

[54] FIRE DETECTOR AND EXTINGUISHER
SYSTEM

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[58] Field of Search..... 340/418, 419, 222

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[57] ABSTRACT

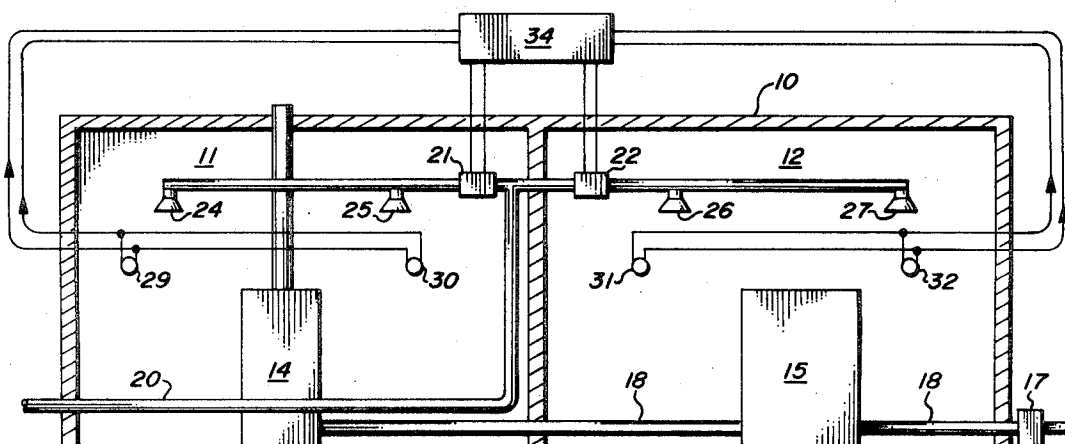
The system uses a plurality of light sensitive diodes, a plurality of relays, a timer and a plurality of solenoids to detect fire and to control the quantity and distribution of fire fighting substance used on the fire.

