

March 8, 1960

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2,927,646

SPRINKLER APPARATUS

Filed April 1, 1959

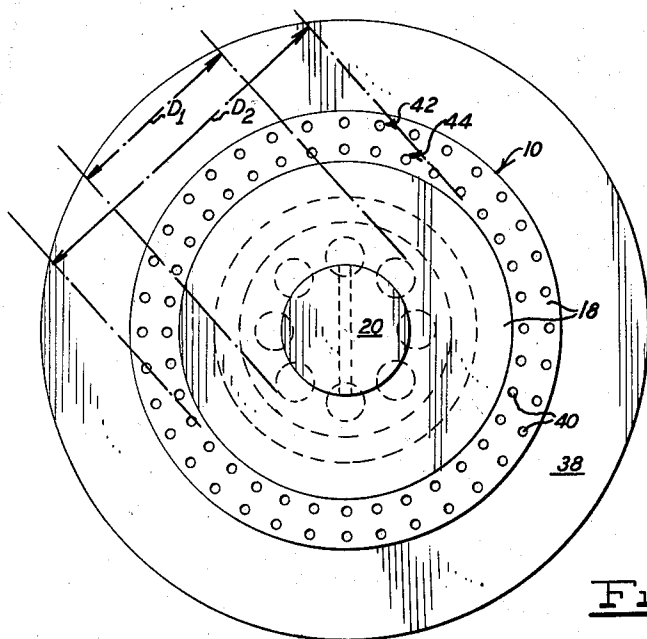


Fig. 1

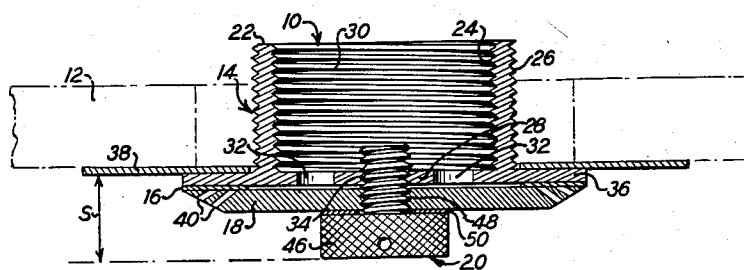


Fig. 2

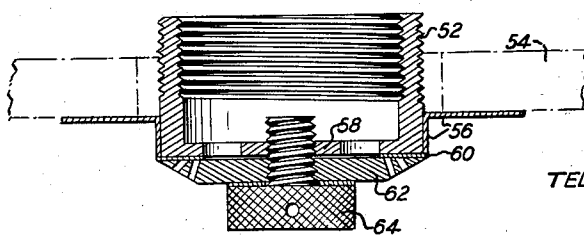


Fig. 3

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2,927,646

SPRINKLER APPARATUS

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Application April 1, 1959, Serial No. 803,393

4 Claims. (Cl. 169—37)

This invention relates to thermally responsive devices, and more particularly to sprinkler apparatus.

A basic object of the invention is to provide an improved sprinkler structure for protection against fires. More specifically, it is an object of the invention to provide improved sprinkler apparatus which is extremely reliable.

The invention is also concerned with the fact that known sprinkler apparatus is unsightly and generally extends into the zone to be protected in such a manner that the apparatus can be accidentally struck and therefore damaged or destroyed. Accordingly, it is a further object of the invention to provide improved sprinkler apparatus which extends minimally into the zone to be protected so that the apparatus is inconspicuous and therefore not unsightly nor likely to be damaged.

An additional advantage which inures to the benefit of the invention by virtue of its providing inconspicuous apparatus is that the apparatus is less subject to vibration and shock which tend, in conventional apparatus, to initiate unwanted sprinkling operations.

Furthermore, many known types of sprinklers require the use of movable parts. This makes the structure complex and costly and increases the likelihood of malfunctioning. Accordingly, another object of the invention is to provide apparatus avoiding the use of movable parts.

Still further, in many thermally responsive sprinkler devices, the thermally responsive unit is exposed and therefore likely to be destroyed by mechanical forces rather than by heat as is desired. Another object of the invention is, therefore, to provide for the complete shielding and protection of the thermally responsive device which is to be employed.

To achieve the above and other of its objectives, the invention provides an arrangement which is supported directly in the ceiling or other structural component to which the sprinkler would be normally affixed. Moreover, the invention contemplates the use and assembly of such parts as will extend minimally from the associated structural component.

