My invention relates to improvement in dry pendant sprinklers, and more particularly to means of making the closure at the extreme upper end of a sprinkler head of this type.

Dry pipe sprinkler systems are used in unheated buildings where the piping cannot be filled with water where it might freeze in cold weather. The piping in such systems is fielded with air under pressure. This compressed air acts to hold the water out of the piping under normal conditions through the medium of a dry pipe valve installed in a heated area where the water supply enters the building. This dry pipe valve is so designed that one pound per square inch air pressure in the sprinkler system will hold back five to six pounds per square inch water pressure. Upon operation of a sprinkler head due to fire conditions the air flows out through the opening in the head, the air pressure drops and the dry pipe valve opens allowing the sprinkler system to fill with water as is well known in the sprinkler industry.

By far the greater number of sprinkler heads installed in a dry pipe sprinkler system are installed pointing upward. There is no problem to draining such sprinkler heads if the dry pipe system becomes filled with water. However, it is sometimes desirable or necessary to install sprinkler heads pendant; that is, pointing downward, in a dry pipe sprinkler system. If this is done using nipples to connect from fittings in the sprinkler piping down to standard sprinkler heads, pockets are thereby formed from which water cannot be readily drained should the dry pipe system become filled with water.

To remedy this possibility, dry pendant sprinkler heads are used. With this type sprinkler head, the closure is made at the extreme upper end of the drop nipple which becomes an integral part of the dry pendant sprinkler head. Consequently, no water can enter such a sprinkler head if the dry pipe system becomes filled with water unless the sprinkler head has operated due to fire conditions. Another useful application is in the show windows of stores. These spaces are usually unheated.

One type of dry pendant sprinkler head which has been successful in the past was described in a prior patent to Rowley No. 2,180,258 for “Sprinkler System.” This invention is in essence an improvement over the Rowley type valve. In the Rowley type construction the water supply to the sprinkler head is sealed off by a vertically slidable tube which supports a multiplicity of small balls which in turn support a larger ball in position to exert an expanding force against an annular valve seat. The tube is held in place by a threaded member acting through a fusible element at the sprinkler head, and when the valve is installed, the valve seat pressure is obtained by taking up on this threaded member so as to press the tube upwardly against the balls. When the fusible element gives way under heat conditions, the tube is released so as to drop downwardly, the balls then pass downwardly through the tube, and the water issues through the tube to the sprinkler head.

My invention herein described is based on my discovery that an improvement over the Rowley ball type valve can be made if the valve is arranged to avoid the expanding pressure on the valve seat. With my construction a tight seal at the valve seat is more readily obtained and this is accomplished without possibility of putting any undue strain on the parts in the effort to obtain a tight seal. A more specific object of this invention is to provide a sprinkler system having a normally closed valve comprising an annular valve seat, a hemispherical valve member having a flat surface which engages said valve seat, and means acting against the hemispherical portion of said valve member for holding said flat surfaces tight against the seat, thereby to provide a watertight seal.

Other objects and many of the attendant advantages of the invention will be readily appreciated as the invention becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, in which:

FIG. 1 is a fragmentary vertical sectional view of a sprinkler system embodying the present invention;

FIG. 2 is a view similar to FIG. 1 showing the same device minus the parts which are discharged after the valve has opened; and

FIG. 3 is an enlargement of the top end of the device with the valve closed.

Turning now to FIGS. 1 and 2, there is shown a main water pipe or header 2 having a T 4 into which is threaded a depending preferably brass branch pipe 6. The latter is intended to extend downwardly through a hole 8 in a false ceiling 10 where it supports a sprinkler head 12 screwed into its bottom end. Sprinkler head 12 is of conventional construction and is provided with a yoke 14 into which is threaded a screw 16. Water spreader or deflector 18 is attached to the bottom end of screw 16.