[56] References Cited

UNITED STATES PATENTS

2,570,280 10/1951 Roffman 340/418

8 Claims, 3 Drawing Figures



SHEET 1 OF 2

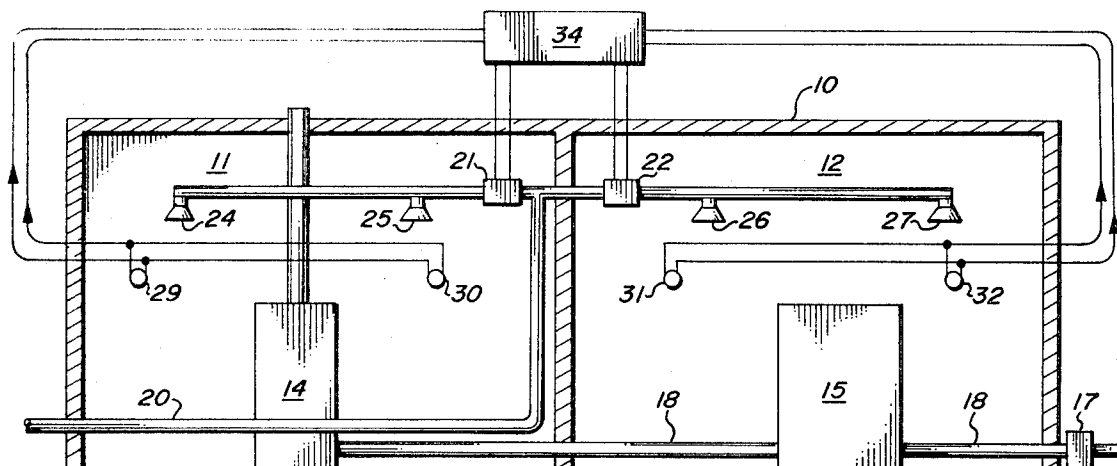


FIG. 1

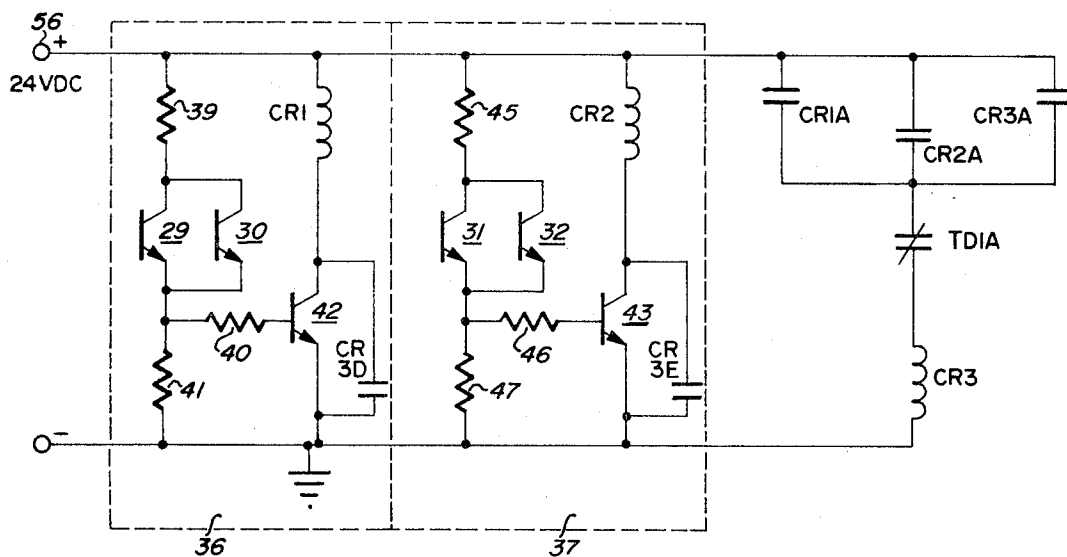


FIG. 3

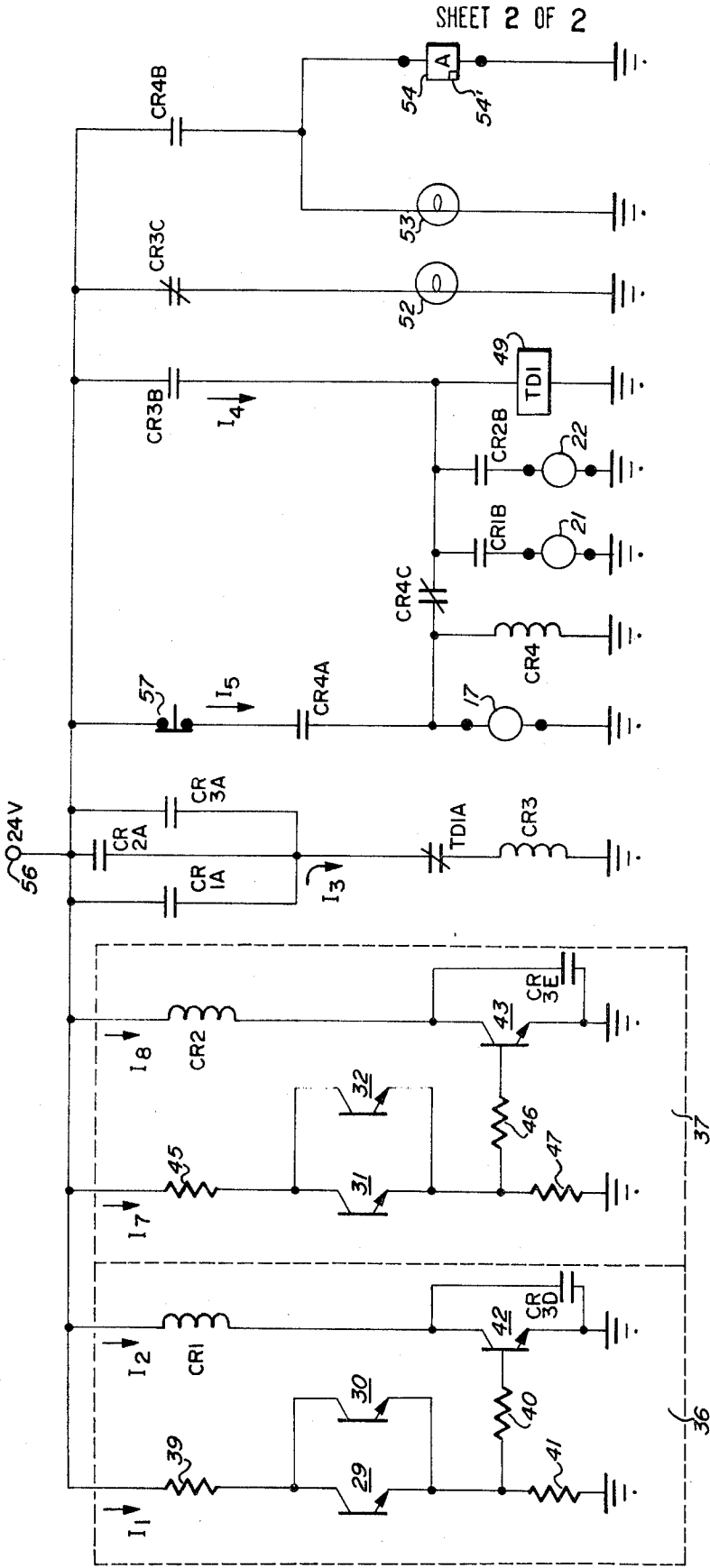


FIG. 2

FIRE DETECTOR AND EXTINGUISHER SYSTEM

BACKGROUND OF THE INVENTION

The present invention pertains to a fire detector and extinguisher system and more particularly to a system which is especially adapted for use in a mobile home or in a house.

Light and/or heat sensitive devices are widely used in industry to detect fires and to turn on sprinkling systems to quench the fire or to reduce the damage until the fire department arrives. In many of the sprinkling systems water is used as the fire fighting substance. The device which detects the fire causes an alarm to be sounded and causes one or more valves to be opened so that water sprays over an area near the fire. However, in many prior art systems the water must be shut off manually when the fire has been extinguished. When the fire occurs in a building in a remote area the water may cause extensive damage to the property before the supply can be turned off. What is needed is a fire detector and extinguisher system which can turn on the supply of water or other fire fighting substance when a fire is detected and turn off the supply when the fire has been extinguished.

In homes or other buildings pipes which carry the supply of fuel into the buildings are often damaged during a fire so that the fuel from the damaged pipes causes the fire to spread and makes it more difficult to extinguish the fire.

What is needed is a fire detector and extinguisher system which shuts off the fuel supply when a fire is detected and turns on a source of fire fighting substances. When the fire has been extinguished it is desired that the source of fire fighting substance be turned off.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages of the prior art by providing a detector which turns off the fuel supply when a fire is detected and causes fire fighting substance to be sprayed into the area where the fire is detected. After a predetermined period of time the source of fire fighting substance is turned off. If the fire is still detected the source is turned on again. If the fire is not detected the source remains off. This invention is especially useful in a mobile home or other buildings where the quantity of fire fighting substance is limited and where it is desired that damage which may be caused by the fire fighting substance be kept to a minimum.

It is, therefore, an object of this invention to provide a new and improved fire detector and extinguisher system.

Another object of this invention is to provide a fire detector and extinguisher system which is especially adapted for use in a mobile home or house.

A further object of this invention is to provide a fire detector and extinguisher system which delivers a fire fighting substance for a predetermined period of time when a fire is detected, then checks the results and delivers an additional quantity of fire fighting substance if the fire is still detected.

