Aug. 22, 1967 B. J. MACARTNEY 3,336,984

SPRINKLER HEAD

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Fig. 1.

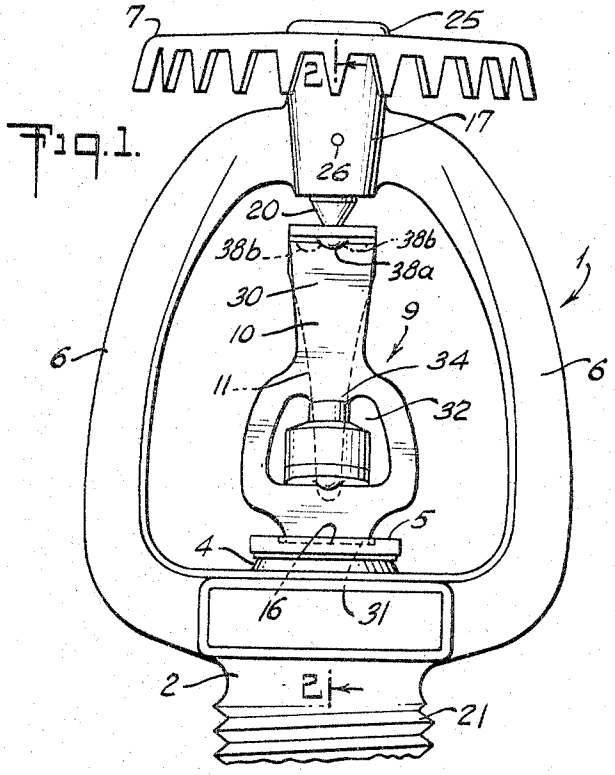


Fig. 2.

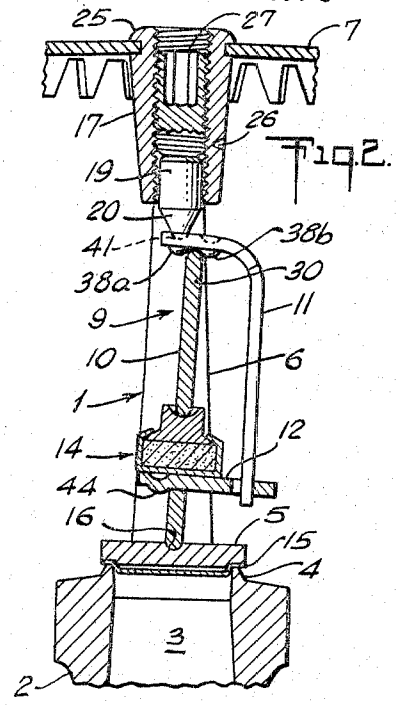


Fig. 3.

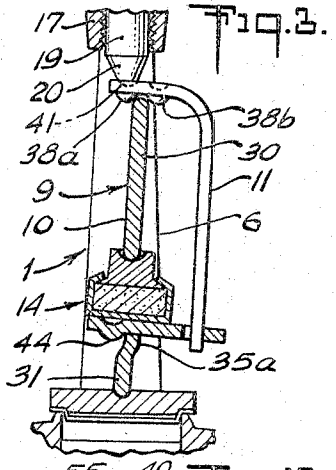


Fig. 5.

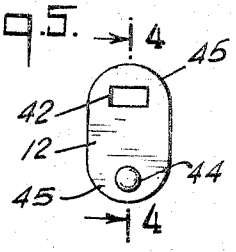


Fig. 4.

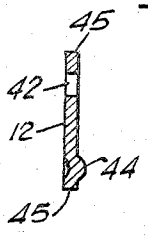


Fig. 6.

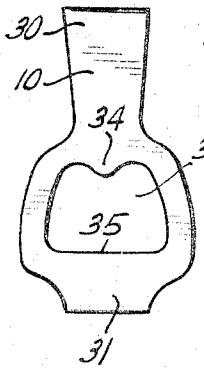


Fig. 7.

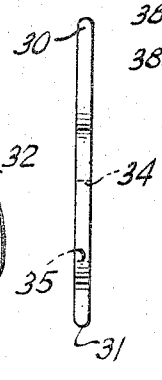


Fig. 8.

