

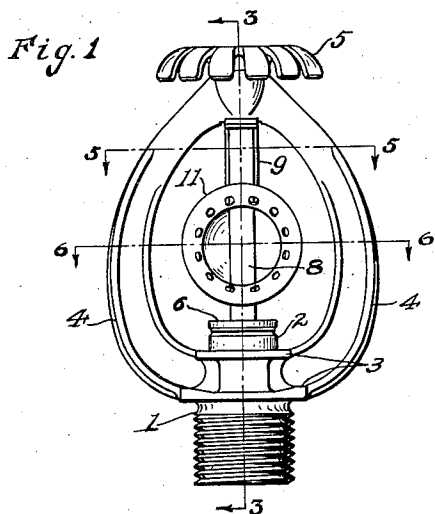
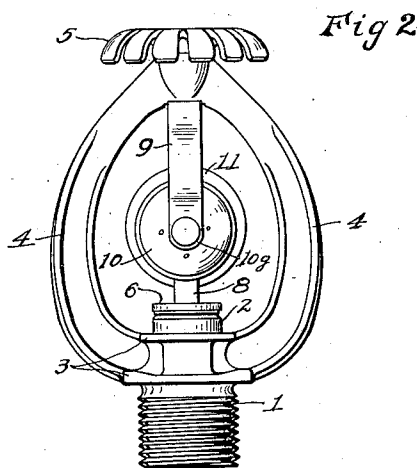
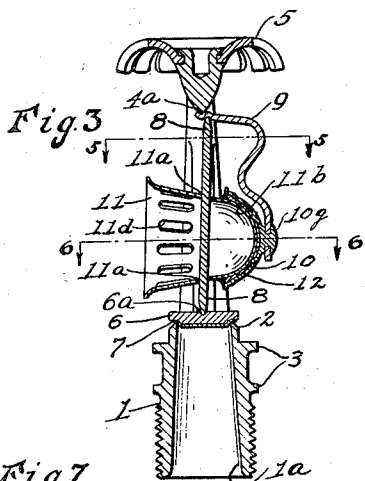
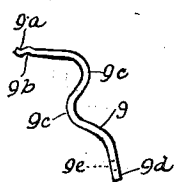
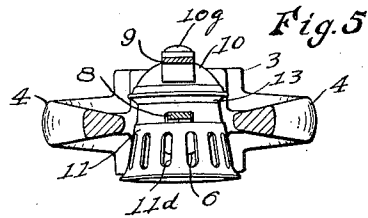
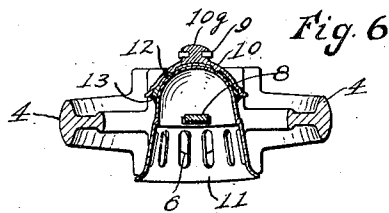
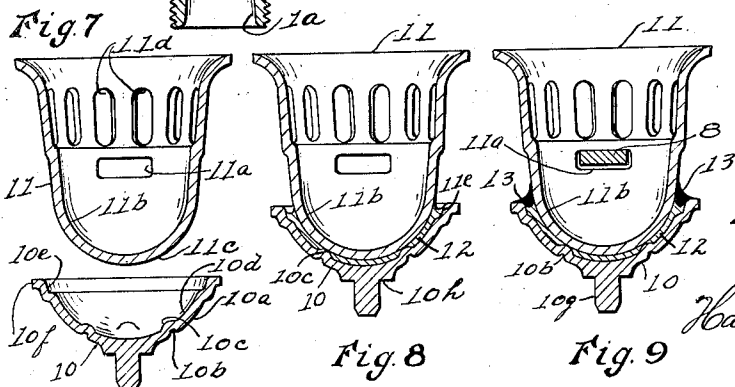
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2,075,816

AUTOMATIC SPRINKLER

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AUTOMATIC SPRINKLER

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Application February 11, 1933, Serial No. 656,266

23 Claims. (Cl. 169—39)

This invention relates to improvements in automatic sprinklers. More particularly it has to do with heads which employ fusible material as the heat responsive element and is especially directed to improving the type of sprinkler disclosed in Letters Patent 1,919,235 granted July 25, 1933 to Albert Loepsinger.

