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RESIDENTIAL FIRE HAZARD ALLEVIATION SYSTEM

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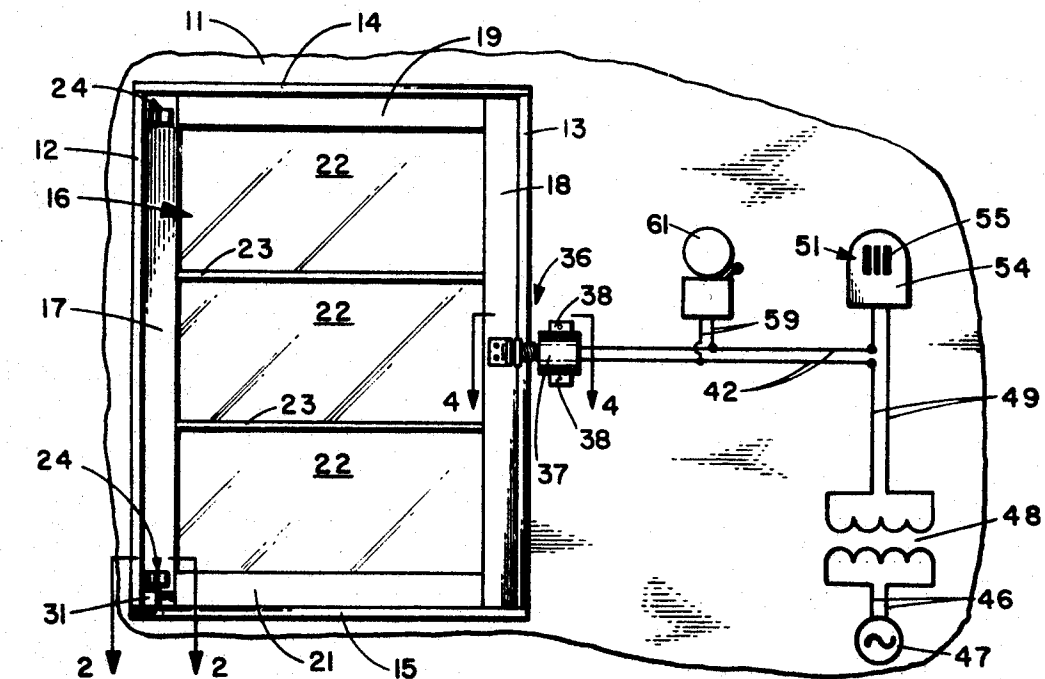


FIG. 1

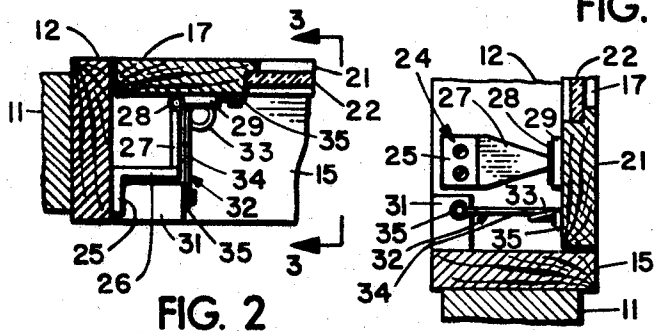


FIG. 2

FIG. 3

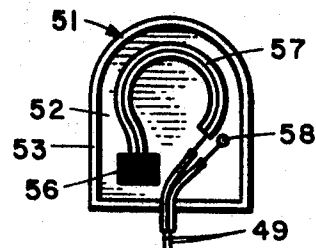


FIG. 6

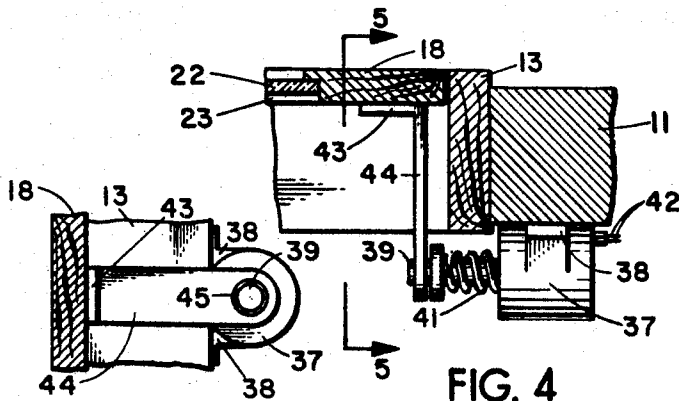


FIG. 5

FIG. 4

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RESIDENTIAL FIRE HAZARD ALLEVIATION SYSTEM

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ABSTRACT OF THE DISCLOSURE

A fire hazard alleviation system including a closure device mounted to swing about a vertical hinge line in an emergency escape opening formed through a residential building wall. An electrically operable latch device normally maintains the closure device in a position closing the wall opening. The system further includes normally open circuit means connecting the latch device and an electrically operable audible alarm device to an electrical energy source; the circuit means being provided with a thermostatic control for completing the circuit when the temperature within the building reaches a predetermined level. Completion of the circuit means activates the audible alarm and the latch device, permitting spring means to swing the closure device out of the wall opening.

