April 27, 1965 H. M. KELLEY 3,180,422

COMBINATION ALARM AND CONTROL VALVE FOR SPRINKLER SYSTEMS

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Fig. 1

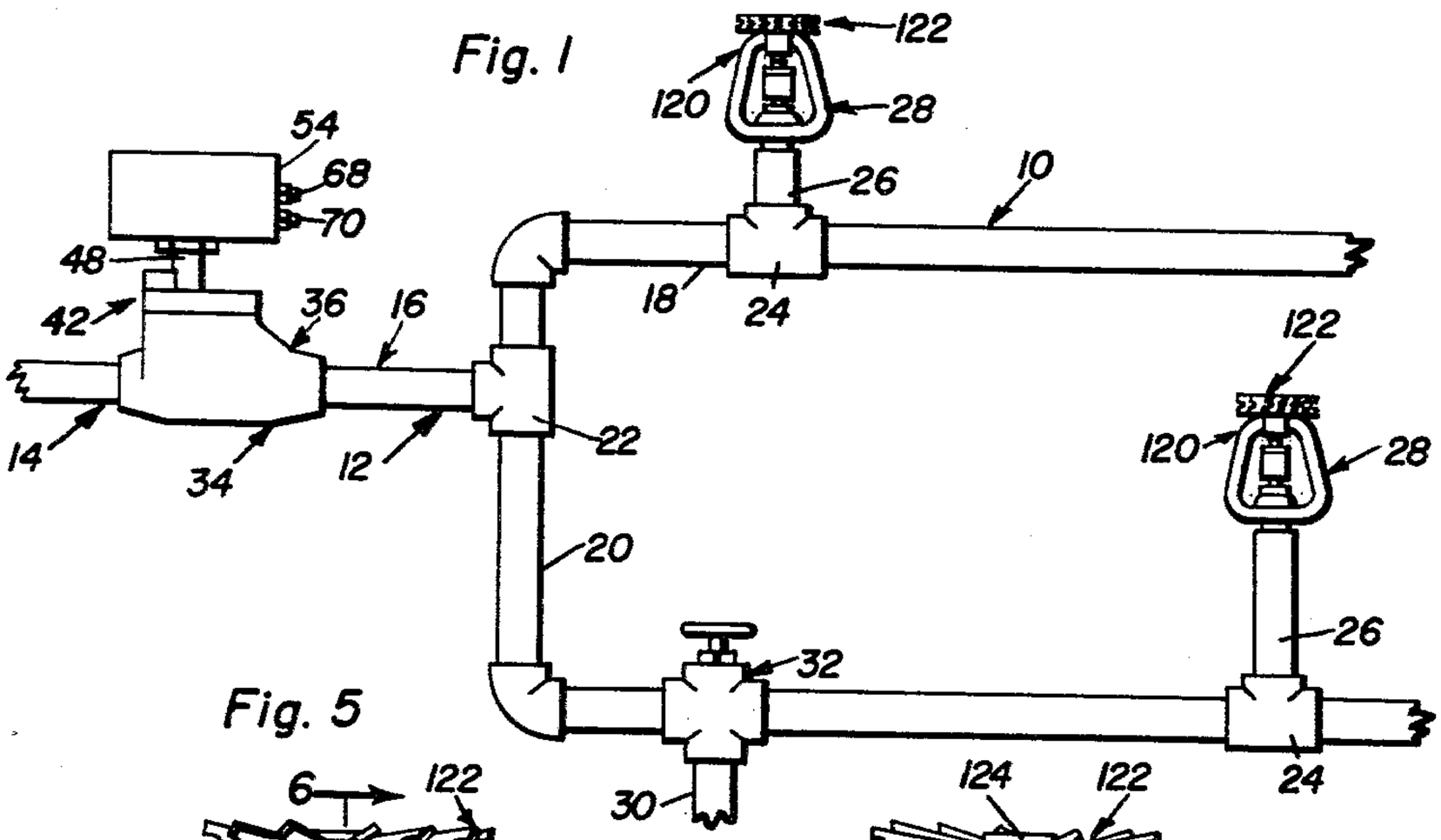

Fig. 5

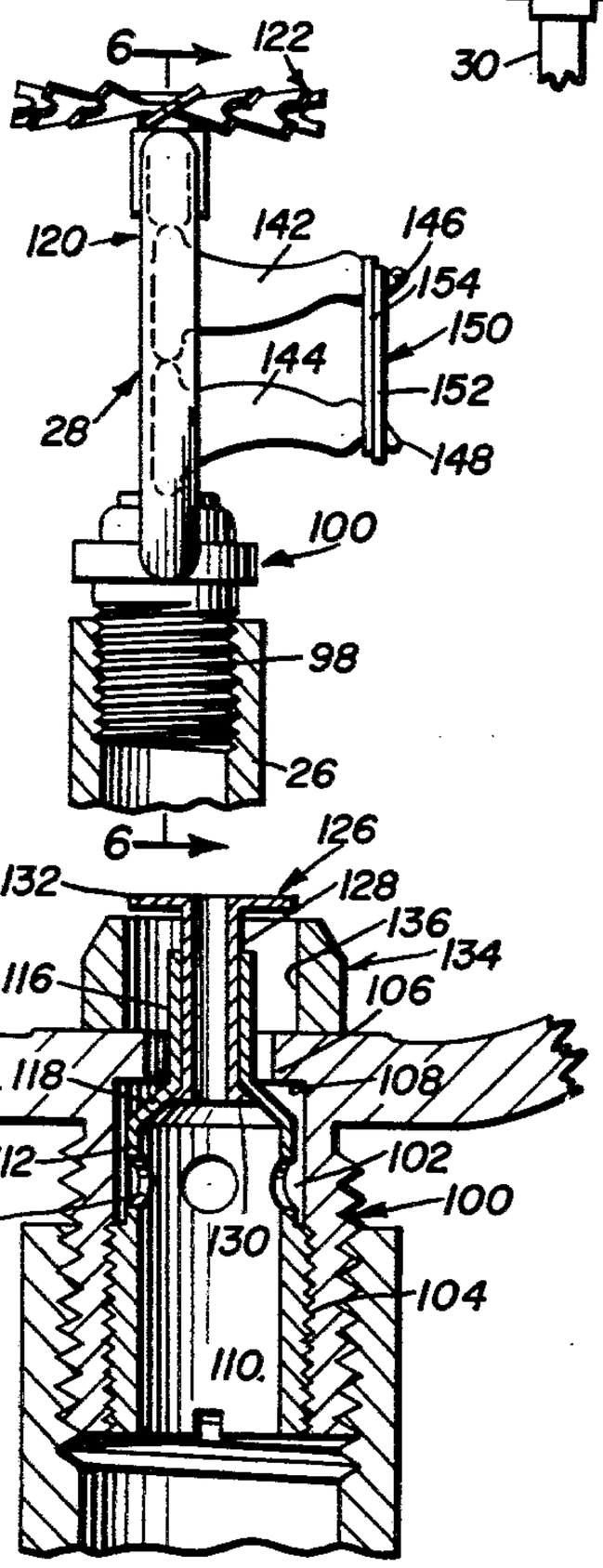

Fig. 7

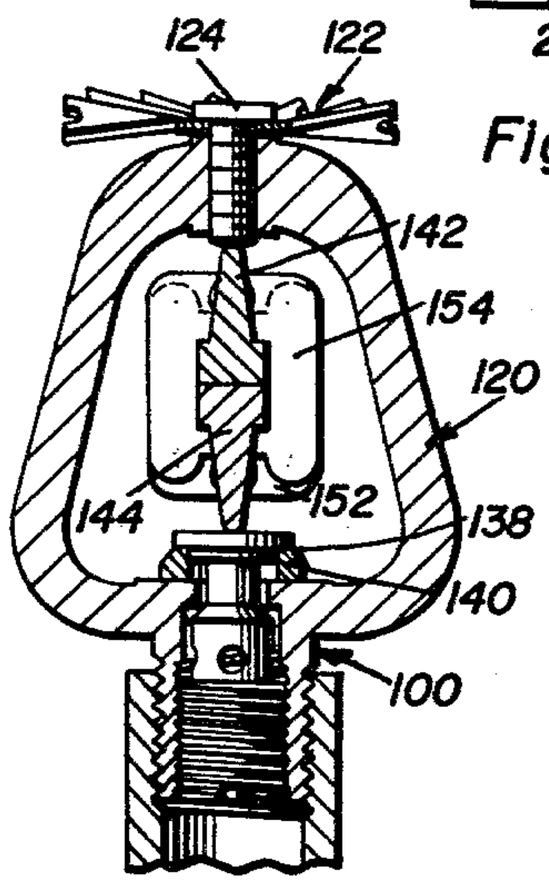

Fig. 6

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Fig. 2

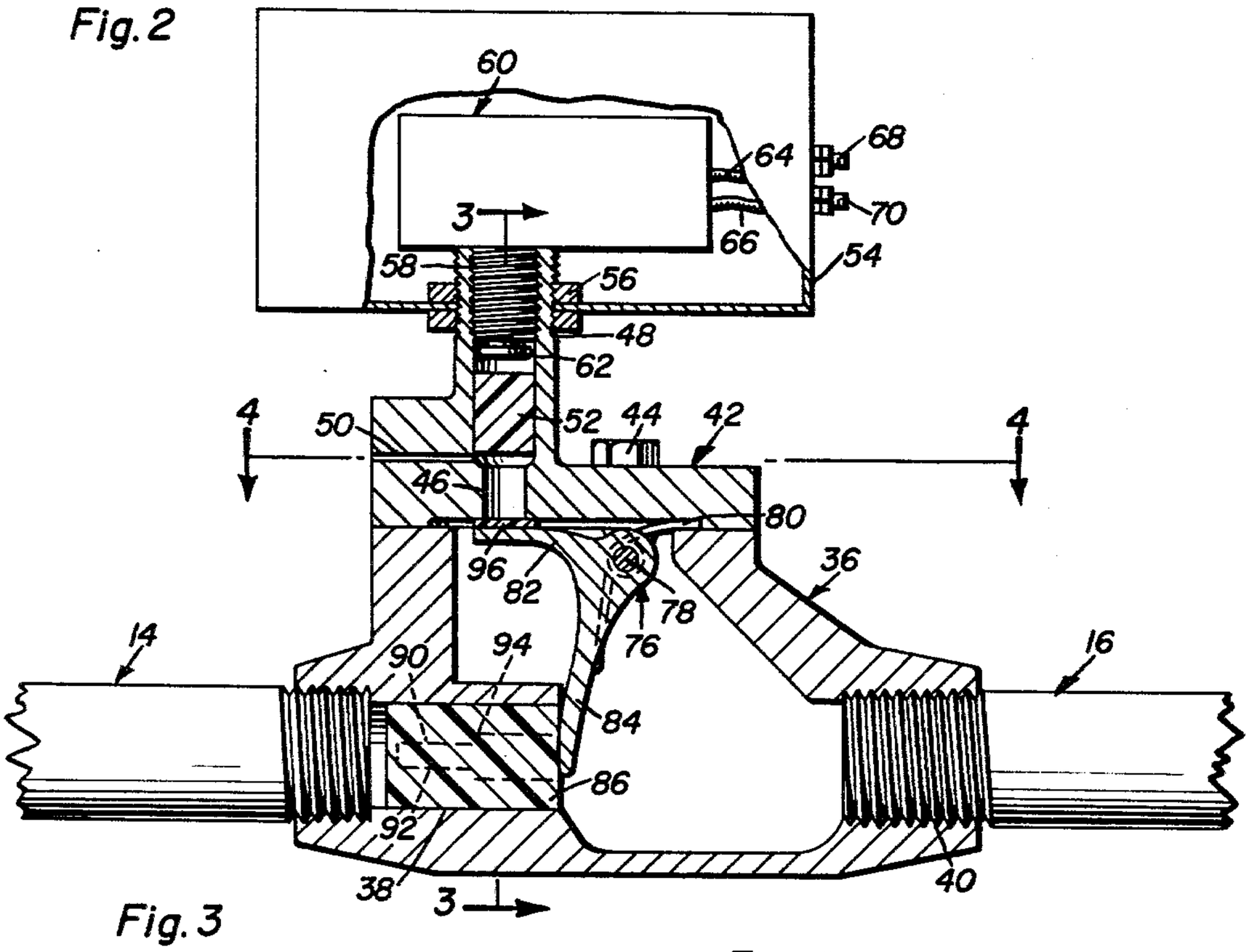


Fig. 3

