

Oct. 22, 1963

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3,107,732

CEILING-TYPE AUTOMATIC FIRE EXTINGUISHER

Filed April 3, 1961

2 Sheets-Sheet 1

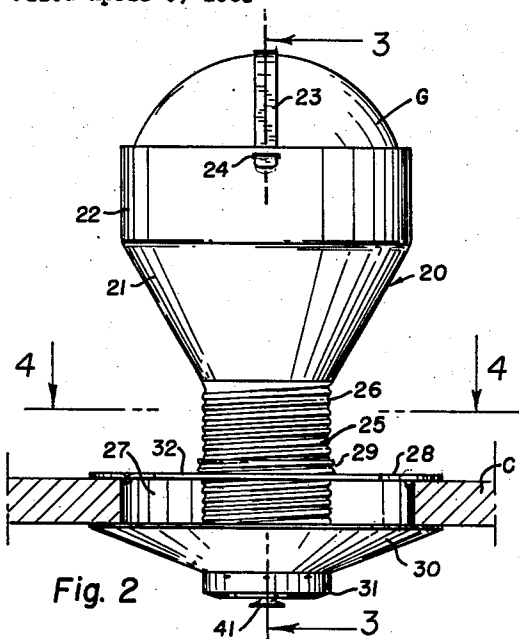


Fig. 2

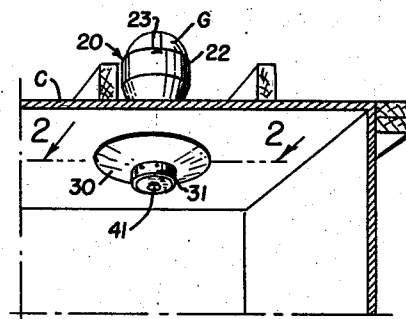


Fig. 1

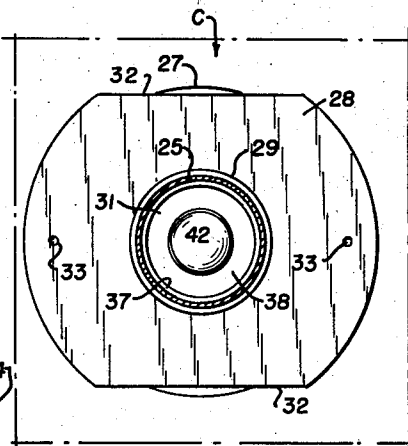


Fig. 4

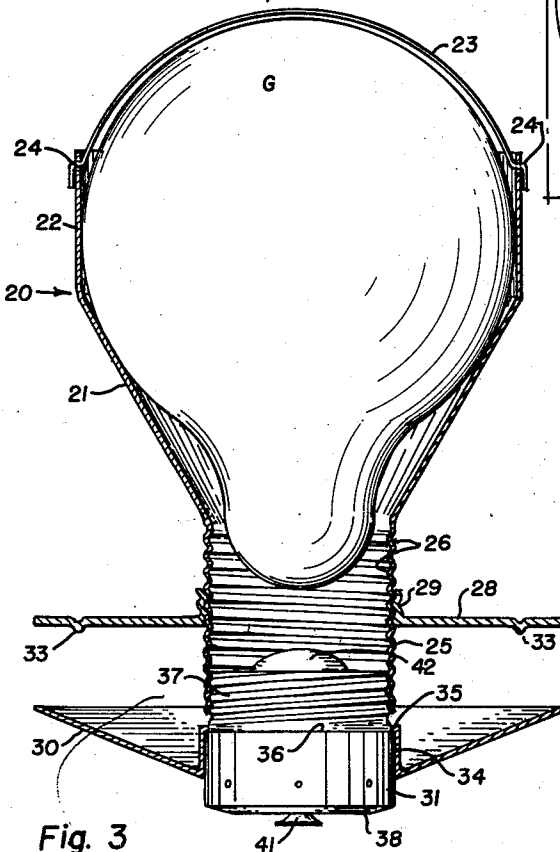


Fig. 3

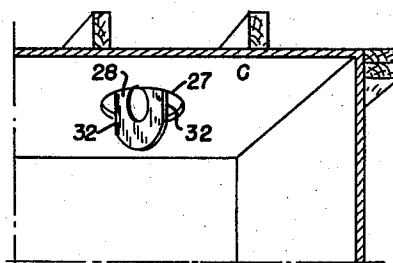


Fig. 5

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2 Sheets-Sheet 2

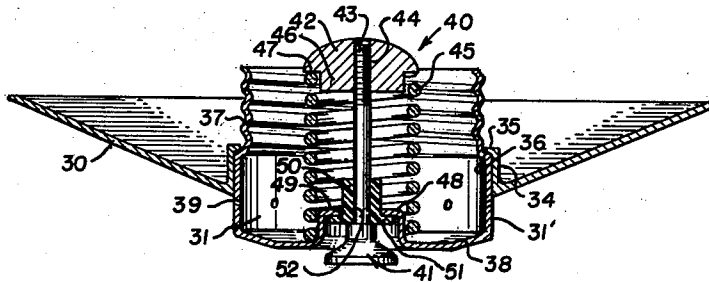


Fig. 6

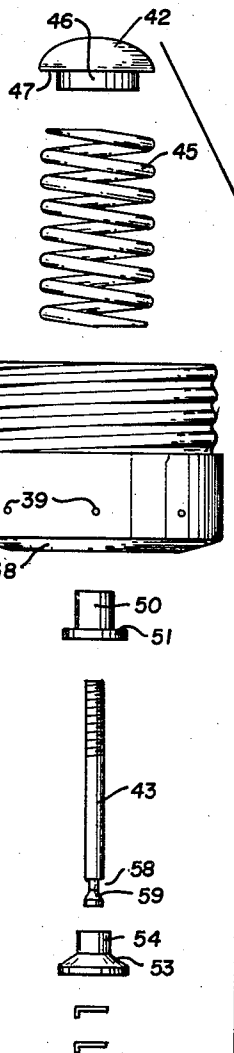
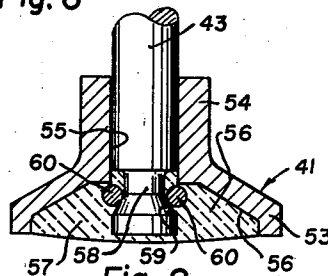


Fig. 8

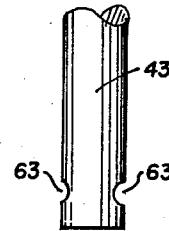


Fig. 11

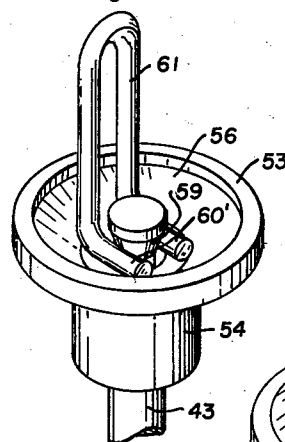


Fig. 9

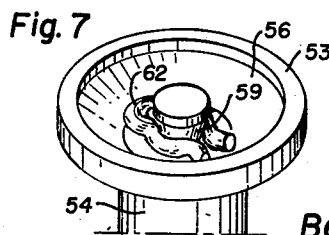


Fig. 12

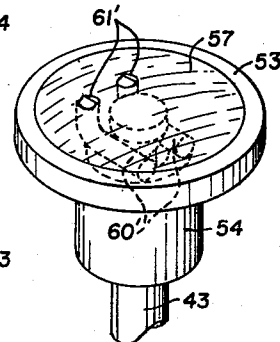


Fig. 10

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1

3,107,732

CEILING-TYPE AUTOMATIC FIRE EXTINGUISHER

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8 Claims. (Cl. 169-26)

This invention relates to automatic chemical fire extinguishers of the type which include a frangible grenade and a striker adapted to break and release the fluid contents of the grenade responsive to an abnormal temperature rise, and more particularly, to concealed and partially concealed grenade-type automatic fire extinguishers.

A primary object of the invention is to provide a novel and improved construction of a partially concealed grenade-type fire extinguisher which is especially adapted for installation at the ceiling of a room with only the base of the extinguisher being exposed below the ceiling surface and with the body thereof extending through the ceiling and being concealed thereby. As such, the invention will be hereinafter referred to as a ceiling-type automatic fire extinguisher, and sometimes simply as a fire extinguisher.