This invention relates generally to a system for the alleviation of residential fire hazards, and more particularly to a system for warning householders of the outbreak of fire within the premises while automatically and simultaneously opening up an emergency exit route therefrom.

While it has been standard practice for many years, generally as a matter of compliance with state and local law, to provide fire alarm systems and fire escape devices for large public and commercial buildings, such as multi-storied hotels and office buildings or the like, private residential structures are rarely so equipped. This state of affairs is considered attributable, not only to the absence in almost all of the local building codes of any requirement that such equipment be provided, but to the nonavailability of simple and inexpensive systems of this type readily adapted for installation in residential structures. Yet, each year, thousands of fires break out during the hours of darkness within private dwellings while the occupants thereof lie asleep.

Upon the nocturnal outbreak of fire within a residential structure, the sleeping occupants thereof are often fatally asphyxiated as the result of the inhalation of smoke and fumes, or, lying unconscious as a result thereof, are burned to death. On the other hand, particularly in the case of the newer residences provided with central air conditioning plants and equipped with windows which cannot be opened, a sleeping occupant may awaken to find fire blocking all exits therefrom. Consequently, it will be seen that a great many persons, including entire families, needlessly lose their lives each year in nocturnally occurring residential fires.

Accordingly, an object of the present invention is the provision of a simple and reliable system for warning householders of the outbreak of fire.

Another object of the instant invention is the provision of an inexpensive and reliable system for warning sleeping householders of the nocturnal occurrence of the fire within the premises while simultaneously opening up an emergency exit route therefrom.

A further object of the present invention is the provision of a simple and inexpensive electrical activated system for producing an audible signal to warn sleeping householders of the nocturnal outbreak of fire within the premises while simultaneously and automatically opening up an emergency escape route therefrom.

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According to the instant invention, the foregoing and other objects are obtained by providing, in a residential building structure, at least one emergency escape opening formed through one of the walls thereof, and a closure device positioned in the wall opening and effectively hinged along an edge thereof to the wall. Also provided are spring means effectively coupled between the wall and the closure device for forcibly swinging the closure device upon its hinges out of the wall opening, as well as an electrically operable latch device which, when not electrically energized, is utilized to override the action of the spring means and maintain the closure device within the wall opening. The present invention further includes a suitable electrical energy source and a thermostatic control both connected in series with the electrically operable latch device; the thermostatic control operably completing the circuit only when the temperature in the vicinity thereof rises above a preselected level. The instant invention also includes an electrically operable audible signal alarm device connected in series with both the electrical energy source and the thermostatic control, and yet connected in parallel with the electrically operable latch device.

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1 is a fragmentary elevational view of the interior surface of a building structure wall carrying the fire alarm signal and emergency escape system of the present invention;

FIG. 2 is an enlarged fragmentary plan view, partially in section, of a portion of the building structure wall and a portion of the closure device positioned in the emergency escape opening formed in the wall, taken along the line 2-2 of FIG. 1;

FIG. 3 is an elevational view taken along the line 3-3 of FIG. 2;

FIG. 4 is an enlarged fragmentary plan view, partially in section, of another portion of the building structure wall and another portion of the closure device positioned in the emergency escape opening formed in the wall, taken along the line 4-4 of FIG. 1;

FIG. 5 is an elevational view taken along the line 5-5 of FIG. 4; and,

FIG. 6 is an enlarged elevational view of the interior of the thermostatic control utilized in the present invention.

Referring now more particularly to the drawing, wherein like reference numerals designate the same or identical parts throughout the several views, and more specifically to FIG. 1, there is shown the interior surface of a residential building structure wall 11. An emergency escape opening formed through wall 11 is framed by a pair of vertically extending side jamb members 12 and 13, as well as by horizontally extending head jamb member 14 and horizontally extending sill member 15. Positioned within the framed opening through wall 11 is a closure device, generally designated by the reference numeral 16, which, as illustrated in the drawing, may take the form of a conventional window. Closure device 16, as shown, includes a vertically extending stile member 17 disposed adjacent side jamb 12, a vertically extending stile member 18 disposed adjacent side jamb 13, a top rail member 19 disposed adjacent head jamb 14, a bottom rail member 21 disposed adjacent sill 15, and several panes of glass 22 separated each from another by intermediate rail members 23. Obviously, the framed opening formed through wall 11 could as readily extend downwardly to floor level, and the closure device 16 could

then take the form of a conventional door; the generic term "closure device" employed herein being intended to cover doors, windows, and other like devices.