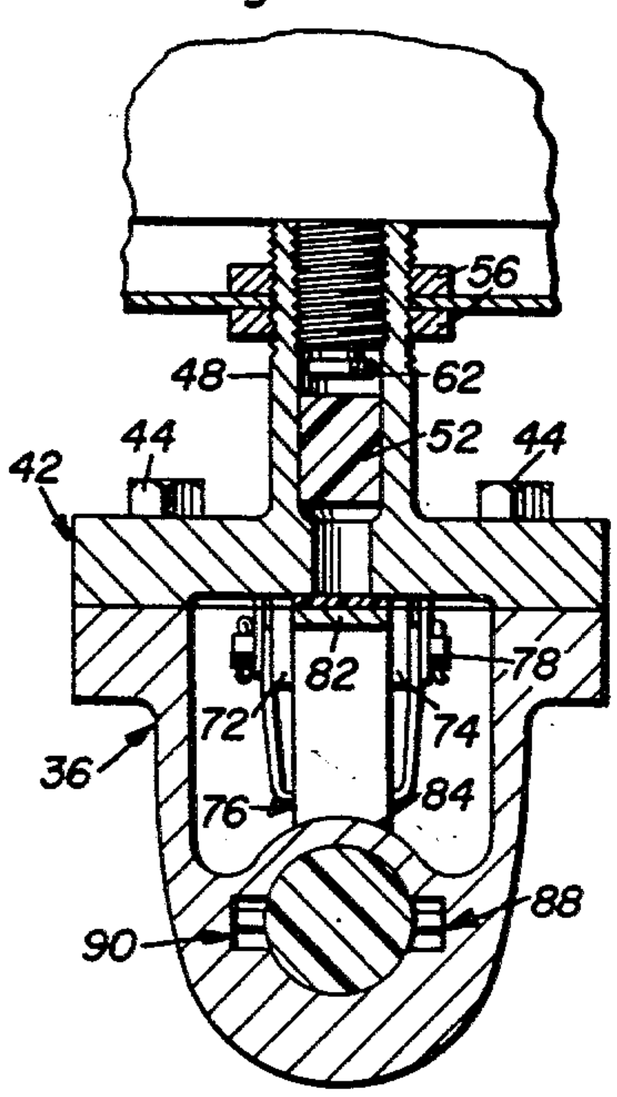
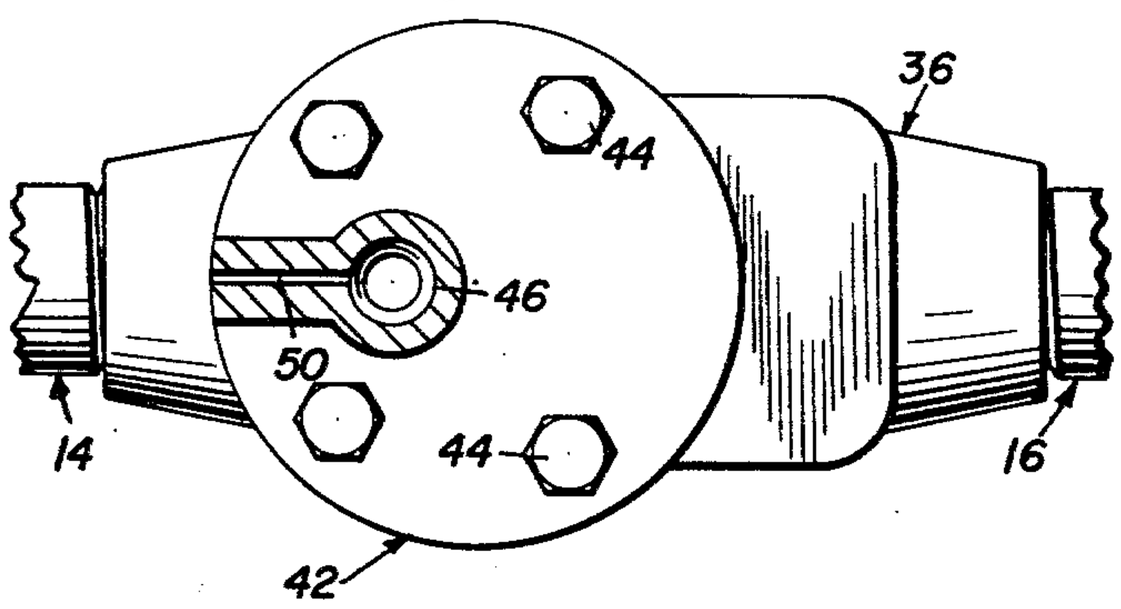


Fig. 4



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COMBINATION ALARM AND CONTROL VALVE FOR SPRINKLER SYSTEMS

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9 Claims. (Cl. 169—23)

This invention relates to a novel and useful combination alarm and control valve for sprinkler systems of the type including a water conduit having one end communicated with a source of water under pressure and one or more sprinkler heads carried by the other end of the conduit disposed downstream of the alarm and control valve.

The control valve is primarily designed for use with sprinkler systems utilizing sprinkler head assemblies of the type having an outlet opening closed by a closure plug or the like which is removably secured in a closed position by means of heat responsive release means which will, in response to a rise in temperature past a certain point, release the closure plug from the outlet opening of the sprinkler head and allow the water under pressure to flow therefrom.

The alarm and control valve of the instant invention is primarily designed for use with sprinkler head assemblies such as those which will be hereinafter more fully set forth that are capable of effecting a dense fog-like discharge of water.

