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Magdars

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[54] **FIRE EXTINGUISHING SYSTEM**

[75] Inventor: **John T. Magdars**, Northbrook, Ill.

[73] Assignee: **General Fire Extinguisher Corporation**, Northbrook, Ill.

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[52] **U.S. Cl.**..... **169/2 A**, 169/19, 169/26, 169/42, 123/198 D

[51] **Int. Cl.**..... **A62c 3/10**, A62c 13/40, A62c 35/12

[58] **Field of Search**..... 169/2 R, 2 A, 3, 169/9, 19, 26, 42; 123/198 D

[56] **References Cited**

UNITED STATES PATENTS

1,263,291	4/1918	Schultz	169/9
3,316,974	5/1967	Cholin	169/26
1,879,509	9/1932	Rockwood	169/42
1,604,380	10/1926	Boyce	169/2 A
3,387,662	6/1968	Molgano	169/2 A

FOREIGN PATENTS OR APPLICATIONS

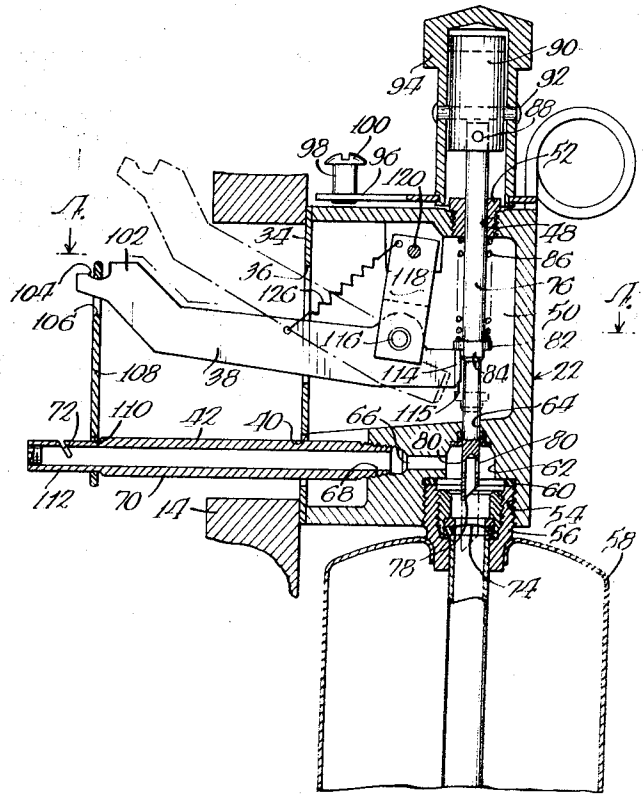
371,388	4/1932	Great Britain	169/2 A
391,164	4/1933	Great Britain	169/2 A
422,557	1/1935	Great Britain	169/2 A
447,621	5/1936	Great Britain	169/2 A

Primary Examiner—Robert S. Ward, Jr.
Attorney—Axel A. Hofgren et al.

[57] **ABSTRACT**

A fire extinguisher particularly suited for use in conjunction with the engine compartments of boats or the like which is operable automatically in response to the detection of a fire or which may be manually operated from a remote location. The extinguisher includes a container for a fire extinguishing material which may be mounted by means of a housing on the exterior wall of an engine compartment or the like and includes a nozzle extending through an opening into the compartment. A piercing type actuator is normally held in a position away from a diaphragm sealing the container by a lever extending through the opening into the engine compartment which, in turn, is held in place by a fusible link extending between the lever and the nozzle. The invention also contemplates the provision of a unique cocking mechanism for the actuator.

10 Claims, 5 Drawing Figures



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2 Sheets-Sheet 1

Fig. 1.

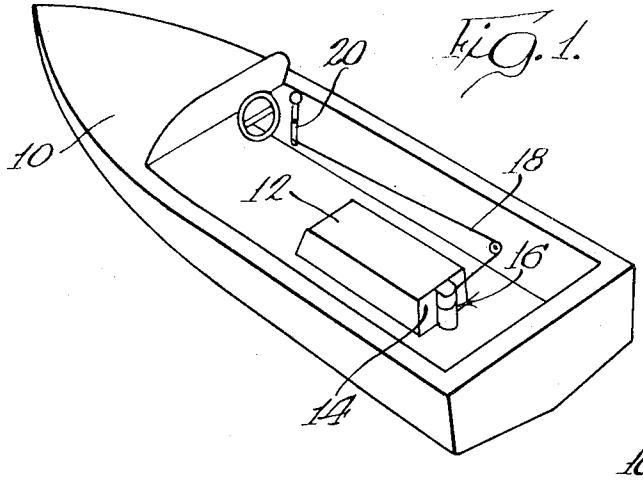

Fig. 2.

