced to present an unobstructed cylindrical space of a cross sectional area of at least that of the inlet port and extending from the inlet port to the adjacent lower end of the casing and comprising another portion movable, when displaced, to present an unobstructed direct water passage from the inlet port to the spreader.

7. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system with its upper end as high as the bottom of the pipe bore, a circular inlet port in the upper end of the casing, a valve seat for said port, a valve seating upwardly against said seat, a spreader supported from the casing beneath and spaced from its lower end, and displaceable means normally extended between the spreader and the
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valve acting to hold the valve seated and movable when displaced to present an unobstructed cylindrical space of a cross sectional area of at least that of the inlet port and extending from the inlet port adjacent the lower end of the casing and to clear the space between the lower end of the casing and the spreader to provide an unobstructed direct water passage from the inlet port to the spreader and in which the said displaceable means comprises a device normally rigid but collapsible when subjected to a predetermined degree of temperature and a multi-part strut extending from the said device to the valve when seated and in which the lower part of the strut is of such size as readily to drop clear of the head when displaced.

8. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system with its upper end as high as the bottom of the pipe bored, a circular inlet port in the upper end of the casing, a valve seat for said port, a valve seating upwardly against said seat, a spreader supported from the casing beneath and spaced from its lower end, and displaceable means normally extended between the spreader and the valve to hold the valve seated and movable when displaced to present an unobstructed cylindrical space of a cross sectional area of at least that of the inlet port and extending from the inlet port adjacent the lower end of the casing and to clear the space between the lower end of the casing and the spreader thereby to provide an unobstructed direct water passage from the inlet port to the spreader and in which the said displaceable means comprises a strut member of less length than the distance between the lower end of the casing and the spreader which member extends within the lower end of the casing when coacting to hold the valve seated and which drops clear of the head when displaced.

9. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system with its upper end as high as the bottom of the pipe bored, a circular inlet port in the upper end of the casing, a valve flexibly connected to the casing at one side thereof seating upwardly against said seat when closed and when open movable downwardly out of alignment with the inlet port, a spreader supported from the casing beneath and spaced from its lower end, a device normally rigid but collapsible when subjected to a predetermined degree of temperature mounted on the spreader, a two-part strut coacting with the said device and extending therefrom to the valve when seated acting to hold the valve seated, the lower part of the strut being of such size as readily to drop clear of the head when displaced and the upper part consisting of a tube presenting at its upper end a discharge port and presenting from above said discharge port to its upper end an unobstructed interior cross sectional area no smaller than that of the inlet port, the said tube remaining in the casing but dropping to and held in a position with its lower end at the lower end of the casing.

11. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system and displaceable means normally extended between the spreader and the valve to hold the valve seated, said displaceable means comprising a two-part strut, the upper part of which consists of a tube engaging at its upper end the valve when seated and presenting at its lower end a discharge port and from above said discharge port to its upper end an unobstructed interior circular cross sectional area no smaller than that of the inlet port, the said tube remaining in the casing but dropping to and held in a position with its lower end at the lower end of the casing when the displaceable means is displaced.

12. A pendant sprinkler head for a dry pipe system comprising an elongated tubular casing, means for connecting the casing to a pipe of the system with its upper end as high as the bottom of the pipe bored, a circular inlet port in the upper end of the casing, a valve seating upwardly against said seat, a spreader supported from the casing beneath and spaced from its lower end, and displaceable means normally extended between the spreader and the valve to hold the valve seated, the said displaceable means comprising a two-part strut in which the upper part is a rod engaging at its upper end of the valve when seated and hingedly connected at its upper end to the casing to swing upwardly against said seat and downwardly out of alignment with the inlet port on which the hinged connection between the upper end of the rod and the casing comprises a pair of arcuate links pivoted at one end to the casing and at the other end in a longitudinal slot in the said upper end of the rod and embracing the valve when the valve and rod have moved to displaced position.

WILLIS K. HODGMAN, Jr.
CERTIFICATE OF CORRECTION.


WILLIS K. HODGMAN, JR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 57, claim 12, strike out the word "of"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of May, A. D. 1939.

Henry Van Arsdale
(Seal)
Acting Commissioner of Patents.