The combination alarm and control valve includes a body portion having a fluid inlet and outlet passages formed therein and the control valve is adapted to be interposed in a fluid conduit between adjacent sections thereof with the outlet end of the upstream conduit section communicated with the inlet passage and the outlet passage communicated with the inlet end of the downstream fluid conduit. Electrical switch means including a movable actuator is carried by the body of the alarm and control valve and the latter includes movable pressure responsive alarm actuating means which is communicated with the interior of the valve body by means of passage means. Movable valve means is operatively associated with the passage means and is normally resiliently urged to a closed position sealing the alarm actuating means from the interior of the body. In addition, flow responsive force means is disposed in the inlet passage of the body and is engageable with the valve means for opening the latter in response to the flow of fluid through the body. Accordingly, should the heat responsive release means of any one of or a combination of the sprinkler head assemblies communicated with the downstream end of the fluid conduit be actuated, the flow of fluid passing through the alarm and control valve body would actuate the electrical switch means which is carried by the body. By operatively connecting the switch means to an electrical alarm circuit, an alarm may be given almost simultaneously with the actuation of one of the sprinkler head assemblies.

The entire sprinkler assembly of the instant invention has been primarily designed for use adjacent spaced heating units and will therefore be beneficial in rendering an alarm while simultaneously spraying the area adjacent the spaced heating unit upon a rise in temperature immediately adjacent one or more of the spray head assemblies above a predetermined point.

The main object of this invention is to provide an automatic alarm and sprinkler assembly which may be readily operatively associated with a spaced heating unit and utilized to give an alarm in response to an abnormal rise of temperature immediately adjacent the spaced heating unit, to effect a heavy fog-like spray of water in the area of the spaced heating unit in the event

the abnormal increase in the temperature around the spaced heating unit has been caused by an open fire and to turn off the heating unit.

A further object of this invention, in accordance with the immediately preceding object, is to provide a sprinkler system and an alarm and control valve therefor which is adaptable to operation in conjunction with water pressure sources under five pounds per square inch pressure or more.

A further object of this invention, in accordance with the preceding object, is to provide an alarm and control valve for a sprinkler system constructed in a manner whereby a portion of the sprinkler system may be temporarily vented for testing operation of the alarm and control valve and then again closed with the alarm and control valve being constructed in such a manner whereby it will automatically reset itself for actuation by the opening of one of the sprinkler head assemblies at a subsequent date.

A final object to be specifically enumerated herein is to provide a sprinkler system and combination alarm and control valve therefor which will conform to conventional forms of manufacture, be of simple construction and easy to install so as to provide a device that will be economically feasible, long lasting and relatively trouble free in installation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a fragmentary side elevational view of a sprinkler system shown with the alarm and control valve of the instant invention mounted therein;

FIGURE 2 is an enlarged fragmentary elevational view of that portion of the sprinkler system having the alarm and control valve disposed therein, the alarm and control valve being shown in longitudinal vertical section and parts of the electrical switch means being broken away and shown in section;

FIGURE 3 is a fragmentary sectional view taken substantially upon a plane designated by the section line 3—3 of FIGURE 2;

FIGURE 4 is a horizontal sectional view taken substantially upon a plane designated by the section line 4—4 of FIGURE 2;

FIGURE 5 is a side elevational view of one of the sprinkler head assemblies illustrated in FIGURE 1 and on somewhat of an enlarged scale and with portions of the sprinkler system shown in section and removed;

FIGURE 6 is a sectional view taken substantially upon a plane indicated by the section line 6—6 of FIGURE 5; and

FIGURE 7 is an enlarged fragmentary sectional view similar to that of FIGURE 6 but showing portions of the sprinkler head assembly in their operative positions.

Referring now more specifically to the drawings the numeral 10 generally designates a sprinkler system which includes a fluid conduit generally referred to by the reference numeral 12. The fluid conduit 12 includes a first conduit section generally referred to by the reference numeral 14 and a second fluid conduit section generally referred to by the reference numeral 16. The conduit sections 14 and 16 comprise the manifold line and it will be noted that branch conduits 18 and 20 are communicated with the conduit section 16 by means of a T-fitting 22. The branch conduits 18 and 20 each have a T-fitting 24 disposed therein and a stand pipe 26 connected to each T-fitting 24. A spray head assembly generally referred to by the reference numeral 28 is mounted atop each stand pipe 26 and it will also be observed that the branch

conduit 20 has a pressure and release conduit 30 communicated therewith by means of a valve assembly generally referred to by the reference numeral 32.