A sprinkler has what may be termed three distinct stages, its stage of manufacture, its stand-by stage, and its stage of action and discharge. It should be easy to make and assemble, should be reliably resistive to corrosion and abuse, should be keenly sensitive to heat, and should respond promptly and unfailingly when needed. It is among the objects of this invention to provide a sprinkler that excels in all of these requirements. These objects embrace a design of parts which will be economical to produce and put together, which when assembled will have marked resistance to the dangers combated during the stand-by stage, and which when affected by heat resulting from the occurrence of fire will act promptly to open the sprinkler and bring about a most effective fire extinguishing discharge.

In the accompanying drawing a sprinkler is shown which embodies the present improvements but this is primarily illustrative and it is intended that the patent shall cover by suitable expression in the appended claims whatever features of patentable novelty exist in the invention as a whole.

In the drawing:

Figure 1 is an elevation of the sprinkler viewed from one side and Figure 2 is a similar elevation looking from the opposite side;

Figure 3 is an elevation in section as on line 3—3 of Figure 1;

Figure 4 is a view of the spring hook, prior to assembly;

Figures 5 and 6 are plan views in section on line 5—5 and 6—6 respectively of Figures 1 and 3;

Figure 7 is a view in section of the heat gatherer and key prior to being soldered together;

Figure 8 is a similar view after the soldering operation; and

Figure 9 is another similar view after the corro-proofing material has been applied.

Referring now more particularly to the drawing, the sprinkler comprises a hollow stem 1 externally threaded for engagement with a source of fire extinguishing medium, and terminating in a seat 2 upstanding from squared portions 3 adapted to receive a wrench. From the stem extend yoke arms 4 which are of channel cross section at first but whose outstanding edges

merge into an ovate cross section as the arms join at the top. To the latter is secured a deflector 5.

The throat 1a is normally closed by a shouldered disk valve 6 (there being preferably a thin copper washer 7 between it and its seat) which has a depression 6a in its upper surface to receive a strut member 8. This strut extends substantially along the axis of the sprinkler from the valve to engage the end of a spring hook 9. The latter is a resilient member having adjacent creases 9a, 9b, at one end to engage a blunt knife edge 4a on the yoke and to receive the said strut member, and having an extended portion provided with convolutions 9c which enhance the resiliency. The extended end 9d of this spring hook is riveted to a formed member 10 also termed a key which is soldered to a correspondingly formed member 11, also called a heat gatherer. The latter extends from the key to beyond the strut 8, having opposed slots 11a through which the said strut projects.

The key 10 and the end 11b of the heat gatherer to which it is attached by the fusible material 12 might both be flat plates but, as will later more particularly appear, it is a feature of this invention to have a minimum exposure of solder and so the key and heat gatherer are so shaped or formed as to greatly increase the ratio of the soldered area to the solder exposure. But this ratio must not be too great because it is not desirable to have formed surfaces that will result in a sliding action during their separation. When the solder melts it is intended that the key 10 will be vigorously separated from the heat gatherer 11 primarily by the resilient action of the spring hook 9. Accordingly, the formed surfaces to be soldered together must be so shaped and of such depth that the action of the spring hook in moving from its sprung position to its natural or unsprung position will be sufficient to completely separate the formed surfaces and thus permit the upward thrust on the strut 8 to complete the dislodgment of the movable parts.

The preferred form is as shown with the key 10 and the end 11b of the heat gatherer hemispherically shaped, but other forms, such as a corrugated surface, a cone shaped surface, a pitched-roof shaped surface, a pyramidal surface, and the like could be employed if desired. It is to be noted, however, that the terms "formed surface" or "formed member" as herein used are to be understood as embracing any surface, or any member having a surface, whose actual area is greater than the area of its projection.

The several parts are easily manufactured and lend themselves to methods of production well adapted to insure close adherence to dimensions. Prior to final assembly the key 10 and heat gatherer 11 are soldered together and corroproofed. The outer formed surface 10a of the key is slightly indented during its formation (as at 10b) to form small protuberances 10c on the inner formed surface 10d, so that when this latter surface is presented to the outer formed surface 11c of the heat gatherer, these protuberances will define a predetermined space between the said adjacent surfaces. This space is filled with fusible material such as solder, such slight excess as might occur being taken care of by the annular trough 10e formed by the outstanding flange 10f on the key. This trough is then filled with a non-corrosive substance 13, as for example a wax compound, known as corroproof. This is applied in a fluid state, quickly fills the trough, runs up slightly on the outer surface 11c of the heat-gatherer and to the edge of the key flange 10f, and solidifies with an exposed meniscus-shaped surface as seen clearly in Figure 9.