As a feature of the invention, a fusible element is employed which is a separate and independent member. Thus, although when this element is mounted, it is substantially fixed in position, the element can be readily dismounted and replaced by an element having a different thermal response.

As a further feature of the invention, there is provided a member which serves not only to hold the thermally responsive element in position, but to protect the same as well. In fact, as will be seen, the thermally responsive element is so well protected as to be practically indestructible except in response to heat.

Other features of the invention relate, for example, to the use of two or more independent and different thermal elements to respond to different temperatures.

Still other objects, features and advantages of the invention will be found in the following detailed description as illustrated in the accompanying drawing in which:

Fig. 1 is a bottom elevational view of a sprinkler device provided in accordance with the invention;

Fig. 2 is a side view of the structure of Fig. 1, partially in axial section; and

Fig. 3 is a partially sectional view of a second embodiment of the invention.

The sprinkler device 10 illustrated in Figs. 1 and 2 is intended to be supported upon a structural component such as a ceiling 12, through which the sprinkler device extends. As will be noted and as will be explained in greater detail hereinafter, the sprinkler device extends minimally from the ceiling and is, therefore, inconspicuous and extremely unlikely to be subject to external vibratory and shock forces.

In general, the sprinkler device 10 comprises a conduit 14, a fusible element 16, a plate 18, and a bolt 20.

The conduit 14 preferably comprises a generally cylindrical portion 22 provided with an internal thread 24 and an external thread 26. Either of the threads 24 or 26 may be employed for coupling the conduit 14 to a supply of fluid, such as water or the like, the thread engaging a threaded nipple on a water supply pipe (not shown).

The conduit 14, moreover, may employ the external thread 26 for purposes of engaging the ceiling 12 or other structural component which is to form a support, if so desired. Alternatively, the conduit 14 may be supported solely by the water supply to which it is attached, or the external thread 26 may be engaged by a nut member (not shown).

In the embodiment of the invention illustrated in Figs. 1 and 2, the conduit 14 is provided with an end wall 28, which partially obturates the central bore 30 of the conduit. End wall 28 is preferably provided with a circular or annular array of perforations 32 which may be arranged in a different alignment, as found necessary. The end wall 28 is also provided with a central or axially disposed threaded hole 34, for a purpose which will hereinafter become apparent.

Coplanar with the end wall 28 is an annular flange 36. In this embodiment of the invention, the annular flange 36 is integral with the conduit 14, and thus a part thereof. The purpose of annular flange 36 is to position the sprinkler device 10 properly with respect to the ceiling 12 and, if desired, a washer 38 may be employed intermediate flange 36 and ceiling 12.

Directly below annular flange 36 and end wall 28 is positioned the fusible element 16. The fusible element is a member of a material which melts at a determinable temperature. The types of material which are used for this purpose are well known and require no explanation. However, by way of example, Woods metal can be employed.

Preferably, fusible element 16 is in the shape of a washer; that is to say, element 16 is a circular member having a central aperture. This aperture is alignable with the threaded hole 34, so that the fusible element 16 and end wall 28 are coaxially aligned.

It is to be noted that element 16 is preferably devoid of holes or perforations, so that when it is held in face-to-face abutting relationship with end wall 28 and flange 36, perforations 32 are closed. Consequently, fluid supplied to the bore 30 is incapable of escaping through perforations 32.

Directly beneath the fusible element 16 is positioned the plate 18. This member is also a circular member having a central hole which is alignable with the threaded hole 34 in the end wall 28. Plate 18 sandwiches the fusible element 16 against the end wall 28 and flange 36, and is, for example, made of steel, aluminum and like materials which are not susceptible of being melted except by extremely high temperatures.

The plate 18 is provided with one or more circular

arrays of holes 40. In Fig. 1 are illustrated two arrays 42 and 44 of said holes. Preferably, holes 40 are inclined relative to the axis of bore 30. If two circular arrays are provided, they may be inclined at different angles relative to said axis.

As illustrated in Fig. 1, the diameter D1 of perforations 32 is different from the diameter D2 of either of the circular arrays of holes 42 and 44. Consequently, a sharp instrument extending through holes 40 can never operate to perforate the fusible element 16 and communicate holes 40 with perforations 32. Accordingly, in this regard, a communication of perforations 32 with holes 40 requires a melting of fusible element 16, and the communication cannot be otherwise provided.