Still another object of this invention is to provide a fire detector and extinguisher system which disconnects the source of fuel from the structure being protected and controls the quantity and distribution of fire fighting substance used in fighting a fire.

The foregoing objects are achieved in the present invention by employing a plurality of light sensitive diodes, a plurality of relays, a timer and a plurality of solenoids to detect a fire and to shut off the fuel supply, all arranged in a predetermined manner. A fire fighting substance is sprayed on a selected area where the fire is detected. After a predetermined length of time the supply of fire fighting substance is shut off. The supply if turned on again only if the fire is detected again.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a cross-sectional view of a building using the present invention.

FIG. 2 illustrates one embodiment of the present invention.

FIG. 3 illustrates another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 there is shown a building 10 having rooms 11 and 12 containing the fire detector and extinguishing system. Rooms 11 and 12 contain a water heater 14 and furnace 15, respectively. Gas or other fuel is supplied through a fuel solenoid 17 to a pipe 18 which is connected to the heater and the furnace. Carbon dioxide or other fire fighting substance is supplied through a second pipe 20 and control solenoids 21 and 22 to a plurality of sprinkler heads 24-27. Solenoid 21 controls the quantity of carbon dioxide to heads 24 and 25. Solenoid 22 controls the quantity of carbon dioxide to heads 26 and 27. A plurality of sensors such as light sensitive diodes 29-32 supply signals to a control panel 34 when a fire is detected in the building 10. The diodes 29 and 30, for example, may be connected in a parallel circuit and other diodes may be connected in parallel with these diodes. If desired only one diode may be used in each room. The signals from the diodes cause the control panel to provide voltages which cause the fuel solenoid to shut off the supply of fuel to the heater and furnace. Signals from diodes 29 and 30 cause the control panel to provide voltage which causes solenoid 21 to open a valve and causes sprinkler heads 24 and 25 to spray carbon dioxide on a fire in room 11. Solenoid 22 controls a valve which controls the flow of carbon dioxide to sprinkler heads 26 and 27 in room 12.

FIG. 2 shows a circuit which can be used by the control panel 34 to sense a fire in building 10 and to control the solenoid shown in FIG. 1. In FIG. 2 two diodes are shown for each of the rooms 11 and 12 of FIG. 1; however, the operation of the circuit will be the same if a greater or lesser number of diodes is used. The first detector 36 includes light sensitive diodes 29 and 30, resistors 39-41, transistor 42 and a relay having a coil CR1 and first and second pairs of normally open contacts CR1A and CR1B. The contacts are shown to the right of the detector 36. Detector 37 includes light sensitive diodes 31 and 32, relay coil CR2, transistor 43 and resistors 45-47. The relay of detector 37 includes coil CR2 and first and second pairs of normally open contacts CR2A and CR2B.

A third relay includes a coil CR3, first, second and third pairs of normally open contacts CR3A, CR3B, CR3D and a pair of normally closed contacts CR3C. A fourth relay includes coil CR4, first and second pairs of normally open contacts CR4A and CR4B and a pair of

normally closed contacts CR4C. A timer 49 includes a timing mechanism a coil TD1 and a pair of normally closed contacts TD1A. A normally closed switch 57, a green bulb 52, a red bulb 53 and an alarm 54 are also shown. Alarm 54 may contain a deenergizing switch 54'.

The operation of the circuit of FIG. 2 will now be described. The light sensitive diodes have a high value of resistance between anode and cathode when no radiation from a fire falls on the diode. When radiation from a fire falls on the diode the resistance between the anode and the cathode has a low value so that current flows from anode to cathode. When there is no fire, diodes 29-32 have a high value so that current does not flow. When there is no current in the diodes there is no current between base and emitter of transistors 42 and 43. When there is no current between base and emitter of transistor 42 and 43 these transistors are rendered nonconductive so that no current flows in relay coils CR1 and CR3 and all relay contacts are as shown in FIG. 2. When the contacts are as shown in FIG. 2, a current flows from the 24 volt potential through contacts CR3 and green bulb 52 to ground, causing the green bulb to light, indicating that there is no fire.

