July 8, 1969 R. T. GROOS 3,454,097

FIRE PROTECTION SYSTEMS AND SPRINKLER HEAD

Original Filed July 19, 1965

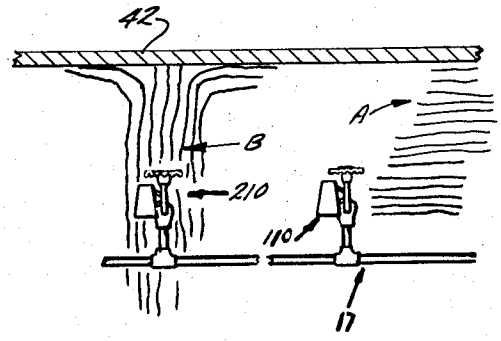


FIG. 4

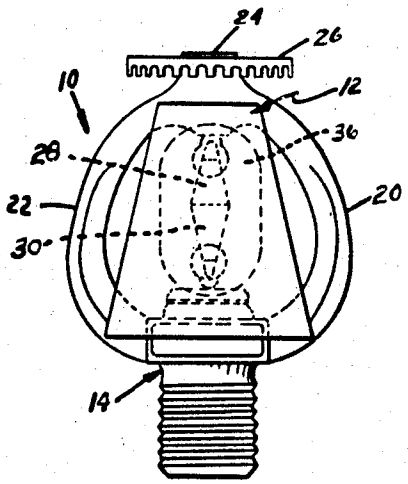


FIG. 2

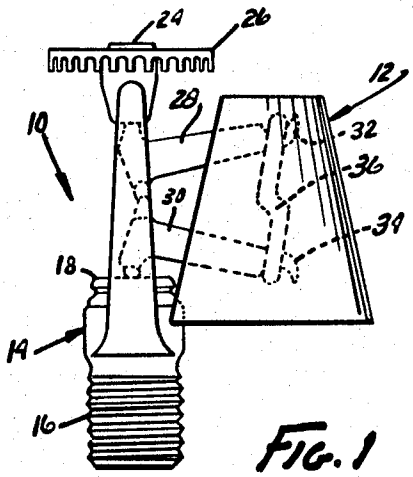


FIG. 1

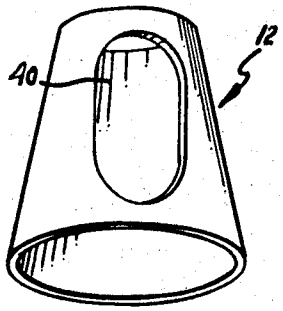


FIG. 3

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United States Patent Office 3,454,097 Patented July 8, 1969

3,454,097

FIRE PROTECTION SYSTEMS AND SPRINKLER HEAD

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Continuation of application Ser. No. 472,778, July 19, 1965. This application Aug. 8, 1967, Ser. No. 659,057
Int. Cl. A62c 37/12, 37/30
U.S. Cl. 169—38 8 Claims

ABSTRACT OF THE DISCLOSURE

A heat-actuated sprinkler head device for use in overhead fire protection systems, in which a tubular shield is positioned about the triggering mechanism for the sprinkler head, which shield prevents direct contact with the triggering means of heat currents which are bellowing horizontally beneath the ceiling while at the same time permitting free contact with the triggering means of heat currents traveling vertically upward directly from fires located generally therebeneath. This makes the sprinkler system selectively actuable by preventing actuation of a given sprinkler head unless the fire to be extinguished is truly beneath that head.

This application is a continuation of my previous application Ser. No. 472,778, filed July 19, 1965, now abandoned.

This invention relates to fire protection systems of the general type which has a plurality of heat-responsive sprinkler heads spaced beneath the ceiling of a room or building for automatically actuating when exposed to the heat from an accidental fire to release water for fighting and extinguishing the fire; more particularly, the invention relates to a new and unique sprinkler head apparatus for use in such systems which is directionally responsive to the heat from such a fire.

As is well known at the present time, a plurality of heat-responsive sprinkler heads may be coupled to an overhead piping system containing water or the like under pressure to provide an automatic fire-extinguishing system. The sprinkler heads are usually actuated by a heat-absorption type triggering means, which is activated upon absorbing a predetermined amount of heat. Most typically, the sprinkler heads utilize a fusible link as the tripping or triggering mechanism, which melts and separates under prescribed heat conditions to release the supply of water and discharge the same upon the general area of the fire therebelow.