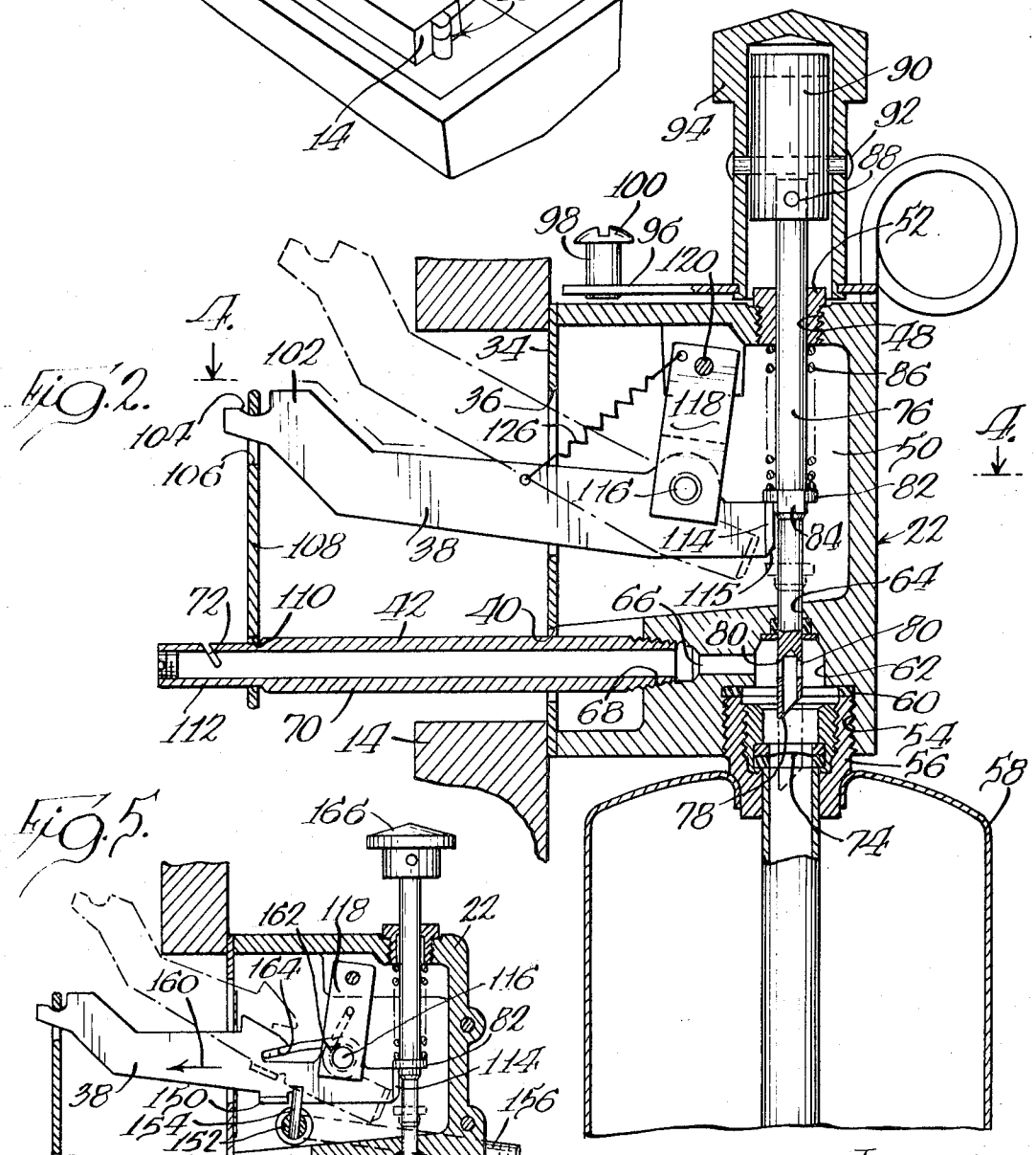

Fig. 5.