The alarm and control valve of the instant invention is generally designated by the reference numeral 34 and includes a hollow body generally referred to by the reference numeral 36. With attention now directed to FIGURE 2 of the drawings it will be noted that the hollow body 36 is provided with a fluid inlet passage 38 and a fluid outlet passage 40. The outlet passage 40 and the outer end of the inlet passage 38 is internally threaded and the corresponding ends of the conduit sections 14 and 16 are secured in the outer ends of the passages 38 and 40 respectively.

The upper end of the housing 36 is open and is closed by means of a cover plate generally referred to by the reference numeral 42 which is secured to the housing or body 36 by means of fasteners 44.

The cover plate 42 has a passage 46 formed therethrough and one end of the passage 46 opens through the lower end of the cover plate 42 while the upper end of the passage 46 is defined by an externally threaded neck portion 48. A small diameter vent passage 50 communicates the exterior of the body 36 with the interior of passage 46 and it will be noted that a movable pressure responsive alarm actuating means in the form of a piston 52 is slidably disposed in an intermediate portion of the passage 46.

A housing generally referred to by the reference numeral 54 is secured to the externally threaded neck portion 48 by means of nuts 56 and the externally threaded neck portion 58 of a microswitch assembly generally referred to by the reference numeral 60 is secured in the upper internally threaded end of the neck portion 48. The microswitch assembly 60 includes a movable actuator 62 which may be engaged by the piston 52 and urged upwardly upon increase of fluid pressure within the passage 46.

It is to be understood that the microswitch assembly 60 is of conventional design and that upward movement of the actuator 62 will cause a bridging member (not shown) to bridge a gap between two contacts carried by the electrical wires 64 and 66 whose outer ends are secured to terminal posts 68 and 70 supported from the housing 54. The terminal posts 68 and 70 may of course be disposed in series in an electrical circuit of an electrical alarm of any given type and in a circuit to effect shut-down of a heater burner.

With attention now directed to FIGURES 2 and 3 of the drawings it will be noted that two apertured ears 72 and 74 project downwardly from the lower surface of the cover plate 42. A bell crank generally referred to by the reference numeral 76 is pivotally secured between the apertured ears 72 and 74 by means of a pivot pin 78. As can best be seen from FIGURE 2 of the drawings, a spring 80 normally resiliently urges the bell crank 76 toward a position with the arm 82 thereof over the lower end of the passage 46. The bell crank 76 includes a second arm 84 and it will be observed that a force piston 86 is slidably disposed in the inlet passage 38 inwardly of the conduit section 14. The free end of the arm 84 is disposed in engagement with the inner end of the piston 86 to an outwardmost position.

From FIGURE 3 of the drawings it will be noted that the body 36 includes a pair of bypass passage means 88 and 90 and from FIGURE 2 of the drawings it may be seen that each of the bypass passage means 88 and 90 includes an outer end portion 92 which is of a constant cross-sectional area and a larger inner end portion 94 that is greater in cross-sectional area than the corresponding outer end portion 92. Accordingly, as the piston 86 moves inwardly, more fluid will bypass the piston 86.

The upper end or surface of the arm 82 has any suitable form of sealing material 96 secured thereto and this sealing material, when urged into contact with the lower end of the passage 46 seals the latter from the interior of the body 36.

With attention now directed to FIGURES 5 through 7 of the drawings it will be noted that each of the spray head assemblies 28 includes a cylindrical body portion having one end which is externally threaded as at 98 threadedly engaged in the internally threaded upper end of the corresponding stand pipe 26. The cylindrical body portion or hollow housing 100 of each spray head assembly 28 has a bore formed longitudinally therethrough whose lower end is internally threaded as at 104. The upper end of the bore 102 terminates in a diametrically reduced outlet opening 106 defined by a shoulder 108. A hollow sleeve member 110 is threadedly engaged in the lower end of the bore 102 and includes a diametrically reduced upper end portion 112 which has a plurality of outlet openings 114 formed therein. The diametrically reduced upper portion 112 terminates in a neck portion 116 defined by a truncated cone-shaped shoulder portion 118. A frame-like bail generally referred to by the reference numeral 120 is carried by the housing 100 and a first water deflection means generally referred to by the reference numeral 122 and in the form of a bladed disk is rotatably mounted by means of pivot pin 124 for rotatation about an axis generally paralleling the longitudinal axis of the bore 102.