In the final assembly the washer 7 and valve 6, both of which are suitably shouldered, are placed on the ring seat 2 and the previously-soldered-together key 10 and heat gatherer 11 are slipped onto the strut 3. The reversely creased end of the spring hook 9 is then placed against the knife edge 4a on the yoke and the strut interposed between the hook and the valve. The other end 9d of the hook is then forced toward the key, the latter being readily slidable with the heat gatherer along the strut to bring the rivet end 10g into alignment with a hole 9e in the hook. This rivet end is slightly rounded over so as to pass easily through the hole during the arcuate movement of the hook. With the latter held firmly against the raised shoulder 10h on the key the rivet is upset to bind the hook and key securely together. Thus the assembling is easily and rapidly accomplished.

Sprinkler systems may stand for years without ever being called into action and yet when needed are expected to respond unflinchingly. The responsive elements of the system are the sprinklers and if these are not always ready to open upon the occurrence of fire the protective value of the system is obviously nothing. During the quiescent or stand-by period, the sprinklers are constantly subjected to various dangers. They may be struck by a broom, belt shifter, ladder or other object at any time and if the sensitive parts are so exposed as to receive the brunt of such a blow the sprinkler may be permanently deformed so as to be inoperative or, what is more likely, the parts will be disturbed so as to cause the sprinkler to leak.

The improved sprinkler guards against this particular form of danger by virtue of the location of its movable parts which lie substantially along the axis of the sprinkler and are largely protected from accidental damage by the rigid deflector and the body portion. Moreover the members of the strut assembly are of light resilient construction and well able to cushion the force of any reasonable blow without injury to themselves.

Another danger encountered by sprinklers during the stand-by period is the danger of cold-flow by which is meant the premature flow or yielding of the fusible material. This danger is not ordinarily experienced unless excessive strain is constantly being imposed upon the solder or like fus-

ible material. No such strain is present in the improved sprinkler for several reasons. First, the total force exerted on the valve by the water or air pressure is appreciably reduced because of the taper throat. This leads to a discharge opening which is smaller than could be used if the throat were not tapered and consequently the static force imposed upon the valve is thus reduced since its area exposed to pressure is smaller than is usual in sprinklers. Secondly, this force is by virtue of the lever action of the spring hook largely imposed upon the yoke, with only a relatively small part being transmitted to the key. Thirdly, this relatively small force is distributed throughout the entire layer of solder which, as previously pointed out, is of substantially uniform thickness and has a relatively large area of contact with the key and heat gatherer. The aforesaid construction and arrangement of parts renders all danger of cold flow entirely negligible.

In addition there remains the dangers arising from corrosion. The improved sprinkler is unusually resistant to such dangers. The non-fusible metal parts may be made from known alloys well adapted to resist corrosion and yet having the properties of strength, resiliency and heat conductivity required by the design. The solder, however, to serve its purpose must have an appropriate melting point. In the most commonly used heads this is 164° F. and to obtain this an alloy having but slight resistive qualities to corrosion must be used.

Heretofore in sprinklers using this material as the fusible element, the solder has been applied in a most irregular manner over a considerably exposed area. Because of this, it has been customary, when corroproof sprinklers have been desired, to coat the entire sprinkler with a thick film of the corroproof material. This is objectionable because the corroproofing acts as an insulating blanket making the sprinkler less sensitive. But the forms of the soldered surfaces in the improved sprinkler and the manner of soldering leave only an edge of the solder exposed and this is easily covered by a narrow ring of the corroproof material 13 as clearly seen in Figure 9. The small amount thus used has no appreciable effect on the sensitiveness of the sprinkler.

Another advantage gained by the improved manner of soldering and corroproofing is the ease and safety with which the sprinkler as a whole may be electroplated. This is sometimes desirable for appearance, as where the piping of a system is concealed and only the sprinklers are exposed. In such cases the sprinkler may be plated with copper, brass, tin, nickel or chromium. In other cases, where a sprinkler may be exposed to chemical fumes it may be desirable to plate the sprinkler with a coating highly resistant to the reaction of such fumes, for example, with a heavy plating of lead. With the improved sprinkler it can be so plated without fear of the added metal reaching the solder because the corroproof is a non-conductor and no metal is deposited upon it. Thus is the improved sprinkler in its native state, as it were, not only highly resistant to the danger of corrosion but it can be further heavily plated, either for appearance or extreme protection, without affecting the solder employed.