Another object of the invention is to provide a novel and improved ceiling type, automatic fire extinguisher which is adapted to be mounted in an opening in a ceiling to expose only a simple, neat-appearing base, a flat, compact nozzle and a thermosensitive fuse, with the base being held flush against the ceiling surface and with the nozzle and fuse depending from the base in a neat symmetrical manner and in a position for effective operation of the unit.

Another object of the invention is to provide a novel and improved fire extinguisher which is especially adapted to be quickly and easily mounted in a circular ceiling opening for a snug, tight fit thereto and to be quickly and easily dismounted therefrom as for inspection and replacement of parts.

Another object of the invention is to provide a novel and improved ceiling-type fire extinguisher which is especially easy to inspect, maintain and to recharge without the need of sending the unit to the factory, and which includes an interchangeable striker element to permit the use of a new, completely-reliable factory-set striker element in a recharged extinguisher.

Another object of the invention is to provide, in a grenade-type automatic fire extinguisher, a novel and improved nozzle unit which effectively combines the nozzle with a grenade-breaking striker, a thermosensitive fuse to release the striker and a spray nozzle into a compact, replaceable unit that may be set into the base of the extinguisher with only the nozzle and fuse being exposed.

Another object of the invention is to provide a novel and improved construction of a grenade-breaking means for an automatic fire extinguisher including a neat and compact arrangement of a spring-loaded grenade-breaking striker and a thermosensitive release fuse which are especially adapted to be mounted in a fire extinguisher as a compact, factory-set unit.

Another important object of the invention is to provide a novel and improved construction of a thermosensitive fuse for the release of a spring-loaded striker for an automatic fire extinguisher and for any like spring-loaded release device that will release by the melting of a low-melting-point metal whenever the temperature at the fuse rises to the metal's melting point, which is simple in form, positive in its action and will not release prematurely as where the metal is weakened by continued warming to temperatures which are less than the critical melting point temperature.

2

Another object of the invention is to provide a novel and improved thermosensitive release fuse for a spring-loaded striker and like release devices which are released by the melting of a low-melting-point alloy, and which is held against the pull of a release shaft by a positive locking means, and which thereby permits the use of various types of low-melting-point alloys that will melt at various selected temperatures but which, in many instances are notably deficient in strength and are not suitable in conventional thermo-release devices.

Yet other objects of the invention are to provide a novel and improved ceiling-type automatic fire extinguisher and improved components therein which are versatile, simple, neat, inexpensive, reliable, easily installed and easily maintained units.

With the foregoing and other objects in view, all of which more fully hereinafter appear, my invention comprises certain novel constructions, combinations and arrangements of parts and elements, as hereinafter described, defined in the appended claims and illustrated in preferred embodiment in the accompanying drawing, in which:

FIGURE 1 is a fragmentary, sectional, perspective view of a corner of a room, and the attic space above, illustrating my improved automatic fire extinguisher as being properly mounted in the ceiling of the room.

FIGURE 2 is a fragmentary sectional portion of the ceiling as viewed from the indicated line 2-2 at FIG. 1 but on an enlarged scale and illustrating the fire extinguisher as a side elevational view.

FIGURE 3 is an elevational view of the fire extinguisher per se, on a further enlarged scale with portions thereof being in section and as viewed from the indicated line 3-3 at FIG. 2 to better illustrate other portions at the interior of the unit.

FIGURE 4 is a sectional plan view of portions of the fire extinguisher and a fragment of the ceiling, as illustrated from the indicated line 4-4 at FIG. 2.

FIGURE 5 is a fragmentary view of a room, similar to FIG. 1, but illustrating the ceiling as being prepared for the installation of the fire extinguisher by cutting a sized hole therein and the manner of inserting certain elements through this opening to lock the extinguisher in place.

FIGURE 6 is a sectional elevational view of the exposed base and nozzle-carrying-striker per se, as taken from the indicated line 6-6 at FIG. 3 but on a further enlarged scale.

FIGURE 7 is an elevational exploded view of the nozzle and striker elements therein.

FIGURE 8 is a fragmentary sectional view, as taken from the indicated line 8-8 at FIG. 6, but on a further enlarged scale, to illustrate the construction of the fuse of the striker mechanism.