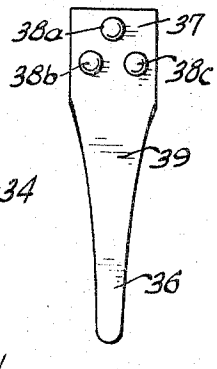


Fig. 9.

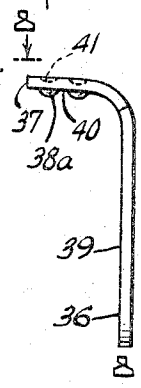
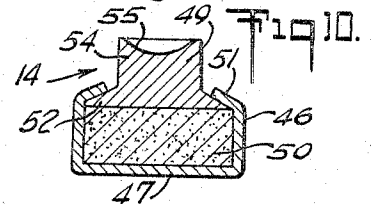


Fig. 10.



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Fig. 11.

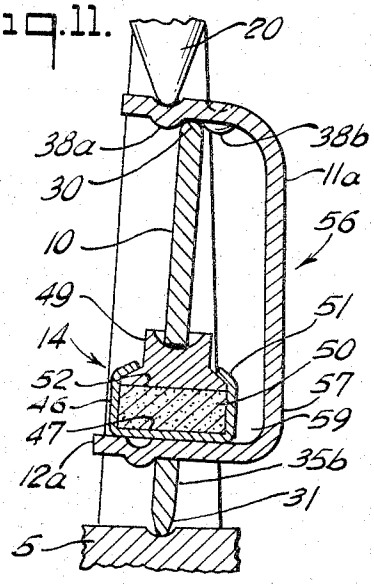


Fig. 12.

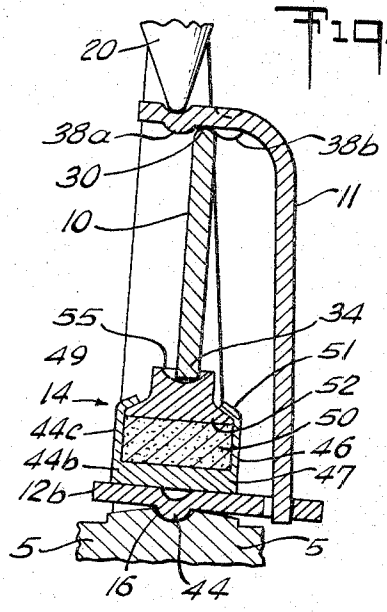


Fig. 13.

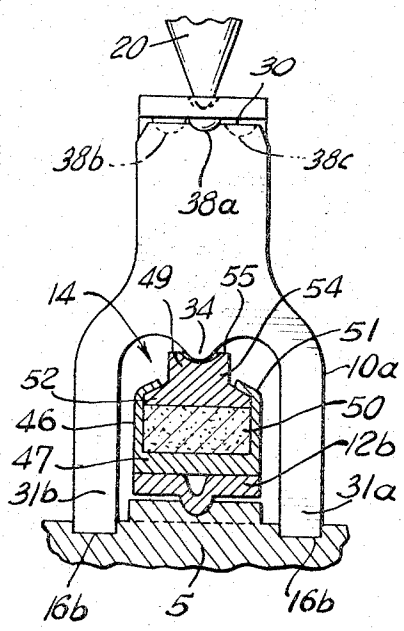
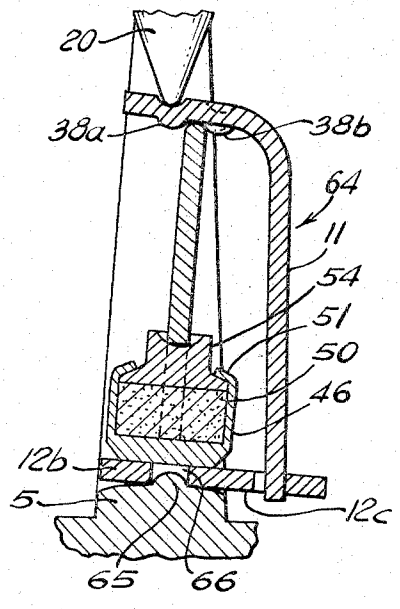


Fig. 14.