Inventor:
John T. Magdaro
By Hofgren, Wegner,
Allen, Stellman & McCord
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Fig. 3.

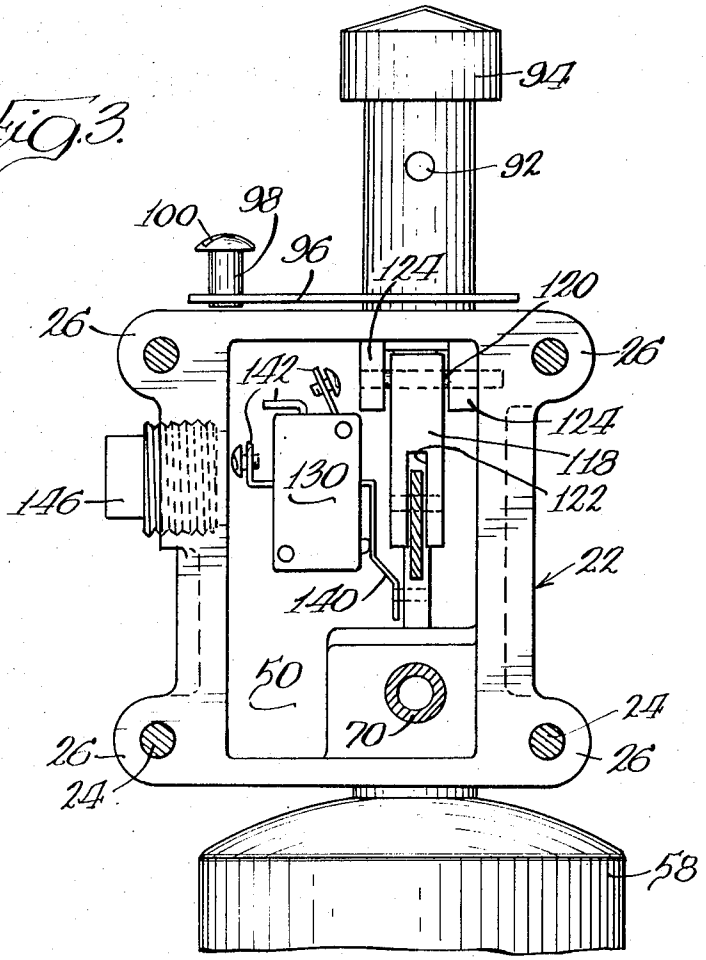
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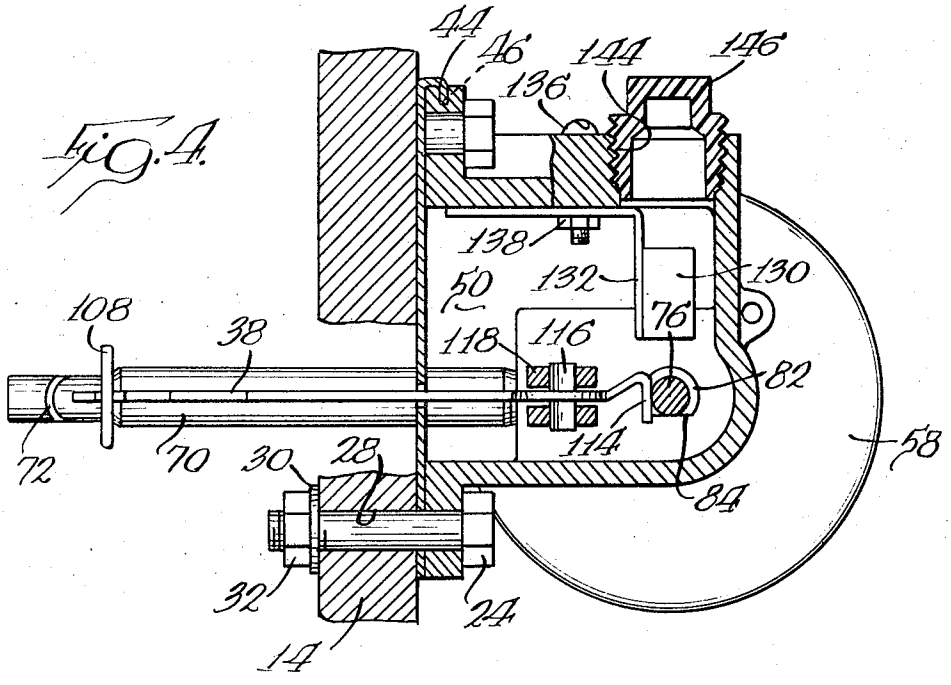
Fig. 4.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FIRE EXTINGUISHING SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to fire extinguishing systems, and more particularly, fire extinguishing systems of relatively small size and including fire detecting means for actuating the system.