A second water deflection means generally referred to by the reference numeral 126 and in the form of a tubular member 128 slidably disposed in the neck portion 116 and having a flared lower end 130 for abutting engagement with the shoulder 118 and a disk-like member 132 carried by its upper end is slidably disposed in the neck portion 116 for limited longitudinal reciprocal movement. It will be noted that the disk-like member 132 may be moved to a retracted position within the outlet neck generally referred to by the reference numeral 134 which defines an outlet opening 136. A closure plug 138 and having a diametrically reduced portion 140 is seatingly received in the outlet opening 136 and retains the tubular member 128 in a retracted position within the confines of the neck portion 134. A pair of lever arms 142 and 144 provided with hook portion 146 and 148 respectively are disposed between the pivot pin 124 and the cover plug 138. Heat responsive releasing means generally referred to by the reference numeral 150 is secured between the hooked portions 146 and 148 and comprises a pair of plate-like members 152, 154 which are secured together in any convenient means such as by soldering. However, it is to be noted that the soldering used to secure the plate-like members 152 and 154 together is of a particular type which will melt at a given temperature whereby the lever arms or members 142 and 144 will be released upon the temperature of the plates 152 and 154 exceeding a predetermined level.

In operation, the sprinkler system 10 is connected to a suitable source of water under pressure. The spring 80 will retain the piston 86 in an outermost position in the fluid inlet passage 38 thereby also maintaining the lower end of the passage 46 out of communication with the interior of the body 36. However, upon a rise in temperature of any one of the pairs of plates 152 and 154, the soldering material used to secure these plates together will melt whereupon the lever arms or members 142 and 144 will fall from between the pivot pin 124 and the closure plug 138. The static pressure within the sprinkler system 10 will then push the closure plug 138 out of the outlet opening 136. Then, water entering the body 36 to displace the water which has forced the closure plug 138 out of the neck portion 134 will push the piston 86 to the right as viewed in FIGURE 2 thereby pivoting the bell crank 76 and moving the arm 82 thereof out of sealing engagement with the lower end of the passage 46. The movement of more water into the body 36 will then cause the piston 52 to raise in the passage 46 and to strike the actuator 62.

As water moves through each of the housings 100,

some of the water will pass through the tubular member 128 and strike the corresponding bladed disk 122. This will impart rotary movement to the bladed disk 122 and an umbrella-like spray will be effected. In addition, some of the water passing through the housing 100 will pass through the outlet openings 114 and upwardly through the housing 100 around the outside of the neck portion 116 and strike the disk-like member 132 to be deflected radially outwardly of the tubular member 128 to form an inverted cone-shaped spray. Thus, each of the sprinkler head assemblies 28 is capable of effecting two separate sprays which will together form a fog-like spray to completely saturate any object adjacent either one of the spray head assemblies 28.

The piston 86 will automatically adjust itself to the number of spray-head assemblies 28 being utilized and as more water is needed, the piston 86 will move further inwardly of the inlet passage 38 whereby the bypass passage means 88 and 90 will provide all of the water which is required.

If it is desired to test the alarm and control valve 34, the valve assembly 32 may be actuated or opened whereby the pressure relief conduit 30 will discharge some of the water from the sprinkler system 10 and cause the piston 86 to again move to the right as viewed in FIGURE 2 thereby actuating the microswitch assembly 60. However, as soon as the valve 32 is closed, the vent passage 50 will bleed off the excess water within the passage 46 and enable the bell crank 76 to again close the lower end of the passage 46. In addition, the vent passage 50 may also be used to indicate if the sealing means 96 is not forming a perfect seal with the lower end of the passage 46. However, even should the sealing means 96 not perfectly seal the lower end of the passage 46, there will not be a sufficient amount of water pressure built up in the passage 46 because of the vent passage 50 and thus, the piston 52 will not be urged into engagement with the actuator 62 until such time as one of the spray head assemblies 28 has been actuated.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A combination alarm and control valve for actuating switch means for actuating an alarm and for causing burner shutdown of a heating unit upon the flow of fluid through a fluid conduit, said alarm and control valve including a body having fluid intake and outlet passages formed therein adapted to have the outlet and inlet ends respectively of a pair of sections of fluid conduit communicated therewith, movable pressure responsive alarm actuating means carried by said body and operable to actuate an alarm upon being communicated with a source of fluid under pressure, passage means communicating said alarm actuating means with the interior of said body, movable valve means operatively associated with said passage means and normally resiliently urged to a position closing said passage means and sealing said alarm actuating means from the interior of said body, and movable flow responsive force means disposed in said body, engageable with said valve means and responsive to the flow of fluid through said body for moving said valve means to a position opening said passage means, said valve means comprising a bellcrank pivotally mounted in said body and having one arm whose free end is registrable with the inlet end of said passage means, said flow responsive force means comprising a piston slidably disposed in said fluid inlet passage, said bell crank including a second arm whose free end portion is engaged with the inner end of said

force means piston, means normally resiliently urging said bell crank to a position with said first and second arms closing said passage means and urging said force piston to an outermost position in said inlet passage.