In addition to the advantages already noted the improved sprinkler opens with great rapidity when exposed to the heat of a fire. This is due to the heat gatherer 11 which extends into space away from the soldered surface, thus collecting

heat that would otherwise be ineffective and conducting it to the solder. Perforations 11d in the heat gatherer have been found of advantage because they permit the hot air to reach its inner surface and also permit a continued flow of hot air through the interior of the gatherer. It is to be noted that in order to melt the solder it is necessary not only to bring it to its melting point but to supply the heat necessary for fusion, this being the latent heat of fusion. While during melting the solder remains at its melting point, just as does ice, the heat gatherer becomes hotter (because of the passing hot air), and there is a flow of heat from the gatherer to the solder.

The sensitivity of the sprinkler is also increased because of the open construction and the thinness of the soldered parts. This is possible because these parts are not called upon to directly bear the force necessary to keep the sprinkler closed. This is the function of the strut member 8 which, being of a material having low conductivity and not being in good thermal relation with the heat collector, (since there is only substantial line contact between the heat gatherer and one side of the strut, see Figure 9) does not rob the latter of any appreciable amount of heat. The heat gatherer and key are made of a good heat conducting metal, copper, while the strut member is made of Monel metal, which, having a high nickel content, is a poor conductor. It is to be noted also that this construction prevents cooling of the sprinkler by the fire extinguishing medium in a pipe to which the sprinkler may be connected, particularly when the medium is flowing past a sprinkler to discharge from one that has previously been opened. Thus the improved sprinkler not only provides for gathering heat and applying it directly to the solder over its relatively large area but in addition prevents the wasteful dissipation of the gathered heat and the transmission of "cold" to the solder.

As the solder fuses and loses its holding power it is important that the movable parts rapidly clear themselves from the sprinkler. This the invention insures by providing a vigorous and sustained follow-up which is effective to separate quickly and widely the soldered parts before water can leak past the valve and recoil the solder. This follow-up action is also of advantage should the parts have become loaded with deposits of foreign material such as, for example, cement, flour, or sticky substances like sugar syrup. In the improved sprinkler the spring hook 9, as its name implies, is so shaped with reversed convolutions or bends 9c as to render it highly resilient and capable of large deflection. Its open or unsprung condition is seen in Figure 4. When its creased end is interposed between the strut 8 and the yoke 4, this end becomes substantially fixed while its remote end is capable, due to the resiliency of the member, of a large arcuate movement toward the key. Thus while the solder holds, the spring hook is constantly tending to return to its initial shape and as the solder melts this tendency is exerted on the key to separate it from the heat gatherer. When the holding power of the solder fails the spring hook and key are vigorously and rapidly separated from the heat gatherer. Indeed this separation is complete before the spring hook, with its attached key, can move far enough to afford any appreciable release to the strut member. In consequence, there is practically no leaking past the valve until after the soldered parts have been widely separated. The follow up of

the spring hook not only draws the key away from the heat gatherer but as the hook continues to swing upward it influences the deflection of the strut member, thus aiding in the complete dislodgment of the moving parts from the sprinkler. Accordingly the improved sprinkler is not only keenly sensitive, being quickly responsive to the heat changes caused by a fire, but it has a vigorous and rapid opening action consequent upon its response.

The features of the spring hook disclosed herein have been made the subject matter of a divisional application, Ser. No. 118,933, filed January 4, 1937.

We claim:

1. An automatic sprinkler having means for holding the sprinkler closed comprising a hemispherically shaped member and a cup-shaped member having a hemispherically shaped end joined to said first member by fusible material; the wall portion of the last said member being perforated and extending away from its hemispherically shaped end for gathering heat and effecting its conduction to the fusible material.

2. An automatic sprinkler having means for holding the sprinkler closed comprising a strut member located substantially along the axis of the sprinkler; a lever member extending from the end of said strut member; a key member secured to said lever member; and a heat gatherer mounted on said strut member having a portion joined to said key member by fusible material located between said strut and lever member; and having another portion extending to a point materially beyond the other side of said strut for gathering heat and conducting it to the fusible material.

3. An automatic sprinkler having means for holding the sprinkler closed comprising two members soldered together and a spring element interposed between one member and the frame of the sprinkler; the element and said members being so constructed and arranged that upon the destruction of the solder connection the spring element moves one of said members away from the other without any relative bearing between them.