Increasingly, there has been a need for automatically operable fire extinguishing systems of relatively small size which may be economically employed in a variety of different settings. For example, there are numerable instances where a structure includes a potential fire hazard and the hazard is separated from the remainder of the structure as by a partition or the like. Typical of such a structure is a power operated boat where the engine therefor is wholly contained within an engine compartment and can be a potential fire hazard.

There have been a number of systems proposed to meet the need but in general the same have failed to provide devices that are easily maintained and which are not subject to various problems attendant the use of such systems in particular environments.

For example, where the particular type of fire hazard involved requires the use of halogenated extinguishing agent systems, dry chemical systems or carbon dioxide systems, various extinguishers quite frequently employ valves in the form of rupturable diaphragms which are pierced by a preloaded actuator. Of course, in the process of rearming such a system, it is necessary to recock the actuator and where a container for the fire extinguishing material is mounted on a side of a partition remote from the hazard, hazard. recocking may be extremely difficult particularly when a fusible element is employed as a fire detecting device and must be located on the fire hazard side of the partition. Often rearming such systems requires two persons, one for holding the actuator in a cocked position while the other replaces the fusible element.

Similarly, many such systems are not designed to protect the actuating elements of the system from environmental deterioration as, for example, salt spray in a marine system.

SUMMARY OF THE INVENTION

It is the principal object of the invention to provide a new and improved fire extinguishing system. More particularly, it is an object of the invention to provide a new and improved fire extinguishing system for use in situations requiring relatively small fire extinguishing capacities and which may be operated either automatically in response to the detection of a fire or manually, which is protected from environmental deterioration and which may be easily armed by a single person.

The exemplary embodiment of the invention achieves the foregoing objects by means of a combination housing which is adapted to be secured to a partition separating a potential fire hazard from the remainder of a structure over an opening in the partition. The housing contains a spring loaded piercing type actuator for piercing a diaphragm sealing a container receiving a fire extinguishing material to release the contents of the same. The housing includes a threaded bore adapted to removably receive a threaded end on such a container and bores in fluid communication with an outlet from the housing which, in turn, receives an elongated, rigid nozzle which extends through the opening in the partition to the fire hazard side thereof.

The piercing type actuator includes a peripheral collar having a flat on one side thereof which may be engaged by a latching lever pivotally mounted to a pivotally mounted link within the housing bracket itself. The latching lever includes an elongated end extending through the opening in the partition to receive one end of a fusible link which, in turn, may be connected at its other end to the nozzle.

The end of the latching lever within the bracket housing is adapted to engage the collar on the piercing type actuator and hold the latter in a position away from the diaphragm of the container, and further includes, on one surface thereof, a cam surface whereby the actuator may be cocked after a link is installed by reason of the collar camming the latching lever about the pivot axis of the connection of the link to the housing. A spring interconnecting the latching lever and the link urges the latching end of the latching lever back into position underlying the collar to hold the same in a cocked position.

Means are also provided whereby a remote manual operation can be caused to rotate the piercing type actuator about its longitudinal axis so that the flat on the collar is brought into alignment with the latching lever to permit escapement of the piercing type actuator for manual operation. Finally, the housing is provided with an electrical switch responsive to downward movement of the collar and the switch may be employed in conjunction with an electrical alarm system, or alternately, be used to break an ignition circuit for an engine, upon the detecting of a fire.