When there is a fire in room 11 (FIG. 1), diode 29 and/or 30 has a low value of resistance so that a current I_1 flows from terminal 56 through resistor 39, diode 29 and/or 30, through resistor 40, from base to emitter of transistor 42, rendering transistor 42 conductive. When transistor 42 is rendered conductive, a current I_2 flows from terminal 56 through CR1, from collector to emitter of transistor 42. Current I_2 energizes relay CR1 so that contacts CR1A close and contacts CR1B close.

When contacts CR1A close, a current I_3 flows from terminal 56 through CR1A, TD1A and CR3 to ground. Current I_3 energizes relay CR3 so that contacts CR3A, CR3B and CR3D close and CR3C open. When CR3C opens the green bulb is no longer energized. When CR3B closes a current I_4 flows from terminals 56 through CR3B, CR4C and coil CR4 to ground. Current I_4 energizes relay CR4 so that contacts CR4A close, CR4B close, and a fraction of a second later contacts CR4C open. A portion of the current through contacts CR3B also flows through contacts CR1B and solenoid 21, causing solenoid 21 to open a valve so that carbon dioxide flows from sprinkler heads 24 and 25 into room 11 of FIG. 1. The closing of contacts CR3B also applies 24 volts to the timer TD1, causing the timer to start timing out the duration of time that the carbon dioxide will flow into room 11. When contact CR3A closes, the +24 volts from terminal 56 is coupled to the fuel solenoid 17 and to coil CR4. The 24 volts energizes solenoid 17, causing solenoid 17 to close a valve to shut off the fuel supply to the building. The 24 volts applied to coil CR4 keeps relay CR4 energized when contacts CR4C are open. Contacts CR4B now provide 24 volts to the red bulb 53 and to alarm 54 so that audible and visual warnings are provided.

After the 24 volts has been applied to timer TD1 for a predetermined period of time, TD1 opens contacts TD1A so that relay CR3 is deenergized. When relay CR3 is deenergized, contacts CR3B open so that timer TD1 and solenoid 21 are deenergized. Switch 57 remains closed so that relay CR4 and fuel solenoid 17 are still energized. The fuel supply is still shut off and the red bulb and alarm are still energized. Switch 57 must be opened by pressing a push button to deenergize

relay CR4 and fuel solenoid 17. Relay contacts CR3A are closed during the time that contacts TD1A are closed so that relay CR3 will remain energized if contacts CR1A should open when the fire is partially extinguished. If the fire is still burning when the timer is deenergized, relay CR1 will still be energized so that carbon dioxide will again be sprayed into room 11 as described above.

The operation of detector 37 is similar to the operation of detector 36. A fire in room 12 causes diode 31 and/or diode 32 to have a low value of resistance so that a current I_7 flows from terminal 56 through resistor 45, diode 31 and/or diode 32, through resistor 46, and from base to emitter of transistor 43, rendering transistor 43 conductive. When transistor 43 is conductive, a current I_8 flows from terminal 56 through relay coil CR2 and transistor 43 to ground. Current I_8 energizes relay CR2 so that contacts CR2A close and CR2B close. When contacts CR2A are closed relay CR3 is energized, causing contacts CR3B and CR3E to close and apply 24 volts to timer TD1. The closed contacts CR2B cause solenoid 22 to be energized so that carbon dioxide is sprayed from sprinkler heads 26 and 27 into room 12 of FIG. 1.

FIG. 3 illustrates another embodiment of the present invention using 110 volts A.C. to operate the timer, solenoids, alarm, bulbs and relays of a portion of the circuit. The operation of the circuit of FIG. 3 is the same as the operation of the circuit in FIG. 2. The timer, relays, light sensitive diodes, transistors and solenoids are standard items which can be readily purchased.