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3,336,984

SPRINKLER HEAD

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Filed Sept. 13, 1965, Ser. No. 487,012
10 Claims. (Cl. 169—38)

The present invention relates to an improved sprinkler head for automatic fire extinguishing systems.

The sprinkler system may be used to discharge water or other suitable fire extinguishing fluid supplied to the sprinkler head through a piping system.

It is important that the sprinkler head be dependable in operation even though it may be in position for many years prior to its use. Inasmuch as it is impractical to remove the sprinkler head for testing after its installation, it is necessary that the sprinkler head be quite rugged so as to withstand rough handling before and during installation, and while in use.

Difficulty has been had with prior sprinkler heads because the construction has been such that the heat produced by a fire has been conducted away from the fusible elements at a rapid rate thus tending to make the sprinkler heads slow in operation. Other prior sprinkler heads have been subject to the deleterious effects of corrosion. Still other prior sprinkler heads have utilized constructions in which the fusible members are stressed in shear thereby inherently making it difficult to achieve stable operating characteristics. In other cases the construction has been such that changes in the operating charactertistics have resulted because of cold flow of the fusible metal under uneven compression.

The present invention is an improvement over the construction shown in my Patent No. 3,161,236 issued Dec. 15, 1964.

The present invention aims to provide a sprinkler head in which the compressive stress applied to the fusible member is more evenly applied than has been the case for prior constructions.

In accordance with the invention there is provided a sprinkler head in which the valve member is held against its seat by a lever arrangement. The lever is secured by a fusible element in compression and having a large contact area for the force applied. By simple means the pulling force of the lever is converted to an evenly distributed compressive force on the fusible element.

The construction is advantageous in that the sprinkler head may be tested while installed to ascertain the amount of pressure urging the valve member against its seat.

Another object of the invention is to provide a sprinkler head which is simple and economical in manufacture, which may be accurately and dependably adjusted, and which is rugged in use.

In the drawings:

FIGURE 1 is a front view of a sprinkler head in accordance with the invention.

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a fragmentary view of a portion of FIGURE 2 showing a modification of the construction in accordance with the invention.

FIGURES 4 and 5 are respectively side and top views of a holding member for the sprinkler head.

FIGURES 6 and 7 are respectively front and side views of a strut member for the sprinkler head.

FIGURE 8 is a front view of a lever member for the sprinkler head before being formed.

FIGURE 9 is a side view of the lever member shown in FIGURE 8 after it has been formed.

FIGURE 10 is an enlarged sectional view of a fusible element for the sprinkler head.

FIGURE 11 is a fragmentary sectional view corresponding to FIGURE 2 of a somewhat modified sprinkler head.

FIGURE 12 is a view corresponding to FIGURE 11 of a further modified sprinkler head.

FIGURE 13 is a front view of the sprinkler head shown in FIGURE 12.

FIGURE 14 is a view corresponding to FIGURE 11 of a still further modified sprinkler head.

Referring to the drawings, the sprinkler head **1** includes a body member **2** having a passageway **3** extending therethrough, the end of the passageway **3** forming a combination nozzle and valve seat **4**. A valve member **5** closes the passage through the nozzle **4**. Upwardly extending from the body member **2** is a frame **6** carrying at its upper end a deflector head or spreader **7**.

The valve member **5** is held on its seat **4** by a thermally collapsible assembly **9** including a strut member **10**, a lever member **11**, holding means or key **12** and a fusible element **14**. A gasket **15** is interposed between the valve member **5** and its seat **4**. The top of the valve member **5** is grooved to form a bearing surface **16**.

At the upper end of the frame **6** is a collar **17** having a threaded opening therethrough to receive a screw or an adjustably set member **19** having a threaded outer surface and provided with a bearing surface **20** at its lower end. The thermally collapsible assembly **9** is maintained in position between the bearing surfaces **16** and **20**.