Other objects and advantages will become apparent from the following specification taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a structure, in particular, a power boat, with which the invention is ideally suited for use;

FIG. 2 is a vertical section of a fire extinguishing system made according to the invention;

FIG. 3 is a side elevation of the fire extinguishing system;

FIG. 4 is a horizontal section of the fire extinguishing system taken approximately along the line 4—4 of FIG. 2; and

FIG. 5 is a vertical section of a portion of a modified system made according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As mentioned previously, one ideal use for a fire extinguishing system made according to the invention is in conjunction with a power boat including an engine compartment and FIG. 1 illustrates, in somewhat schematic form, an exemplary embodiment of the invention in such an environment. Specifically, a power boat **10** includes an engine compartment **12** housing an internal combustion engine (not shown) which constitutes a potential fire hazard. Mounted on the rear wall **14** of the engine compartment **12** is a fire extinguisher, generally designated **16**, made according to the invention. A control cable **18** extends therefrom to a control lever **20** secured to the hull of the boat **10** in a position adjacent the normal position of the operator of the boat. As will be seen, the fire extinguisher **16** is provided with means for detecting a fire within the engine compartment **12**

and for automatically initiating its operation to extinguish such a fire. In addition, if the operator of the boat **10** senses such a fire before the same is automatically detected, he may actuate the control lever **20** to manually initiate operation of the extinguisher **16.**

Turning now to FIGS. **2–4** inclusive, the fire extinguisher **16** will be described in greater detail. Specifically, the same includes a housing, generally designated **22,** secured to the rear partition **14** of the engine compartment by means of bolts **24** extending through apertured lugs **26** located about the periphery of the housing **22** and through bores **28** in the partition **14** to receive lock washers **30** and retaining nuts **32.**

The housing **22** includes a surface defined by a separate gross sealing plate **34** which includes bores not shown for the bolts **24,** an aperture **36** through which a latching lever **38** may pass and an aperture **40** through which a rigid nozzle **42** may pass into the interior of the engine compartment **12.**

The gross sealing plate **34** may be secured to the body of the housing **22** by folded over reentrant portions **44** (FIG. **4**) overlying peripheral flanges **46** on opposite sides of the housing bracket **22** and is effective to substantially seal the interior of the housing **22** from the environment.

The upper side of the housing **22** includes a tapped bore **48** entering into a cavity **50** and which receives a bushing **52** forming a plastic or the like. In alignment with the tapped bore **48** but on the underside of the housing **22** is a somewhat larger tapped bore **54** which may threadedly receive the threaded neck **56** of a container **58** which, in turn, may contain any suitable fire extinguisher material such as a halogenated extinguishing agent, a dry chemical or carbon dioxide. A seal **60** is interposed between the upper end of the threaded neck **58** and the end of the bore **54.**

The upper end of the bore **54** is in fluid communication with a passage **62** which, in turn, at its upper end, terminates in a relatively small bore **64** extending upwardly into the cavity **50.** The passage **62** includes a radial offshoot passage **66** directed toward the gross sealing plate **34** and in substantial alignment with the opening **40** therein. The end of the passage **66** is tapped as at **68** for receiving the threaded end of an elongated, rigid nozzle **70** having a discharge opening in the form of an upwardly directed slit **72** at its end remote from the threaded end **68** which extends beyond the partition **14** into the engine compartment.

The particular type of nozzle shown, i.e., the upwardly directed slit **72,** is particularly suited for use with halogenated extinguishing agents in that same directs the extinguishing agent upwardly toward the top of the engine compartment **12** whereby the entire contents of the compartment would be blanketed to extinguish any fire therein. The invention contemplates, however, that other types of nozzles may be used depending upon the type of fire hazards to be protected against, the surrounding environment of use of the system, and the type of extinguishing agent emloyed.

Returning to the container **58,** the same is of the type which includes a pierceable diaphragm **74** in its neck, which, when pierced, permit the contents of the container **58** to pass upwardly through the neck **56** to the passage **62,** the passage **66** and out the nozzle **72.** Motivating pressure for the extinguishing material may be provided by the material itself or by a pressurized gas cartridge as is well known.

To provide for the piercing of the diaphragm **74,** an elongated piercing element **76** is reciprocably received in the bushing **52** and the bore **64** and at its lower end includes a hollow piercing point **78** and a pair of radial apertures **80** extending outwardly from its hollow center. The piercing element **76** and the diaphragm **74** constitute a preloaded valve means for controlling the flow of an extinguishing agent.

Intermediate the ends of the piercing element **76** is a collar **82** defining a latching portion and having a flat **84** on one side thereof. Interposed between the upper side of the collar **82** and the underside of the bushing **52** to bias the piercing element **76** downwardly toward the diaphragm **74** is a coil spring **86** of sufficient strength to cause the piercing element **76** to pass through the diaphragm **74** when the former is released by a latch means to be described in greater detail hereinafter.