2. The combination of claim 1 wherein said inlet passage and said force piston include coacting means defining bypass means which is closed upon positioning said force piston outermost in said inlet passage and which is opened upon movement of said force piston inwardly of said inlet passage and becomes progressively greater in cross-sectional area as said force piston moves further inwardly of said inlet passage.

3. The combination of claim 2 including limited flow vent means communicating said passage means with the exterior of said body.

4. The combination of claim 1 wherein said movable pressure responsive alarm actuating means comprises a piston slidably disposed in a portion of said passage means.

5. A combination alarm and control valve for actuating switch means for actuating an alarm and for causing burner shutdown of a heating unit upon the flow of fluid through a fluid conduit, said alarm and control valve including a body having fluid intake and outlet passages formed therein adapted to have the outlet and inlet ends respectively of a pair of sections of fluid conduit communicated therewith, movable pressure responsive alarm actuating means carried by said body and operable to actuate an alarm upon being communicated with a source of fluid under pressure, passage means communicating said alarm actuating means with the interior of said body, movable valve means operatively associated with said passage means and normally resiliently urged to a position closing said passage means and sealing said alarm actuating means from the interior of said body, and movable flow responsive force means disposed in said body, engageable with said valve means and responsive to the flow of fluid through said body for moving said valve means to a position opening said passage means, said valve means comprising a bellcrank pivotally mounted in said body and having one arm whose free end is registrable with the inlet end of said passage means, said bell crank including a second arm whose free end portion is engaged with the inner end of said force means piston, means normally resiliently urging said bell crank to a position with said first and second arms closing said passage means and urging said passage means and urging said force piston to an outermost position in said inlet passage.

6. The combination of claim 5 wherein said inlet passage and said force piston include coacting means defining bypass means which is closed upon positioning said force piston outermost in said inlet passage and which is opened upon movement of said force piston inwardly of said inlet passage and becomes progressively greater in cross-sectional area as said force piston moves further inwardly of said inlet passage.

7. The combination of claim 6, wherein said inlet passage and said force piston include coacting means defining bypass means which is closed upon positioning said force piston outermost in said inlet passage and which is opened upon movement of said force piston inwardly of said inlet passage and becomes progressively greater in cross-sectional area as said force piston moves further inwardly of said inlet passage, limited flow vent means communicating said passage means with the exterior of said body.

8. The combination of claim 7 including electrical switch means operatively associated with said body and including an actuator adapted to be engaged by said alarm actuating means.

9. A combination alarm and control valve for actuating switch means for actuating an alarm and for causing burner shutdown of a heating unit upon the flow of fluid through a fluid conduit, said alarm and control valve

including a body having fluid intake and outlet passages formed therein adapted to have the outlet and inlet ends respective of a pair of sections of fluid conduit communicated therewith, movable pressure responsive alarm actuating means carried by said body, and operable to actuate an alarm upon being communicated with a source of fluid under pressure, passage means communicating with alarm actuating means with the interior of said body, movable valve means operatively associated with said passage means and normally resiliently urged to a position closing said passage means and sealing said alarm actuating means from the interior of said body, and movable flow responsive force means disposed in said body, engageable with said valve means and responsive to the flow of fluid through said body for moving said valve means to a position opening said passage means, said valve means comprising an actuator member movably mounted in said body and having a first portion registrable with the inlet end of said passage means, said flow responsive force means comprising a piston slidably disposed in said fluid inlet passage, said actuator member including a second portion engageable with the inner end of said force means, means normally resiliently

urging said actuator means to a position with said first and second portions thereof closing said passage means and urging said force piston to an outermost position in said inlet passage.

References Cited by the Examiner

UNITED STATES PATENTS

534,631	2/95	Carpenter	169—23
880,889	3/08	Jacoby	169—19
1,533,948	4/25	Rockwood	169—23
1,822,654	9/31	Hamilton	169—23
1,941,695	1/34	Kilgour	169—23
1,950,029	3/34	Hamilton et al.	169—23
1,982,078	11/34	Spencer	169—37
1,984,067	12/34	Kennedy	169—23
1,997,404	4/35	Hamilton	169—37
2,153,875	4/39	Queen	169—23
2,265,810	12/41	Lowe et al.	169—24 X
3,098,527	7/63	Allen et al.	169—23

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