The body member **2** is threaded at one end as indicated at **21** in order that the sprinkler head **1** may be secured in the outlet of a conventional fire extinguishing piping system not shown. The frame **6** and the collar **17** may be made integrally with the body member **2** in a cast or forged construction or otherwise as is well known in the art. The frame **6** should be of ample strength so that the valve member **5** is held on its seat **4** with the desired amount of contact pressure without undue distortion of the frame **6**.

The deflector head **7** is conventional and is secured in position by the turning over of the upper end of the collar **17** as indicated at **25**. If desired the collar **17** and the screw **19** may be apertured to receive a pin or rivet or peened as indicated at **26** to maintain the screw in the desired set position. The upper end of the screw **19** is apertured and formed as indicated at **27** to receive a standard tool to adjust the force with which the valve member **5** is urged against its seat.

The bearing surface **20** is preferably generally cone shaped with a rounded tip providing ample bearing area. The strut member **10** is preferably made of a straight flat piece of material of adequate strength to hold the valve member **5** against its seat **4**. The strut member **10** has its upper end **30** and its lower end **31** rounded to provide pivotable supporting surfaces, the upper end **30** of the strut member **10** forming a fulcrum for the lever **11**. The strut member **10** has an opening **32** adjacent the lower portion thereof, with a projection **34** extending downwardly therein from its upper portion. Wall **35** at the bottom of the opening **32** is flat.

The lever member **11** shown in detail in FIGURES 8 and 9 may be formed from a piece of flat stock having a lower end or arm **36** and an upper end **37**. The upper end **37** is turned approximately at right angles to its body **39**. In the upper end **37** are formed a plurality of projections **38***a*, **38***b* and **38***c* of generally hemispherical shape made by deforming the metal of the upper end **37**. The projection **38***a* is placed in the center of the upper end **37** adjacent its edge. The projections **38***b* and **38***c* are positioned side by side and located inwardly of the projection **38***a*, a space **40** being provided to receive the rounded end **30** of the strut member **10**. Depression **41** on the

opposite side of the end **37** from the projection **38***a* is adapted to receive the end of the rounded bearing surface **20**. The spacing between the bottom of the depression **41** and the center of the space **40** provides a short lever arm while the spacing between the depression **41** and the end of the arm **36** provides a long lever arm.

The holding member or key **12** in FIGURES 4 and 5 is formed with an aperture **42** adjacent one end acting as holding means to receive the arm **36** of the lever member **11**. The length of the aperture **42** is somewhat greater than the thickness of the lever member **11** for a purpose which will be hereinafter explained. At the opposite end of the holding member **12** from the aperture **42** is a downwardly depending means such as a projection **44** centrally positioned along the longitudinal axis of the holding member **12**. Both ends of the holding member **12** may be rounded as indicated at **45**.

The fusible element **14** shown in detail in FIGURE 10 includes a generally cup-shaped base member **46** having a flattened bottom surface **47**. The upper end of the base member **46** is closed by a piston member **49** which seats on a mass of fusible material **50**. The upper edge of the base member **46** is turned inwardly as indicated at **51** over edges **52** of the piston member **49** to provide a hermetically sealed construction.

The fusible material **50** is well known in the art and may be made of metal alloys or chemical materials normally solid and liquefiable at a desired temperature, for example, at 160 degrees F. Such materials are not limited to but may include solder, dichlorobenzene, benzyl disulfide, or cobalt nitrate. The fusible material **50** is confined in the cavity of the base member **46** and thus is not subjected to shearing stress. The edges **52** of the piston member **49** are spaced from the inner surface of the side walls of the base member **46** so as to provide a clearance of approximately .05 to .08 inch in order that the fusible material **50** may pass through this space when fused. The construction of the fusible element **14** so far disclosed is well known in the art.

The piston member **49** is provided with an extension **54** having a cup-shaped depression **55** to receive the projection **34** of the strut member **10**. Alternatively, a construction might be used in which the extension **54** is pointed and the projection **34** is enlarged and a cup-shaped depression is provided therein, both constructions forming pivotable bearing means for the fusible element **14** with respect to the strut member **10**.