The bolt 20 constitutes, in effect, a locking component. Bolt 20 includes a head 46 and a threaded shank 48. Shank 48 extends through the central holes of plate 18 and fusible element 16, and threadably engages hole 34 in end wall 28. The head 46, therefore, functions to sandwich all of these detachable or separable components together.

If desired, a washer 50 may be employed between the head 46 and the plate 18. Washer 50 may be of a fusible material which melts at relatively low temperatures, as will be described hereinafter.

In the event of a fire, fusible element 16 will melt and will be forced by virtue of the water pressure existing in bore 30 from its position between end wall 28 and plate 18. The water, or whatever other fluid is employed, will escape radially between annular flange 36 and plate 18, and will also escape through holes 40. Accordingly, the structure provides a simple controlled means of egress for water supplied via conduit 14. Moreover, as noted above, washer 50 can be provided in the form of a fusible element. In this case, the material from which washer 50 is made is preferably of a type which melts at a higher or different temperature than the temperature at which fusible element 16 will melt. Accordingly, as the intensity of the fire increases, washer 50 melts and plate 18 drops down against head 46, thus increasing the spacing of flange 36 and plate 18 by an amount equal to the thickness of washer 50. As a result, a passage of larger dimension is provided for the escaping fluid, the rate of discharge of which is consequently increased.

Fig. 3 illustrates a further embodiment of the invention, in which a conduit 52 extends through a structural component 54, in the manner indicated above. In this embodiment, however, conduit 52 includes a portion protruding out of the structural component 54. This section is engaged by a separate or detachable flange 56, and the sprinkler device thus positioned relative to this support.

In all other respects, this embodiment is similar to that described above, and comprises a perforated end wall 58, a fusible element 60, a perforated plate 62, and a bolt or locking element 64 sandwiching the aforesaid members together.

Referring to Fig. 1, it will be noted that the sprinkler device protrudes beneath the ceiling 12 by a distance S. Distance S is a cumulative thickness consisting of the thicknesses of flange 36, fusible element 16, plate 18, and head 46 of bolt 20. Since all of these elements are conveniently flat components, the distance S is generally very small. The structure of the invention, therefore, provides a sprinkler device which is very conspicuous

and which is hardly likely to be damaged by forces and devices existing in the zone to be protected.

It is true that the embodiment of the invention illustrated in Fig. 3 extends slightly further into the zone to be protected. However, this additional protrusion, consisting of the distance by which conduit 52 extends beneath ceiling 54, is very nearly inconsequential.

It will be noted from what has been stated above that the sprinkler devices provided in accordance with the invention consist of very few elements which are extremely simple in construction. The invention, therefore, provides improved sprinkler devices which are extremely reliable.

It is apparent from the simple construction of the device that its manufacture is a simple matter, and that sprinkler devices of the invention may be produced at extremely low costs. Furthermore, it is to be observed that the use of movable parts is avoided, which both improves the operation of such devices and reflects materially upon the costs thereof.

There will now be obvious to those skilled in the art many modifications and variations of the structures set forth. These modifications and variations will not, however, depart from the scope of the invention, as defined in the following claims.

What is claimed is:

1. A sprinkler, adapted for connection to a fluid supply and for being mounted in a structural component such as a ceiling, comprising a conduit extendible through said component for support by the latter and for connection to said supply, said conduit including an end wall provided with perforations, a plate provided with perforations, a separate fusible member sandwiched between said wall and plate to prevent said fluid from flowing through the perforations of the wall, and means for locking the plate to said conduit thereby maintaining the fusible member in position, said fusible member melting at a determinable temperature and permitting a flow of fluid through the perforations of both said wall and said plate as well as between said wall and plate.
2. A sprinkler as claimed in claim 1 wherein said means comprises a bolt connecting the plate to said wall and a washer between the bolt and said plate, said washer being of a fusible material different from said fusible member to vary a flow of said fluid in two magnitudes depending on temperature.
3. A sprinkler as claimed in claim 1 wherein said plate and wall respectively define circular arrays of perforations, the arrays having different diameters.
4. A sprinkler as claimed in claim 1 wherein said conduit defines an axis, the perforations of the end wall being parallel to the axis and the perforations of the plate being inclined with respect to said axis.

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