The principal advantage of such systems is of course they are automatic and hence provide an economical but foolproof guard against what would otherwise be heavy losses due to accidental fires. Such systems have the inherent capacity, however, to operate only in the actual area where there is a fire, so that the drenching downpour of water from the sprinkler heads is confined to that area of the building actually having the fire. It is generally conceded, however, that in actual operation such systems do not perform at the level of their true capabilities, since in practically every instance of operation many sprinkler heads located at considerable distances from the actual area of the fire are observed to actuate. This releases quantities of water which are neither needed nor desired, causing substantial damage due to flooding and also lowering the available water pressure in the areas where water is needed by overtaxing the water supply.

The present inventor has observed that the basic reason underlying this undesired operating characteristic of automatic fire protection systems is to be found in the behavior

exhibited by the hot gases produced by the fire. Such gases rise vertically with considerable speed and little deviation until they reach the vicinity of the ceiling. At this point, the gases begin to billow horizontally in spreading waves, traveling at a speed which is less than that of their vertical rise, but which is still quite considerable. The upward rush of hot gases very soon actuates the sprinkler heads directly over the fire. However, within a relatively short time the gases have moved horizontally past a number of sprinkler heads which actually are remote from the fire itself but which are actuated nonetheless, thereby producing unnecessary waste and damage.

Accordingly, the present invention provides as a major object a sprinkler head apparatus having directional heat absorption qualities, which actuates quickly in response to gases flowing in a vertical direction but is by comparison very slow to actuate in response to gases flowing in a horizontal direction.

Another object of the present invention is to provide a sprinkler head apparatus having means for directing horizontally-spreading heat flow away from its triggering mechanism while allowing free access thereto of the vertically-rising heat flow from the area of the fire, such that the sprinkler head is directionally responsive to the flow of heat.

Still another object of the present invention is to provide a sprinkler head apparatus of the character described which includes a generally tubulous shield mechanism which telescopes over the triggering mechanism to achieve the purposes noted.

A still further object of the present invention is to provide a sprinkler head apparatus having the foregoing attributes, whose tubulous shielding means is in the form of a truncated cone which acts to provide a chimney effect upon the vertically-rising gases from the fire to hasten and facilitate the response of the sprinkler head to such gases while simultaneously sheltering the triggering mechanism from horizontally-traveling gases, to enhance the directional heat absorption qualities of the sprinkler head.

The foregoing objects and advantages of this invention, together with other equally desirable features and attributes thereof, will become increasingly apparent to those skilled in the pertinent arts upon consideration of the following specification and its appended claims, particularly when taken in conjunction with the accompanying illustrative drawings setting forth a preferred embodiment thereof.

In the drawings:

FIG. 1 is a side elevation of the complete sprinkler head apparatus of the present invention;

FIG. 2 is a front elevation of the structure shown in FIG. 1;

FIG. 3 is a frontal perspective view of the novel heat flow-directing shielding means involved in the invention; and

FIG. 4 is a fragmentary, pictorial or diagrammatic view on a reduced scale, illustrating a portion of a system using the novel sprinkler head apparatus of the invention.

Briefly stated, the present invention provides a sprinkler head apparatus which is directionally responsive to the flow of hot gases from a fire by virtue of a triggering mechanism which operates to absorb heat from vertically rising gases much faster than from horizontally spreading gases. In the most preferred embodiment of the invention, disclosed herein, these results are achieved by providing a generally tubulous shield structure which telescopes over the fusible link or other heat absorption triggering means in the sprinkler head to shield the same from gases traveling in a horizontal direction by deflecting such gases aside. The open ends of the tubulous shield in no way interfere with vertically-rising gases, which remain free to contact the triggering means and actuate

the sprinkler head. Indeed, the shielding means actually enhances the upward movement of such gases by providing a chimney effect which speeds the upward travel of these gases to the triggering means by drawing them upwardly.