The upper end of the piercing element **78** extends out of the housing **22** to be secured to an enlarged element **88** having an elongated, vertically arranged slot **90** therein. Passing through the slot **90** is a rivet **92** or the like, which in turn, is secured to a combination cover and recocking knob **94.** By pulling upwardly on the knob **94,** piercing element **76** may be raised against the bias of the spring **86** after the system has been discharged for recocking purposes as will be described.

Secured to the skirt of the knob **94** is a lever arm **96** mounting in one end, a securing collar **98** including a securing screw **100.** The collar **98** may receive an end of the control cable **18** such that when the operable control lever **20** is pivoted, the lever arm **96,** along with the knob **94** and the piercing element **76** as well, is rotated approximately 90°. The purpose of this construction is to permit manual actuation of the system as will be described in greater detail hereinafter.

Returning to the latching lever **38,** the same includes an end **102** having a notch **104** for penetration through an aperture **106** in a conventional fusible link **108.** The end of the link **108** opposite the aperture **106** includes an aperture **110** through which a reduced end portion **112** of the nozzle **70** may pass. The other end of the latching member **38** includes a transverse latch **114** that is adapted to underlie the collar **84** to block movement of the piercing element **76.** The latch **114** includes a chamfered undersurface **115.**

The latching lever **38** is pivotally connected by a pivot pin **116** to the lower end of a link **118** which has its upper end pivotally connected to the bracket housing **22** by a pivot pin **120.** As is best seen in FIG. **3,** the lower end of the link **118** is bifurcated as at **122** to receive the latching lever **38** while the pivot pin **120** is received in two lugs **124** projecting into the cavity **50** and formed integrally with the housing **22.** In addition, a spring **126** interconnects the upper end of the link **118** and the approximate midpoint of the latching lever **38** in such a way as to bias the latching lever **38** in a clockwise direction about the pivotal axis of pinot pin **116** while the pivot pin **116** is dispaced from a vertical plane passing through pivot pin **120** in a direction away from the collar **82.**

With reference now to FIGS. **3** and **4,** it will be seen that the housing **22** includes a microswitch **133** mounted on an L-shaped bracket **132** within the cavity **50.** The L-shaped bracket **132** is secured to a side wall of the cavity **50** by a screw **136** and associated nut **138.** As best seen in FIG. **3,** the microswitch **130** includes an

actuator 140 that is positioned sufficiently close to piercing element 76 such that downward movement of the same will cause the collar 82 to engage the actuator 140 and change the electrical condition of the microswitch 130. Conventional terminals 142 on the microswitch 130 are adjacent a threaded bore 144 in the side of the bracket housing which is closed by the plastic plug 146 or the like. The plug 146 may be removed to attain access to the terminals 142 and may be replaced with a suitable wire clamp preferably of a waterproof type, so that electrical conductors connected to the terminals 142 may be passed to an electrical system for purposes to be described hereinafter.

The operation of the system is as follows. Initially, the apparatus will be in the condition illustrated in solid lines in FIG. 2 with the fusible link 108 being located on one side of a partition adjacent a potential fire hazard and the remainder of the system (except for the nozzle 70 and the portion of latching lever 38) on the opposite side of the system. Should the temperature rise sufficiently to cause fusing of the fusible link 108, the bias of the spring 86 together with that of the spring 126 will cause the latching lever 38 to move to the dotted line position thereby disengaging the latch 114 from the underside of the collar 82 permitting piercing element 76 to move downwardly to pierce the diaphragm 74. A fire extinguishing agent will then pass from the container 68 through the hollow center of the piercing element and out of the apertures 80 into the passage 62, the passage 66, the nozzle 70 and out of the slit 72 to extinguish the fire.

Alternately, by means of a remote control cable such as mentioned previously, the device may be manually triggered by rotating the lever arm 96 to rotate the piercing element 76 approximately 90° to align the flat 84 on the collar 82 with transverse latch 114. Such will effectively unlatch the piercing element 76 for downward movement under the bias of the spring 86 to pierce the diaphragm 74 to result in the same action.