FIGURE 9 is a perspective view of the elements illustrated at FIG. 8, in an inverted position and in an intermediate phase of their assembly to depict a preferred method of preparing this fuse.

FIGURE 10 is a perspective view similar to FIG. 9 but illustrating the completed fuse and with broken lines indicating the positioning of parts otherwise hidden from view.

FIGURE 11 is a fragmentary view of a modified form of one of the elements illustrated at FIG. 8.

FIGURE 12 is a perspective view, similar to FIG. 9 but illustrating another modification of the fuse construction.

The continued use and demand for chemical fire extinguishers which are commonly known as glass grenades has well established the value of such extinguishers, and over a number of years there have been continuing improvements to the same. Such improvements relate both to the development of non-toxic and highly effective fire

extinguishing fluids and to the improvement of containers for these grenades. One class of such containers include strikers which break the grenades responsive to an abnormal temperature rise and are thus called automatic fire extinguishers. As the worth of such automatic fire extinguishers has been repeatedly demonstrated, the scope of their use has been constantly increased. At many installations the appearance of an exposed fire extinguisher would be undesirable. This has led to several designs of concealed ceiling types of automatic fire extinguishers.

The present invention is a ceiling-type automatic fire extinguisher which is designed for neatness of appearance and ease of installation and maintenance. The outstanding features include a replaceable nozzle construction adapted to spray fluid in a uniformly dispersed manner below the fire extinguisher and striker mechanism within the nozzle having a simplified thermo-sensitive fuse, all as hereinafter described in detail.

Referring more particularly to the drawing, the improved extinguisher is formed as a funnel-shaped body 20 having its upper portion adapted to hold an ordinary pear-shaped glass grenade G which may be filled with such as carbon tetrachloride or preferably, some other type of equivalent commercial fluids one type being commonly sold under the trademark VAPYR-X. The upper portion of the body includes a conical, upwardly-diverging wall 21 capped by a cylindrical rim 22 which is sized to receive the grenade G. The grenade is held in position within this container by a strap 23 which extends over the grenade and is locked into diametrically opposing slots 24 adjacent to the upper edge of the cylindrical rim 22. It is contemplated the grenade need not fit into this cavity tightly and in fact it is desirable that this fit be somewhat sloppy to permit air from above the container to flow past the wall 21 and the side of the grenade to the lower portion thereof to avoid a vacuum action when fluid is flowing from the extinguisher, as hereinafter described. Flanges or corrugations, not shown, may be formed along the walls of the container to facilitate such air movement if desired.

The lower portion of this body 20 is formed as a threaded, axially-centered spout 25 which is of sufficient length to extend through an opening in a ceiling C and to be mounted therein by connectors as hereinafter set forth. This container is preferably formed by a spinning operation and with the threads 26 on the spout being rolled as a phase of the spinning operation. When so formed, the threads 26 will be both at the inside and outside of the spout as clearly illustrated at FIG. 3.

This body 20 will be normally placed above the ceiling of a room through a circular opening 27 and in the attic as shown or in the joist space between a ceiling-floor construction and the size of the grenade and its container will be such that it will fit in an ordinary joist space as where standard 2" x 8" joists are used. The spout 25, however, extends downwardly through the opening 27 in the ceiling C to a point where its lower edge will be approximately at the bottom surface of the ceiling. The unit is held in position by a circular flange 28 having a threaded inner rim 29 which meshes in the threads 26 of the spout 25. When turned down upon the spout, the flange rests upon the upper surface of the ceiling.

The spout 25 is also secured in position by a conical base 30 which carries a cylindrical, threaded nozzle 31, hereinafter further described, which is turned upon the lower reach of the threaded spout to pull the base 30 and flange 28 together upon the spout and to tightly grip the ceiling C as clearly illustrated at FIG. 2.