Latching circuits including relay CR3 are for functional purposes. The light sensitive diodes may act as a one-shot triggering system, but CR1 and CR2 relays must be closed for the duration of an operating cycle.

While the principles of the invention have now been made clear in an illustrative embodiment, there will be many obvious modifications of the structure, proportions, materials and components without departing from those principles. The appended claims are intended to cover any such modifications.

What is claimed is:

1. A fire detector and extinguisher system for use with a source of fuel and first and second fire extinguishers, said system comprising:

first and second light sensitive diodes, each having an anode and a cathode;

first and second relays, each having a coil and first and second pairs of normally open contacts, said coil of said first relay being coupled to said first diode, said coil of said second relay being coupled to said second diode;

third and fourth relays, each having a coil and first and second pairs of normally open contacts and a third pair of normally closed contacts;

first and second reference potentials;

a timer having a coil and a pair of normally closed contacts, said first pair of contacts of said first, said second and said third relays each being connected between said first potential and a first contact of said timer, said coil of said third relay being connected between said second potential and a second contact of said timer;

first, second and third solenoids each having first and second terminals, said first and said second solenoids each controlling the output of a correspond-

ing one of said extinguishers, said third solenoid controlling said source of fuel,
 a switch having first and second terminals, said first terminal of said switch being connected to said first potential, said first pair of contacts of said fourth relay being connected between said second terminal of said second terminal of said switch and a first terminal of said third solenoid, said second terminal of said third solenoid being connected to said second potential, said coil of said fourth relay being connected between said first and said second terminals of said third solenoid, said third pair of contacts of said fourth relay being connected between said first terminal of said third solenoid and a first end of said coil of said timer, a second end of said coil of said timer being connected to said second potential, said second solenoid and said second pair of contacts of said second relay being serially connected between said first and said second ends of said coil of said timer, said first solenoid and said second pair of contacts of said first relay being serially connected between said first and said second end of said coil of said timer, said second pair of contacts of said third relay being connected between said first potential and said first end of said coil of said timer; and

first and second bulbs each having first and second leads, said first leads of said first and said second bulbs being connected to said second potential, said third pair of contacts of said third relay being connected between said first potential and said second lead of said first bulb, said second pair of contacts of said fourth relay being connected between said first potential and said second lead of said second bulb.

2. A fire detector and extinguisher system as defined in claim 1 including:

first and second transistors each having a base, a collector and an emitter, said emitters of said first and said second transistors being connected to said second potential, said coil of said first relay being connected between said first potential and said collector of said first transistor, said coil of said second relay being connected between said first potential and said collector of said second transistor; and

first, second, third and fourth resistors, said first resistor being connected between said second potential and said cathode of said first diode, said anodes of said first and said second diodes being coupled to said first potential, said second resistor being connected between said cathode of said first diode and said base of said first transistor, said third resistor being connected between said second potential and said cathode of said second diode, said fourth resistor being connected between said cathode of said second diode and said base of said second transistor.

3. A fire detector and extinguisher system as defined in claim 1 including:

an alarm having first and second terminals, said first terminal of said alarm being connected to said first lead of said second bulb, said second terminal of said alarm being connected to said second lead of said second bulb.

4. A fire detector and extinguisher system as defined in claim 1 including:

first and second transistors each having a base, a collector and an emitter, said emitters of said first and said second transistors being connected to said second potential, said coil of said first relay being connected between said first potential and said collector of said first transistor, said coil of said second relay being connected between said first potential and said collector of said second transistor;

first, second, third and fourth resistors, said first resistor being connected between said second potential and said cathode of said first diode, said anodes of said first and said second diodes being coupled to said first potential, said second resistor being connected between said cathode of said first diode and said base of said first transistor, said third resistor being connected between said second potential and said cathode of said second diode, said fourth resistor being connected between said cathode of said second diode and said base of said second transistor; and

an alarm having first and second terminals, said first terminal of said alarm being connected to said first lead of said second bulb, said second terminal of said alarm being connected to said second lead of said second bulb.