Downward movement of the collar 82 on either of the foregoing instances will cause an electrical change in the condition of the microswitch as mentioned previously. This electrical change may be used in a variety of ways. For example, by employing normally open contacts of the microswitch 130, the resulting change, which would close such contacts, may be used to actuate an electrical alarm system. Alternately, particularly, where an engine having an electrical ignition system is employed, normally closed contacts of the microswitch 30 may be employed so that the resulting change, which would open such contacts, would break an electrical circuit to the ignition thereby terminating operation of the engine upon the detection of a fire.

To reset and recharge the device, it is only necessary to remove the container 58 and place a new fusible link 108 in the position illustrated in solid lines in FIG. 2.

The device may then be recocked by drawing upwardly on the knob 94 thereby causing the upper surface of the collar 82 to engage the chamfer 115 on the underside of the latch 114. This will result in the camming of the latching lever 38 to the left as viewed in FIG. 2 about the pivot axis of pin 120 until the collar 82 passes upwardly thereof to just above its normal solid line position relative to the latching element 114. The presence of the spring 126 will then cause the latching lever 38 to bodily move to the right as illustrated in FIG. 2 at which time the latching element 114 will again underlie the collar 82 to restrain the piercing element 76.

After the apparatus is recocked, it is then only necessary to replace the container 58 with a recharged container by threading the same into the tapped bore 54.

As a result of the foregoing construction, a single person may replace the fusible link 108 and thereafter move to the other side of the partition to recock the piercing element 76. This factor, coupled with the easy accessibility to the extinguishing agent container 58, assures ease of maintenance and rearming. Furthermore, the use of the substantially sealed housing 22 protects all of the movable parts of the apparatus with the exception of the extreme end of the latching lever. Finally, the use of the nozzle 70 as one retaining element for the fusible link 108 in conjunction with the latching lever 38 results in a structure providing the same function as those heretofore known with fewer parts.

A modified embodiment of the invention is illustrated in FIG. 5. According to the modified embodiment, the flat 84 on the collar 82 is eliminated and other means are provided for manual actuation of the system. In particular, the lower side of the latching lever 38 includes a horizontally projecting ear 150 within the housing 22. The side walls of the housing 22 journal a shaft 152 for rotation about a horizontal axis and within the housing, the shaft 152 includes an upwardly projecting lug 154 located adjacent the ear 150. Outwardly of the housing 22, the shaft 152 includes an actuating arm 156 which may be integral therewith and it will be appreciated that if the latter is moved by being moved manually or by the control cable 18 connected to a connecting element 158 near the extremity of the arm 156 so as to cause counterclockwise rotation of the shaft 152, the lug 154 will engage the ear 150 to bodily move the latching lever to the left as indicated by an arrow 160. This will result in the latch 114 being moved out from its latching position with the collar 82 to cause manual actuation of the system.

FIG. 5 additionally shows an alternate biasing arrangement for the latching lever 38 that may be employed in lieu of the spring 126 illustrated in FIG. 2. In particular, a coil spring 162 is coiled about the pivot pin 116 and has one end thereof connected to the link 118 and the other received in a notch 164 in the upper surface of the latching lever 138. The arrangement is such as to bias the latching lever 138 in a clockwise direction about pivot pin 116.

Finally, FIG. 5 shows a simplified construction of a resetting knob that may be substituted for the knob 94 if the manual actuating system illustrated in FIG. 5 or one akin thereto is substituted for that shown in FIG. 2. Specifically, it is only necessary to pin a knob 166 to the upper end of the shaft 76 avoiding the need for the element 88, the pin 92 and the slot 90 illustrated in FIG. 2.

It will be recognized that the embodiment illustrated in FIG. 5 is productive of the same advantages as that illustrated in FIG. 2 and offers an additional advantage in terms of simplicity of construction.

I claim:

1. A fire extinguishing system for use in structures wherein a potential fire hazard is separated from the remainder of the structure by a partition, said system comprising: a partition; an opening in said partition; a fire extinguisher mounted on said partition adjacent

said opening said fire extinguisher including a container filled with a material capable of extinguishing fires and a preloaded actuator for releasing the contents of the container; nozzle means associated with said container and including a generally rigid tube extending through the opening in said partition for directing the contents of the container to the area on the side of the partition opposite the container when said actuator releases the contents of the container; means including a lever associated with said actuator and extending through said opening for normally restraining the actuator in an inoperative position; and heat sensitive means mounted on and interconnecting said tube and said lever on said partition opposite side and operative to sense the heat of a fire and cause said lever to cease restraining said actuator.