To effect such installation, it is contemplated that a ceiling opening 27 will be a clean-bored hole having a diameter sufficient to permit the body 20 and a grenade C mounted therein to pass upwardly therethrough. However, the opening 27 must have a diameter less than the diameter of the upper holding flange and base. To permit the holding flange 28 to be passed through this circular ceiling opening it is narrowed by a pair of diametrically-

opposing flat edges 32 to provide a narrowed side. This is illustrated at FIG. 4 and the manner of passing the flange through the opening 27 is clearly illustrated at FIG. 5. When the body and flange are individually passed through the opening, the flange may then be screwed upon the spout 25 and then the assembly can be positioned over the opening. Suitable diametrically-opposed indentations 33 in the flange 28 may be used to facilitate proper positioning of the flange. When thus positioned, with the lower rim of the spout at the proper level with respect to the ceiling, the base 30 and the nozzle 31 may then be affixed to the spout.

To provide for a neat appearance of the unit on the ceiling and for other structural considerations, the base 30 is formed as a comparatively flat inverted cone with the diameter at its outer periphery being sufficient to bear against the ceiling C and cover the opening 27. The nozzle 31 is mounted in an axially centered sleeve opening 34 at the inverted apex of the base. The sleeve-formed opening 34 terminates within the base portion as an inwardly turned rim 35 and the nozzle 31 includes a mating shoulder 36 near its midpoint which is adapted to seat against the rim 35. The portion of the nozzle 31 above the shoulder 36 is formed as an upstanding-reduced-diameter threaded stub 37 which is adapted to bypass the rim 35 and to be turned into the spout 25. When the body is properly positioned at the ceiling with the spout 25 properly centered, the nozzle 31 may be placed within the central sleeve 34 of the base and turned into the threaded spout 25 to move the nozzle upwardly into the sleeve 34. This turning will continue until the shoulder 36 of the head bears against the rim 35 of the nozzle and until the nozzle 31 pushes the base against the ceiling to tighten the unit into position.

The nozzle 31 is a hollow, cup-shaped, cylindrical unit having the shoulders 36 at its midpoint and the threaded stub 37 upstanding therefrom, as described. It is also formed with a floor 38 at its base. It follows that the spout 25 of the body when coupled with the nozzle 31 forms a continuous downward passage which terminates at the floor 38. The nozzle 31 is proportioned so that the lower end adjacent to the floor depends a short distance below the lower apex edge of the base 30 as a narrow, cylindrical, exposed ring portion 31'. In this exposed portion 31' there is provided an array of nozzle orifices 39 for releasing fluid which will flow from a broken grenade. These orifices may be arranged in any desired pattern and may be located in the floor 38 as well as in the wall 31'. In the construction illustrated, the orifices 39 are directed upwardly somewhat to form a fluid jet trajectory in an upward and outward manner to obtain a maximum coverage of the area below this nozzle head.

This nozzle 31 is conveniently exposed for easy removal and its cup-shaped form provides an ideal container for a spring-loaded striker 40 for breaking the grenade G. Also, a thermo-sensitive fuse 41 may be conveniently and effectively located below the exposed base of the nozzle.

The striker 40 when positioned in the head 31 must move upwardly against the frangible grenade carried in the body 20 thereabove. It includes a hardened metallic head 42 which has sufficient weight and inertia to easily break the grenade when it is impelled against the grenade.

This head 42 is held on an axially centered shaft 43 threaded into an axially-centered tapped hole 44 in the head 42. The shaft 43 normally extends downwardly and through the nozzle floor 38 for connection with the fuse 41 as hereinafter described. A coiled spring 45 is compressively tensed between the head 42 and the floor 38. It is held in position on the head 42 by a centered stub 46 at the underside of the head which forms a shoulder 47 against which the spring bears. Also, it is held in position by a centered, upstanding boss 48 at the floor 38 which embraces the lower portion of the spring. It follows that whenever the shaft 43 is released to permit the head to move upwardly under the pres-

5

sure of the spring, the acceleration is intense and by the time it has moved a distance sufficient to strike the grenade, breakage of the grenade is assured.

The shaft 43 extends downwardly through an orifice 49 at the center of the boss 48 in the floor 38. This orifice 49 is large enough to receive a hard plastic washer 50 which is in the general form of an inverted cylindrical T with an annular flange 50 of the T fitting into a bearing against the undersurface of the inverted cup-formed boss 48. The cylindrical leg of the T includes a passageway 52 through it through which the shaft 43 slideably extends. It is contemplated that this washer 50 will fit tightly in the orifice 49 and that the diameter of the passageway 52 is such that there will not be an unreasonably large flow of fluid downwardly therethrough should the shaft pass from this passageway by action of the spring 45 moving the head upwardly to the grenade. However, if such leakage is not desired a simple closure means can be provided or the length of the washer may be such as to retain the shaft 43 within its central passageway 52 even after the head 42 has moved upwardly and broken the grenade.