Referring now in more detail to the drawings, in FIGS. 1 and 2 a typical sprinkler head apparatus is shown at **10**, with the novel shielding apparatus **12** installed thereupon in an operative position. The sprinkler head apparatus conventionally consists of the following elements. A nozzle portion or spray means **14** is provided with a threaded coupling extremity **16**, by which the sprinkler head is connected with a source of fire-extinguishing liquid such as water, through a typical overhead arrangement **17** (FIG. 4) of supply pipes or conduits. As will be understood, the nozzle portion **14** has a suitable passageway therethrough, through which the fire-extinguishing liquid is discharged upon actuation of the sprinkler head. So long as the sprinkler head is not actuated, a suitable cap or other restraining means **18** (FIGS. 1 and 2) is positioned across the nozzle discharge to prevent any flow therethrough. A pair of arcuate support arms **20** and **22** integral with or attached to the nozzle portion **14** extend upwardly therefrom, and interconnect centrally of the sprinkler head apparatus to provide a support hub **24**. A generally circular diffuser plate **26** is secured to hub **24** in the manner shown, to facilitate the spraying of the fire-extinguishing liquid.

In the unactuated position of the sprinkler head apparatus illustrated in FIGS. 1 and 2, the restraining cap **18** is secured in position across the discharge orifice of the nozzle portion **14** by a pair of hammer-shaped linkages **28** and **30**. These members interact by a pivoting contact with each other, such as a U-shaped groove in linkage **28** and a pointed extremity on linkage **30** which fits into the groove of linkage **28**. In this relative position the two ends of the linkages **28** and **30** opposite the groove and pointed extremity are wedged firmly between the support hub **24** and the nozzle cap **18** to securely hold the latter in place upon the nozzle **14**.

It will be noted (FIG. 1) that when the linkages **28** and **30** are wedged in place in this manner, their mutual pivotal contact lies to one side of a true center-line between the cap **18** and hub **24**. Consequently, the force of the fire-extinguishing fluid against cap **18** tends to dislodge the linkages **28** and **30** by pushing them to one side and spreading their outwardly-extending end portions **32** and **34**. This is normally prevented, however, by the fusible link **36**, which receives the ends **32** and **34** of links **28** and **30**, respectively, through appropriate apertures or the like formed in the fusible link. As will readily be understood, the fusible link **36** is a heat-absorbing member which separates when exposed to a predetermined degree of heating. Thus, when a fire occurs in the vicinity of the sprinkler head apparatus **10**, fusible link **36** separates upon sensing a predetermined level of heat to release linkages **28** and **30**. Immediately the force of the fire-extinguishing liquid pushes these linkages outward and aside, and dislodged cap **18**. The fire-extinguishing liquid is then discharged through the nozzle against diffuser plate **26**, which sprays the liquid over a predetermined area to extinguish the fire.

The novel shielding means **12** of the present invention is separately illustrated in FIG. 3, where it will be seen that this member is a hollow, generally tubulous structure having an elongated aperture **40** formed in its lateral periphery. As is illustrated in FIGS. 1 and 2, the shielding means **12** mounts over the fusible link **36** and the end extremities **32** and **34** of the linkages **28** and **30**, respectively, which are engaged with the fusible link, such that the latter is more or less completely encompassed within the shielding means. Specifically, the fusible link and the linkage extremities **32** and **34** pass through the elongated aperture **40** in the side of the shielding means, and the shield is then rested in place by the engagement of the

upper edge of aperture **40** upon linkage **28**. By means of this construction, the novel shielding means may be utilized with existing conventional sprinkler heads such as are exemplified by sprinkler **10**, without the requirement of any modification whatsoever to the conventional sprinkler heads. It is to be recognized, however, that this is merely a most preferred embodiment for the novel shielding means, and that in the broader aspects of the invention the shield might be formed with a somewhat different configuration and attached to a sprinkler head of a different design in other ways which might be deemed more suitable to the different sprinkler head designs.

The seeming simplicity of the construction of the novel shielding means **12** belies the unique purpose achieved by this member, and indeed its very simplicity augments its desirability, as is manifestly apparent by the exceedingly simple installation steps necessary to convert ordinary sprinkler heads into the directionally-sensitive heads made available by the invention. In the first place, currents of heat (indicated at "A" in FIG. 4) which have already risen to the ceiling **42** from a fire that is merely in the general vicinity of a sprinkler head **110** but not directly underneath it and which are billowing out horizontally beneath the ceiling are deflected aside by the shielding means of head **110** and do not come into contact with the fusible link **36** sheltered therewithin. Consequently, the sprinkler head **110** will not be actuated under the influence of such heat, and will not produce unnecessary damage to goods, materials, and the like beneath that particular sprinkler.