2. A fire extinguishing system according to claim **1** wherein said actuator comprises a shaft-like element mounted for longitudinal movement and having a latching portion thereon, and a spring biasing the shaft for movement in a predetermined direction; and said lever includes a latch adapted to engage said latching portion to restrain said shaft, said lever further being mounted for movement to a position out of engagement with said latching portion and including means thereon whereby said shaft may be moved to said inoperative position by engagement of said latching portion with said latch to cam said latch out of the path of movement of said shaft as said shaft moves to said inoperative position.

3. A fire extinguishing system according to claim **2** wherein said latching portion is formed to extend only partially about the periphery of the shaft; and a manual actuator for rotating said shaft so that said latching portion is rotated free of said latch to cause manual actuation of said system.

4. A fire extinguishing system adapted for automatic actuation upon the detection of fire comprising: a container adapted to receive an extinguishing agent; valve means movable between a first position wherein the contents of the container are retained therein and a second position wherein the contents of the container may be expelled therefrom to extinguish a fire; means biasing said valve means for movement towards said second position; latch means normally in engagement with said valve means to restrain the same in the first position; heat sensitive means associated with said latch means for causing said latch means to release said valve means when a fire has been detected so that said latch means may move from a first position restraining said valve means to a second position wherein said valve means may move to its second position, said heat sensitive means requiring resetting after each detection of a fire thereby; and means on said valve means and said latch means for moving said latch means from its first position when said valve means is moved from its second position towards its first position whereby said heat sensitive means may be reset and said valve means recocked at different times.

5. The fire extinguishing system of claim **4** wherein said valve means includes a latching collar mounted thereon for engagement by said latch means, and said last-named means includes a cam-like surface on one of said latch means and said collar.

6. The fire extinguishing system of claim **5** wherein said latch means includes an elongated lever having a latch at one end adapted to engage said collar; said heat sensitive means includes a fusible link connected to the other end of said lever; and further including means for mounting said lever for movement between said two positions thereof comprising a pivotally mounted link in turn pivotally connected to said lever intermediate its ends; and spring means normally biasing said lever toward its second position about the pivotal connection of said link to said lever.

7. A fire extinguisher particularly suited for installation in a structure wherein a potential fire hazard is separated from other portions of the structure by a partition and adapted to be mounted on the side of the partition remote from the fire hazard and capable of sensing a fire condition on the other side of the partition and for directing a fire extinguishing material at the hazard when a fire condition is sensed, said fire extinguisher comprising: a substantially sealed housing adapted to be secured to the partition, said housing including a surface adapted to abut the partition about an opening therein, a first opening in said housing extending in the direction of said surface; an elongated nozzle received in said opening and adapted to project through an opening in a partition when the housing is secured thereto; a second opening in said housing; a container adapted to contain a fire extinguishing material under pressure received in said second opening; means in said housing interconnecting said first and second openings; valve means mounted in said housing for controlling the passage of fire extinguishing material from said container to said nozzle, said valve means being normally biased towards an open position; a lever movably mounted in said housing and adapted, at one position thereof, to hold said valve means in a closed position, said lever including an extension extending past said surface and adapted to pass through an opening in the partition when the housing is mounted on a partition; and heat fusible means interconnecting said nozzle and said extension for normally holding said lever in said one position whereby when a fire occurs on the side of the partition opposite the housing, the resulting fusing of the heat fusible means will permit said lever to move from said one position whereupon said valve means will open to permit the flow of fire extinguishing material to said nozzle to extinguish the fire on the other side of the partition.

8. The fire extinguisher of claim **7** further including an electrical switch mounted in said housing, said electric switch having an actuator adapted to be engaged by said valve means as said valve means moves to an open position and adapted to be connected in an electrical system.

9. The fire extinguisher of claim **7** wherein said second opening is threaded and said container includes a threaded end, threadedly and releasably received within said second opening whereby said container may be replaced or removed for recharging without removing said housing from a partition to which it is secured.

10. A fire extinguishing system according to claim **2** further including means for engaging said lever to move the same out of engagement with said latching portion, said means including a manual actuator whereby the system may be manually actuated upon detection of a fire.

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