The shaft is held in position by an improved thermosensitive fuse 41, which is in a general form suggestive of a collar button having a button-shaped body 53 carried below an axially centered stem 54. A passageway 55 extends through the stem and body to receive and hold the end of the shaft 43, and when properly positioned the end of the stem 54 bears against the underside of the T flange 51 of the washer 50 as illustrated at FIG. 6. The fuse thus holds the shaft and the striker means in position for ultimate operation with the spring 45 being tightly compressed between the floors 38 and the striker 42.

The body 53 of the fuse 41 flares outwardly from the stem 54 and is located a short distance below the floor 38 of the nozzle at a convenient position to sense air temperatures and even receive effects of heat radiation. The body 53 thus presents an inverted cup form, and a cavity 56 is located at its underside. This cavity is filled with a low-melting-point metal 57, which may be a suitable alloy of bismuth such, for example, as Rose's metal, which includes 50 percent bismuth, 28.10 percent lead and 21.90 percent tin, and which melts at 203 degrees F. to normally hold the end of the shaft 43 in place but to release when abnormal temperatures melt the metal. Any metal which would effectively solder to the shaft 43 would hold it in place under moderate tension and the pull on the shaft, imposed by the compression of spring 45 could be held by a low-melting-point metal. However, it was discovered that any pull for a substantial period of time could cause the metal to release. This led to the development of an improved holding means in the fuse 41 as now described.

This holding means includes an annular groove 58 near the end of the shaft 43 having the side 59 adjacent to the end of the shaft inclined at an angle sufficient to create an outward thrust against any element lying in the groove and abutting against the inclined surface 59, whenever the shaft is pulled in an axial direction as by the action of the spring 45. Suitable abutting elements are formed as a pair of short pins 60 which are sized to lie in the inverted cavity 56 and to extend into the annular groove 58 at opposing diametrical positions. When these pins are restrained laterally, they lock the shaft in place. They are easily held in position by the low-melting-point metal 57, which, when frozen, effectively prevents them from moving laterally, as from the position illustrated at FIG. 8. Thus, the pins 60 lock and hold the end of the shaft 43 in place without imposing any shear or tension on the low-melting-point metal 57. However, when the metal 57 is melted, as from an abnormal temperature rise in the surrounding environment, the pins 60 are no longer restrained and will move laterally to release the shaft. The inclined

6

side 59 will assure this action. Another advantage of the simple cup form of the button body 53 is that the low temperature point metal is effectively contained within the cavity 56 with only the lower surface being exposed.

FIGURES 9 and 10 illustrate a simplified and highly effective manner of forming the locking pins 60 to hold the shaft 43 in place in the cavity 56. A wire 61 is formed as a U-shaped member having the ends 60' thereof turned at an angle to ultimately form the pins. This U-shaped member may be formed as a tweezer-like unit and act to spring the ends 60' together. Thus, to form the connection of the shaft 43 and fuse body 53, the elements are inverted, the ends 60' are set into the cavity 56 to pinch the shaft 43 at the groove 58, as clearly illustrated at FIG. 9. The next step is to fill the cavity 56 with the low temperature-melting-point metal 57. Once the metal 57 is frozen the extended loop of the wire 61 may be cut off at 61' adjacent to the surface of the metal 57, as illustrated at FIG. 10, to form the individual pins 60' which will hold the shaft in place.

Another variation which may be used in this construction is illustrated at FIG. 12 where, in lieu of the pins above described, a simple spring type shaft key 62 may be placed at the groove 58 of the shaft with the sides of the key abutting against the base of the cavity. Such a key will easily spring apart whenever there is a tension upon the shaft because of the inclination of the side 59 of the shaft groove. However, this key 62 will remain tightly in position whenever the pocket of the button is filled with the low temperature metal 57.