On the other hand, the heat or hot gases which rise vertically (indicated at "B" in FIG. 4) from a fire which is beneath a head such as head **210** are not at all impeded by the shielding means, and are free to contact and actuate the fusible link to trigger the sprinkler. As a matter of fact, when the preferred tapered or conically-shaped shielding means illustrated is utilized, an even greater advantage is realized. In this form, the shielding means creates an added chimney effect upon the vertically-rising gases to accelerate their vertical movement through the shield and against the fusible link, thereby actuating the sprinkler head in even less time than similar but unshielded links ordinarily require.

Even further, the novel shielding means of the invention retards actuation of the sprinkler head by horizontally-moving gases to an extent greater than that which is accountable merely to the deflection of such gases away from the fusible link. This is due to the fact that moisture from such gases will be condensed on the outside of the shielding means, and not on the fusible link. It is a generally accepted fact in the associated art that sprinkler heads operate on the heart-absorption principle are observed to perform faster when the ambient atmosphere has an appreciable moisture content than is true when the atmosphere is dry. The reason for this is believed to be that the condensation of moisture upon the fusible link accelerates its heat-absorption qualities. Since as has been stated, the moisture condensed from horizontally-moving gases accumulates on the shield **12** rather than on the link **36** itself, it will be readily appreciated that a further reduction in the likelihood of actuation of the sprinkler head due to horizontally-moving gases is accomplished by the present novel shielding means.

Having now fully set forth the structure of the present shielding means an of a typical sprinkler head for use in conjunction therewith, and having also elaborated upon the operation of the shielding means in combination with the sprinkler head, other specific embodiments of the concept underlying the invention will doubtless occur to those skilled in the art to which it pertains. Also, various modifications and variations in the specific structure shown and disclosed herein may occur to such persons.

I claim:

1. In a first protection system for buildings and the like, of the type which selectively automatically actuates when

subjected to the heat from a fire within such building to release a desired medium to extinguish such fire, and which includes a source of fire-extinguishing medium and a conduit system coupled to said source for providing distribution of said medium to desired locations in such buildings, the improvement comprising: a plurality of directionally-sensitive sprinkler head means coupled to said conduit system at said desired locations; each of said sprinkler head means including heat-responsive triggering means for actuating that sprinkler head means to spray said medium therefrom; means mounting each of said sprinkler heads such that the triggering means thereof is disposed substantially entirely below the ceiling in such buildings and positioned so as to be freely exposed to heat currents traveling beneath the ceiling in all directions; and each of said triggering means including means for varying its response to heat in accordance with the flow direction thereof, comprising a shield member for blocking heat current traveling in a predetermined direction while permitting free passage of current traveling in a different direction.

2. The improvement in fire protection systems recited in claim 1, wherein said shield member generally encircles said triggering means laterally and has an opening therein by which the shield may be placed about said triggering means.

3. The improvement in fire protection systems recited in claim 2, wherein said shield member comprises a generally tubular element having at least one open end.

4. The improvement in fire protection systems recited in claim 3, wherein said shield member element has both of its ends open.

5. The improvement in fire protection systems recited in claim 3, wherein said shield member element is smaller diametrally than said sprinkler head means and is telescoped over said triggering means only.

6. The improvement in fire protection systems recited in claim 5, wherein said triggering means includes laterally extending arm portions and said tubular element has an opening in its lateral wall for receiving said arm portions.

7. A method by which the selectivity of automatic systems of the type having sprinkler heads with heat-responsive triggering means may be significantly increased, comprising the steps of mounting said heads in a room with their triggering means positioned beneath the ceiling of the room and freely exposed to heat currents traveling beneath the ceiling in all directions; shelding said triggering means laterally from horizontally-moving heat currents while at the same time exposing such means to vertically-moving heat currents, such that heat currents billowing horizontally beneath said ceiling from a relatively distant fire will not actuate said triggering means whereas heat currents rising vertically toward such ceiling from a relatively close fire will actuate such means.

8. The method of claim 7, wherein said shielding step is accomplished by diverting said horizontally-moving heat currents around said triggering means.

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U.S Cl. X.R.

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