4. An automatic sprinkler having a stem with passage therethrough adapted to be connected to a conduit containing fluid under pressure; a yoke; a valve closing said passage when seated; means for holding said valve seated comprising a strut resting on the valve; two members soldered together one of which is connected to said strut; and a resilient lever having one end resting on said yoke and adjacently engaged by the strut and having its other end immovably secured to the other of said soldered members; the aforesaid parts being so arranged and disposed that upon the melting of the solder the separating movement of said members is initiated by the resilient action of said lever and continued by the fluid pressure acting on said valve and is effected without relative bearing between the said members.

5. An automatic sprinkler having a stem with passage therethrough; a yoke; a valve for closing said passage when seated; a strut resting on said valve; a resilient lever interposed between said strut and yoke having reversed convolutions intermediate its ends to enhance its resiliency; a key member immovably secured to the end of said lever remote from its engagement with the yoke; and a member connected with said strut; the said members being soldered together and so

constructed and arranged with respect to the lever that upon the fusing of the soldered connection the lever moves the key member away from the member connected with the strut without relative bearing between these members.

5 6. An automatic sprinkler having a stem with passage therethrough; a yoke; a valve for closing said passage when seated; and means interposed between said yoke and valve for holding
10 the latter seated; said means comprising a strut member and a resilient lever member engaging one end of the strut member and having connection with the strut member intermediate the ends of the latter; said connection comprising a mem-
15 ber engaging the strut member and a key member fusibly connected thereto and engaging the lever member; the lever member and key member being so constructed and arranged with respect to the strut engaging member that upon destruction of
20 the fusible connection the lever member moves the key member away from the strut engaging member without bearing in any way on said strut engaging member.

7. An automatic sprinkler having a stem with
25 passage therethrough; a yoke; a valve for closing said passage when seated; and means interposed between the yoke and said valve for holding the latter seated comprising a strut member and a resilient member connected to the strut member
30 by formed members having surfaces fusibly connected together; the resilient and formed members being so constructed and arranged that upon the giving way of the fusible connection the resilient member effects separation of the formed
35 members without any relative bearing between them during the separating movement.

8. An automatic sprinkler having a stem with
40 passage therethrough; a yoke; a valve for closing said passage when seated; and means interposed between the yoke and said valve for holding the valve seated comprising a strut member, a member engaging the strut member, a key member having a fusible connection with said strut en-
45 gaging member, and a resilient lever member engaging the key member and tending to separate it from the strut engaging member; the said members being so constructed and arranged with respect to one another that upon the giving way of the fusible connection the key member is
50 moved directly away from the strut engaging member without any relative bearing between them.

9. An automatic sprinkler having means for holding the sprinkler closed comprising formed
55 members with opposed surfaces connected by a thin film of solder; one of said members having its edge offset from the other member to provide a trough between the members at the edge of the solder film; and corroproof material extending
60 from said offset edge to the other member and overlying the edge of the solder.

10. An automatic sprinkler having means for holding the sprinkler closed comprising two
65 formed members so constructed and arranged as to define a relatively thin space between them; one of said members having its edge offset from the other member to provide an enlarged annular space at the edge of said relatively thin space; a film of solder filling said thin space and connect-
70 ing said members fusibly together; and corroproof material in said annular space, extending from said offset edge to the other member, and covering the edge of the solder.

11. An automatic sprinkler having a stem with
75 passage therethrough; a yoke; a valve for closing

said passage when seated; means interposed between said valve and said yoke for holding the valve seated comprising fusibly connected formed members located above and substantially over one side of the stem; one of said members having a
5 heat gathering portion extending above and across said stem to the other side thereof; the said members being so constructed and arranged that the fusibly connected members are heated directly by heat currents passing on one side of the stem and
10 heated indirectly by conduction through the said heat gathering portion by heat currents passing on the other side of the stem.

12. An automatic sprinkler having means for holding the sprinkler closed comprising formed
15 surfaces soldered together and located on one side of the sprinkler so as to be heated by rising heat currents, and a heat gatherer extending from said surfaces to the other side of the sprinkler so as to be heated by other rising heat
20 currents; said heat gatherer being capable of gathering heat from said other heat currents and effecting its conduction to the solder connection.

13. An automatic sprinkler having fixed means
25 and movable means for holding the sprinkler closed comprising opposed hemispherically-shaped surfaces fusibly connected together and capable of complete separation from the fixed means upon the giving way of the fusible con-
30 nection; the said means being so constructed and arranged that upon the said giving way of the fusible connection the said surfaces move directly apart with the space between them increasing continuously throughout the separating move-
35 ment.