5. A fire detector and extinguisher system for use with a source of fuel and first and second fire extinguishers, said system comprising:

first and second light sensitive diodes each having an anode and a cathode;

first and second relays each having a coil and first and second pairs of normally open contacts, said coil of said first relay being coupled to said first diode, said coil of said second relay being coupled to said second diode;

third and fourth relays each having a coil and first and second pairs of normally open contacts and a third pair of normally closed contacts;

first and second, third and fourth reference potentials;

a timer having a coil and a pair of normally closed contacts, said first pair of contacts of said first, said second and said third relays each being connected between said first potential and a first contact of said timer, said coil of said third relay being connected between said second potential and a second contact of said timer;

first, second and third solenoids each having first and second terminals, said first and said second solenoids each controlling the output of a corresponding one of said extinguishers, said third solenoid controlling said source of fuel,

a switch having first and second terminals, said first terminals of said switch being connected to said third potential, said first pair of contacts of said fourth relay being connected between said second terminal of said switch and a first terminal of said third solenoid, said second terminal of said third solenoid being connected to said fourth potential, said coil of said fourth relay being connected between said first and said second terminals of said third solenoid, said third pair of contacts of said fourth relay being connected between said first terminals of said third solenoid and a first end of said coil of said timer, a second end of said coil of said timer being connected to said fourth potential, said second solenoid and said second pair of contacts of

said second relay being serially connected between said first and said second ends of said coil of said timer, said first solenoid and said second pair of contacts of said first relay being serially connected between said first and said second end of said coil of said timer, said second pair of contacts of said third relay being connected between said third potential and said first end of said coil of said timer; and

first and second bulbs each having first and second leads, said first leads of said first and said second bulbs being connected to said fourth potential, said third pair of contacts of said third relay being connected between said third potential and said second lead of said first bulb, said second pair of contacts of said fourth relay being connected between said third potential and said second lead of said second bulb.

6. A fire detector and extinguisher system as defined in claim 5 including:

first and second transistors each having a base, collector and an emitter, said emitters of said first and said second transistors being connected to said second potential, said coil of said first relay being connected between said first potential and said collector of said first transistor, said coil of said second relay being connected between said first potential and said collector of said second transistors; and first, second, third and fourth resistors, said first resistor being connected between said second potential and said cathode of said first diode, said anodes of said first and said second diodes being coupled to said first potential, said second resistor being connected between said cathode of said first diode and said base of said first transistor, said third resistor being connected between said second potential and said cathode of said second diode, said fourth resistor being connected between said cathode of

said second diode and said base of said second transistor.

7. A fires detector and extinguisher system as defined in claim 5 including:

an alarm having first and second terminals, said first terminals of said alarm being connected to said first lead of said second bulb, said second terminal of said alarm being connected to said second lead of said second bulb.

8. A fire detector and extinguisher system as defined in claim 5 including:

first and second transistors each having a base, a collector and an emitter, said emitters of said first and said second transistors being connected to said second potential, said coil of said first relay being connected between said first potential and said collector of said first transistor, said coil of said second relay being connected between said first potential and said collector of said second transistor;

first, second, third and fourth resistors, said first resistor being connected between said second potential and said cathode of said first diode, said anodes of said first and said second diodes being coupled to said first potential, said second resistor being connected between said cathode of said first diode and said base of said first transistor, said third resistor being connected between said second potential and said cathode of said second diode, said fourth resistor being connected between said cathode of said second diode and said base of said second transistor; and

an alarm having first and second terminals, said first terminal of said alarm being connected to said first lead of said second bulb, said second terminal of said alarm being connected to said second lead of said second bulb.

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