In the assembly of the sprinkler head **1** the parts are arranged as illustrated and the screw **19** is adjusted to move the bearing surface **20** downwardly to hold the assembly **9** in position and to hold the valve member **5** and its gasket **15** against the seat **4**. As previously stated the opening **42** of the holding member **12** is made somewhat longer than the thickness of the extension **36** of the lever member **11**. By applying a pressure gauge to the end of the extension **36** so as to move the lever member **11** inwardly by the amount provided by the opening **42** a proportionate measure is had of the pressure with which the valve member **5** is held against its seat. This means of testing the pressure with which the valve member **5** is seated may also be used while the sprinkler head is installed on a piping system. The screw **19** is adjusted to provide the desired seat pressure whereupon it is peened as indicated at **26**.

In the embodiment shown in FIGURE 3 a somewhat modified construction is used in which like numerals are employed as for the embodiment shown in the previous figures. The construction of FIGURE 3 differs only in the deforming of the surface **35***a* so that the bearing point of the projection **44** is slightly further to the right for a purpose as will be explained hereafter in the description of the operation of the sprinkler head.

In the embodiment shown in FIGURE 11 a somewhat modified construction is used in which like numerals are employed. In the sprinkler head **56** the holding member **12***a* is formed as an extension of end **57** of the lever member **11***a*. In fabricating this construction it is desirable to formulate angle **59** somewhat less than 90° so that there is a tendency for holding member **12***a* to swing upwardly upon the collapse of the fusible element **14** so as to provide clearance with the surface **35***b* of the strut member **10**. Alternatively, if desired, in the construction of FIGURE 11 the strut member **10** of FIGURE 3 may be used having the offset deformed portion **35***a*.

In FIGURES 12 and 13 there is shown a further modified sprinkler head **60** in which the holding member **12** is shown as in FIGURES 4 and 5. The valve member **5** is formed with its grooved bearing surface **16** adapted to receive the projection **44** of the holding or key member **12**. For convenience of assembly, the valve member **5** may have its depression centered in its upper surface. Further in this embodiment the strut **10***a* (FIGURE 13) is somewhat modified so as to have bifurcated ends **31***a* and **31***b* engaging in cooperating grooves **16***a* and **16***b* of the valve member **5**. Alternatively an upwardly extending projection **62** may be made on the valve member **5** for the support of the holding member **12** modified as shown in FIGURE 14. Obviously the construction of this embodiment might also be modified to incorporate the teaching of FIGURE 11 wherein the holding member **12** is made as an extension of the lever **11**.

In FIGURE 14 there is shown a still further modified sprinkler head **64** in which the valve member **5** is provided with an upwardly extending projection **65** which may be centered in its upper surface for convenience of assembly. The holding or key member **12***b* is provided with an aperture **66** in lieu of the projection **44** of FIGURES 4 and 5. The aperture **66** is adapted to receive the upwardly extending projection **65** of the valve member **5**. This construction may use the bifurcated strut member **11***a* of FIGURES 12 and 13. However the construction of the sprinkler head **64** may also be modified in accordance with the teaching of FIGURE 10 so that the holding member **12** is made as an extension of the lever member **11**. A further modification in accordance with the teaching of FIGURE 14 would utilize the holding or key member **12***b* of FIGURE 14 with its aperture **66** utilized in a construction in accordance with FIGURES 1, 2, 3 or 11 and in which the flattened surface **35** and **35***b* is provided with an upwardly extending projection adapted to fit into the aperture **66** of the holding member **12***b*.

The operation of all of the embodiments is similar. The lever **11** fulcrums by contact of its bearing surface **40** with the end **30** of the strut member **10**. The depression **41** of the lever member **11** is contacted by the bearing surface **20**. The arm **36** of the lever member **11** is held inwardly by tension on the holding or key member **12**. The downwardly depending projection **44** of the key member **12** bears against an abutment so that the tension force of the lever **11** applied to the key member **12** converts the pulling force into a compressive force acting against the bottom of the fusible element **14**. Upon the melting of the fusible material **50** the piston member **49** moves downwardly into the fusible material **50** thereby allowing the lever arm **36** to pull the key member **12** out of its jammed position so that the thermally collapsible assembly **9** collapses allowing pressure of the fire extinguishing fluid to unseat the valve member **5** and move it out of position. The fire extinguishing fluid then impinges against the deflector **7**.