14. An automatic sprinkler having a stem with
40 passage therethrough; a yoke; a valve for closing said passage when seated; and means interposed between said yoke and valve for holding the latter seated; said means comprising a strut member and a lever member engaging one end of the strut member and having connection with the strut member intermediate the ends of the
45 latter; said connection comprising formed surfaces fusibly connected together and located on one side of the strut member, and a heat gatherer extending from one of said surfaces to the opposite side of the strut member to gather heat that would otherwise not affect the fusible con-
50 nection and conduct said gathered heat to the fusible connection.

15. An automatic sprinkler having means for holding the sprinkler closed comprising opposed
55 formed surfaces capable of separation from the sprinkler, each said surface having an actual area greater than its area of projection; and a film of solder between said surfaces fusibly connecting them together; the said means being so constructed and arranged that upon the solder
60 fusing the surfaces move directly away from one another with increasing space between them throughout the extent of the solder film, and separate from the sprinkler.

16. An automatic sprinkler having opposed
65 formed surfaces joined together by a film of solder holding the sprinkler closed; said film having an exposed edge defining a plane and the said surfaces being so disposed that any plane passed through them, perpendicular to the plane de-
70 fined by the exposed edge, cuts the solder film along a continuous line whose length is greater than the line between the points on said edge at the intersection of said planes.

17. An automatic sprinkler having means for 75

holding the sprinkler closed comprising opposed formed surfaces soldered together by a film of material having an exposed edge; the said surfaces being so disposed that any plane passed through them, perpendicular to the plane defined by the exposed edge, cuts the solder film along a line whose length is greater than the line at the intersection of said planes; and the said means being so constructed and arranged that upon the fusing of said solder film the said surfaces move directly apart with the space between them increasing continuously throughout the separating movement.

18. An automatic sprinkler having means for holding the sprinkler closed comprising opposed formed surfaces soldered together by a film of material having an exposed edge; the said film and said edge being so disposed that the shortest distance between any two points on said edge along a line passing within said film is greater than the straight line distance between said points; and the said means being so constructed and arranged that upon the fusing of said solder film the said surfaces move directly apart with the space between them increasing continuously throughout the separating movement.

19. An automatic sprinkler having thermally responsive means for holding the sprinkler closed consisting of a formed film of solder joining opposed formed surfaces and having an exposed edge; the said edge defining a plane and the said surfaces being constructed and arranged so that any plane passed through them, perpendicular to the plane defined by said edge, cuts the solder film along a continuous line whose length is greater than the line between the points on said edge at the intersection of said planes.

20. An automatic sprinkler having means for holding the sprinkler closed comprising surfaces joined together by a solder film having an exposed edge which defines a plane; the said soldered surfaces being formed surfaces substantially throughout their entire extent and being constructed and arranged so that any plane passed through them, perpendicular to the plane defined by said exposed edge, cuts the solder film along a continuous line whose length is greater

than the line between the points on said edge at the intersection of said planes.

21. An automatic sprinkler having opposed formed surfaces joined together by a film of solder holding the sprinkler closed; said film having an exposed edge defining a plane and the said surfaces being so disposed that any plane passed through them, perpendicular to the plane defined by the exposed edge, cuts the solder film along a continuous line whose length is greater than the line at the intersection of said planes; the said means being so constructed and arranged that upon the fusing of said solder film the said surfaces move directly apart with the space between them increasing continuously throughout the separating movement.

22. An automatic sprinkler having thermally responsive means for holding the sprinkler closed consisting of a formed film of solder joining opposed formed surfaces and having an exposed edge; the said edge defining a plane and the said surfaces being constructed and arranged so that any plane passed through them, perpendicular to the plane defined by said edge, cuts the solder film along a continuous line whose length is greater than the line at the intersection of said planes; the said means being so constructed and arranged that upon the fusing of said solder film the said surfaces move directly apart with the space between them increasing continuously throughout the separating movement.

23. An automatic sprinkler having means for holding the sprinkler closed comprising surfaces joined together by a solder film having an exposed edge which defines a plane; the said soldered surfaces being formed surfaces substantially throughout their entire extent and being constructed and arranged so that any plane passed through them, perpendicular to the plane defined by said exposed edge, cuts the solder film along a continuous line whose length is greater than the line at the intersection of the plane; the said means being so constructed and arranged that upon the fusing of said solder film the said surfaces move directly apart with the space between them increasing continuously throughout the separating movement.

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