FIGURE 11 illustrates a variation of the construction of the shaft 43 where notches 63 are cut in the shaft instead of an annular groove heretofore described. The pins 60 or 60' are set in these notches and the final result is the same. This construction is slightly more expensive but the strength of the shaft is increased since the groove 58 is the weakest point.

I have now described my invention in considerable detail and it is obvious that others skilled in the art can devise alternate and equivalent constructions which are nevertheless within the spirit and scope of my invention. Hence, I desire that my protection be limited not by the construction illustrated and described herein but only by the proper scope of the appended claims.

I claim:

1. A ceiling-type automatic fire extinguisher adapted to contain a frangible, fluid-containing grenade and to be mounted in an opening in a ceiling comprising, in combination:

- (a) a funnel-like grenade-containing body having a downward spout,
- (b) means at the spout adapted to hold the body above the ceiling opening with the spout bottom being substantially at the ceiling opening, including a washer-shaped flange about the spout adapted to rest upon the upper surface of the ceiling about the opening,
- (c) a cup-like nozzle having an array of orifices about its base affixed to the bottom of the spout,
- (d) a normally tensed striker means within the nozzle adapted to be released and to be projected upwardly and through the spout to strike and break a grenade within the body, and,
- (e) a releasing means adapted to release said striker means having a thermally sensitive releasing fuse below the nozzle adapted to release whenever said fuse is heated to a selected temperature.

2. In the extinguisher defined in claim 1, said spout being threaded and said flange having internal threads adapted to be turned upon the spout and to rest upon the upper surface of the ceiling about the opening.

3. In the extinguisher defined in claim 1, said spout being threaded and including a washer-shaped flange having internal threads adapted to be turned upon the spout and to rest upon the upper surface of the ceiling about the opening and said holding means including

further a washer-shaped base having an opening through which the bottom of the nozzle extends and being adapted to be affixed to the bottom of the spout to bear against the under surface of the ceiling about the opening.

4. A ceiling-type automatic fire extinguisher adapted to contain a frangible, fluid-containing grenade and to be mounted in an opening in a ceiling, comprising, in combination:

- (a) a funnel-like grenade-containing body having an open internally and externally threaded spout,
- (b) a washer-shaped flange having internal threads adapted to be turned upon the external threads of the spout and to rest upon the upper surface of the ceiling about the opening,
- (c) a cup-like nozzle having external threads at its upper wall portion adapted to be turned into the internal threads of the spout and having further, an array of orifices about its base adjacent to the floor portion thereof and a shoulder at an intermediate portion at the base of the threads,
- (d) a second flange having a central opening through which the threaded portion of nozzle extends with the flange being adapted to rest upon the shoulder of the nozzle whereby said second flange is adapted to bear against the undersurface of the ceiling when the nozzle is turned into the threads of the spout,
- (e) a spring-loaded striker means within the nozzle adapted to be normally tensed at the base of the nozzle and to be released and, to be projected upwardly and through the spout to strike and break a grenade within the body, and,
- (f) a releasing means adapted to release said striker means having a thermally sensitive releasing fuse below the nozzle adapted to release whenever said fuse is heated to a selected temperature.

5. In the extinguisher defined in claim 4, said flange being proportioned to have a first dimension greater than the width of the opening whereby to permit the flange

to be passed through the ceiling opening and to subsequently rest upon the ceiling about the opening.

6. In the organization set forth in claim 4, wherein the spout is formed of comparatively thin sheet material and the internal and external threads are of identical pitch and direction and are formed by deformations of the sheet material with a deformation forming the valley of an external thread simultaneously forming the peak of an internal thread and the deformation forming the peak of an external thread simultaneously forming the valley of an internal thread.

7. In the extinguisher defined in claim 4, wherein the nozzle includes a central orifice through its base, wherein the striker means includes a shaft extending through the orifice when the striker means is tensed and wherein the releasing means includes a short tubular stem adapted to abut against the underside of the nozzle floor with the shaft extending therethrough, a button-like head at the lower extended end of the stem having a normally inverted cavity at its exposed under end into which the end of the shaft extends, and said thermally sensitive fuse includes a low-temperature alloy in the cavity soldering the shaft in position.

8. In the extinguisher defined in claim 7, wherein said end of the shaft includes side notches and pins adapted to bear against the said notches and against the top of said inverted cavity and are held in position by said low-temperature alloy.

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