Threaded into the upper end of branch pipe 6 is a brass bushing 20 having an inner annular flange 22 provided with a narrow depending valve 24 which is formed with a convex or narrow flat contacting edge. Located within branch pipe 6 is a slidable tube 28, preferably made of brass. Its bottom end is of slightly reduced diameter so as to provide a lower tube section 30 which fits slidable in sprinkler head 12 and which also forms a shoulder 32 which, by engagement with the end of the sprinkler head, prevents the tube from descending too far in the branch pipe. Secured to the upper end of tube 28 is an annular ring 34, preferably made of brass, which functions as a guide for the tube when it moves within pipe 6. The upper end of tube 28 is beveled as shown in FIG. 3 to provide a sloped seat for small stainless steel or bronze balls 38. These balls also seal against a beveled surface 40 formed in the bottom end of bushing 20. Disposed within the bushing 20 is a hemispherical valve element 42 whose flat surface 44 is grooved at its periphery to provide an annular shoulder 46. It will be understood that the valve element 42 need not be hemispherical but can equally well be conical or frustro-conical. The diameter of valve element 42 is less than the inner diameter of tube 28. Fitted onto flat surface 44 is a soft metal gasket 48 which is of discarded shape 40 to provide an offset lip 50 which fits on shoulder 46. Metal balls 38 are pressed against the hemispherical surface of valve element 42 and force it upwardly so that the margin of the gasket is pressed tight against valve seat 26 of the bushing 20. Gasket 48 is constructed of a suitable material, preferably copper, which can be squeezed to conform to any irregularities in the valve seat 26 so as to make an airtight seal. The metal balls 38 are held upwardly by tube 28, which in turn is supported by a disk 54. The latter is held against the bottom end of tube 28 by a toggle assembly 56 of which a fusible element is a part and which is subjected to upward pressure from below applied by means of screw 16. As long as the fusible element is intact and the toggle assembly is forced tightly against disk 54,
valve member 42 will be seated against the valve seat 26. When the fusible element is heated and releases, tube 28 drops down by gravity and in response to the pressure in pipe 2. The tube 28 drops down until shoulder 32 abuts the upper end of sprinkler head 12 on the inside. The downward movement of tube 28, of course, frees the balls and valve element and allows them to pass down through and out of tube 28 so as to provide an unobstructed path for delivery of high-pressure water from pipe 2.

A primary advantage of this invention is that it retains certain of the advantages of a ball valve, e.g., simplicity of construction and rapid removal of valve element for maximum water discharge, while simultaneously providing for a better seal between the valve and the valve seat. It is difficult to provide and even more difficult to properly position a gasket for a conventional ball valve. On the other hand, it is a simple matter to form and position a gasket for a flat surface as contemplated in the present invention.

Another advantage is due to the construction of bushing 20. As observed best in FIG. 3, the beveled surface 40 formed in the bottom end of bushing 20 is smooth and uninterrupted, without any shelf or shoulder on which the balls may rest when the bushing and pipe 6 are inverted. Also, the width of beveled surface 40 is such that it will accommodate or support only a single circular array of balls. This facilitates loading of the balls which is done with pipe 6 and bushing 20 in inverted position. When a ball is dropped into pipe 6, it will come to rest on hemispherical valve 42 and cam surface 40. If other balls are added, either singly or together, they will not pile up but will automatically arrange themselves single file in a circle. It is an easy matter thereafter to insert tube 28 and lock it in place against the balls by means of disk 54, fusible link 56, and screw 16. The resulting assembly can then be inverted and screwed into T 4 without any fear of losing any balls 38.

Obviously, many modifications and variations of the invention as possible in the light of the foregoing teachings. It is to be understood, therefore, that the invention is not limited in its application to the details of construction and arrangement of parts specifically described or illustrated, and that within the scope of the appended claim, it may be practiced otherwise than as specifically described or illustrated.

I claim:

In combination with a dry dendent sprinkler head for use with automatic fire protection systems said head including an elongated pipe section one end of which pipe section is adapted for connection in depending relation to a dry pipe sprinkler system, a sprinkler head mounted on the other end of said pipe section and further including a slideable tube within said pipe section; closure means situated at one end of said pipe section adjacent said dry pipe system and supported in closed condition by said slideable tube, said closure means comprising a tubular bushing; external screw threads on said tubular bushing; cooperating screw threads on said pipe section at said end thereof adjacent said dry pipe sprinkler system whereby said bushing may be removable inserted within said pipe section; an inwardly and downwardly projecting annular lip member within said bushing presenting an annular valve seat the principal axis of which is substantially parallel to the principal axis of said bushing, the radius of said annular lip member being less than the internal radius of said slideable tube; a valve element having a first portion provided with a flat annular seat portion about its periphery dimensioned to seat against said annular lip member, said first portion further having a raised cylindrical central portion dimensioned of less radius than the said annular lip member; a second portion on said valve member substantially hemispherical in configuration; said valve element having an overall radius less than the radius of said slideable tube; a plurality of small balls having a radius dimensioned to engage said hemispherical portion of said valve element when said valve element is in seated condition and when said balls are positioned upon the end of said slideable tube adjacent said closure and are bearing against said bushing, and a circular copper disc washer including a first circular portion dimensioned to overlie said circular raised portion of said valve element, a second tubular portion at the periphery of said circular portion to fit snugly against said annular lip member parallel to the axis thereof and a third flat annular portion extending outwardly from said tubular portion, said disc washer being interposed between said valve element and said depending annular lip to facilitate airtight seating of the said annular seat portion of said valve element against the said annular lip member.

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