It will be noted that in the constructions of the various embodiments the compressive force is applied at, or approximately at, the center line of the fusible element **14**. Thus the fusible material **50** is under even compression by its piston member **49**.

The preferred embodiment of the invention is shown in FIGURES 1 and 2 and 4 through 10. In this construction the strut member **10** is flat and thus the compressive force on the fusible element **14** is slightly at one side

of the center line thereof by a few thousandths of an inch. In a practical construction the strut member **10** is .064 inch in thickness. The compressive force is thus .032 inch off the center line. It has been found unnecessary in a practical construction to incorporate the offset **35***a* of FIGURE 3. Tests under elevated temperature conditions made by the Board of Fire Underwriters have indicated that the fusible member is substantially free from forces of a magnitude as might cause cold flow of the fusible material.

From the preceding description it will be seen that the present invention provides a sprinkler head utilizing a fusible element in compression and in which a construction is used so that the pulling force of the lever is converted to an evenly distributed compressive force on the fusible element.

While the invention has been described and illustrated with reference to specific embodiments thereof it will be understood that other embodiments may be resorted to without departing from the invention. Therefore, the form of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. In a sprinkler head comprising a body member having a passage therethrough terminating in a nozzle, the outer end of the nozzle defining a valve seat, a deflector member, a frame extending from the body member and supporting the deflector member in a position axially of the nozzle and in spaced relationship therewith, a valve member seated on the valve seat and releasably closing the passage, means forming a bearing surface carried by the valve member outwardly of its seating surface, an adjustably set member extending inwardly from the frame inwardly of the deflector member, means forming a second bearing surface carried by said adjustably set member, a strut member bearing at one end against one of said bearing surfaces, a lever member interposed between the strut member and the other of said bearing surfaces, the lever member fulcruming on the strut member thereby urging the strut member against one of the bearing surfaces responsive to the setting of the adjustable member, a fusible element, means supporting the fusible element on its sides and one end, piston means abutting the other end of the fusible element and adapted to move into the fusible element upon its melting, holding means for the lever member, the supporting means and the piston for the fusible element interposed between the strut member and the holding means so that upon the melting of the fusible member the valve member is released from its seat,

abutment means positioned generally axially of said piston, and wedging means cooperative between the holding means and the abutment means, the wedging means positioned on the one side of the holding means away from the means supporting the fusible element on its sides and one end, the contacting surfaces of the other side of the holding means and the means supporting the fusible element on its sides and ends being substantially flat, the wedging means coacting with the abutment means for converting a pulling force acting on the holding member parallel to the plane thereof by the lever member into a compressive force transmitted evenly through the fusible element against the face of the piston member.

2. A sprinkler head according to claim **1** in which said means supporting the fusible element on its sides and one end is a cup-shaped cylindrical member.

3. A sprinkler head according to claim **1** in which said holding means is an apertured member and said lever member engages the wall of the aperture of said holding member.

4. A sprinkler head according to claim **1** in which said holding means for the lever member is made in a one-piece construction with said lever member.

5. A sprinkler head according to claim **1** in which said abutment means is a wall of an opening in said strut member.

6. A sprinkler head according to claim **1** in which said abutment means is a wall of a groove forming said bearing surface carried by said valve member.

7. A sprinkler head according to claim **1** in which said holding member is apertured, and said abutment means is the wall of the aperture in said holding member.

8. A sprinkler head according to claim **1** in which said wedging means is a projection extending from said holding member.

9. A sprinkler head according to claim **1** in which said wedging means is a projection extending from said valve member.

10. A sprinkler head according to claim **1** in which said means supporting the fusible element on its sides and one end is a cup-shaped cylindrical member, said holding means is an apertured member and said lever member engages the wall of the aperture of the holding member, said abutment means is a wall of an opening on said strut member, and said wedging means is a projection extending from said holding member.

No references cited.

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