Closure device 16 is coupled with wall 11 by hinges, generally designated by the reference numeral 24, connected to side jamb 12 and stile 17. Turning now to FIGS. 2 and 3, it will readily be seen that a hinge 24 includes an element having a planar section 25 attached to jamb 12 by flathead wood screws passing through countersunk holes formed through section 25, a planar section 26 extending perpendicularly from one vertical edge of planar section 25 and outwardly from side jamb 12, and a tapered planar section 27 extending perpendicularly from the vertical edge of planar section 26 remote from side jamb 12 and parallel to side jamb 12 in the opposite direction from planar section 25; the free vertical edge of tapered planar section 27 being provided with one component of a hinge line 28. A hinge 24 further includes another element having a planar section 29 attached to stile 17 by flathead wood screws passing through countersunk holes formed through section 29; the planar section 29 being provided along the vertical edge thereof nearest side jamb 12 with other components of hinge line 28. The elements of a hinge 24 are interconnected by passing a pin vertically through all of the components of hinge line 28.

A block 31 is secured to side jamb 12 and sill 15 along the indoor edge of the intersection thereof; the height of block 31 being less than the vertical distance between sill 15 and the lower extremity of the lowermost hinge 24, the width of block 31 being substantially equal to the distance between side jamb 12 and hinge line 28 of a hinge 24, and the depth of block 31 being less than the distance between planar section 26 of a hinge 24 and the indoor edges of side jamb 12 and sill 15. It will be noted that the width of block 31 has been somewhat exaggerated in FIG. 2 of the drawing for the purposes of illustration. The block 31 is utilized in mounting a spring, generally designated by the reference numeral 32, which tends to urge the closure device 16 out of the framed opening through wall 11. Spring 32 includes a coiled section 33 having a linear section 34 extending from each end thereof; the free end of each linear section 34 being formed into a substantially hooped section 35, through each of which the shank of a conventional headed fastener may be passed. In the absence of the application of external forces thereto, the linear sections 34 of spring 32 are substantially in alignment although extending in opposite directions from the ends of the coiled section 33 thereof.

The mounting of spring 32 in its operating position is accomplished by swinging closure device 16 upon hinges 24 outwardly to a position of perpendicularity with wall 11; connecting the free end of one of the linear sections 34 of spring 32 to that surface of block 31 lying parallel to the surface of side jamb 12 by means of a conventional headed fastener, such as a nail or a wood screw, having its shank extending through the hooped section 35 formed thereon into block 31; and then connecting the free end of the other of the linear sections 34 of spring 32 to the indoor surface of the bottom rail 21 of closure device 16 by means of a conventional headed fastener having its shank extending through the hooped section 35 formed thereon into bottom rail 21. In so connecting spring 32 to block 31 and bottom rail 21, the coiled section 33 of spring 32 should be positioned substantially to the indoor side of hinge line 28 of the hinges 24, as clearly shown in FIGS. 2 and 3 of the drawing, in order to allow closure device 16 to be swung upon hinges 24 to its closed position. Movement of closure device 16 to its closed position, as shown in the drawing, tightens the coiled section 33 of spring 32, storing energy therein sufficient to cause closure device 16 to swing upon hinges 24 back to its open position in the

absence of means for restraining closure device 16 against such movement.

The specific configuration of the hinges 24 and the spring 32 hereinbefore set forth, together with the use of the block 31, is considered to be particularly advantageous in that swinging movement of the closure device 16 causes no undesirable distortion of spring 32. Obviously, however, hinge and spring configurations other than those disclosed herein may be utilized in lieu thereof, as deemed desirable.

Closure device 16 is maintained in its closed position by an electrically operable latch device, generally designated by the reference numeral 36. Latch device 36 includes a conventional solenoid 37 provided with mounting brackets 38 used in connecting the solenoid to the inner surface of wall 11, as shown in FIGS. 1 and 4. Solenoid 37 is also provided with a substantially cylindrical plunger 39 composed of a magnetizable metal, such as soft iron or the like, as well as with spring means 41 arranged to normally maintain plunger 39 withdrawn from the exciting coil of solenoid 37, which is connected by conductors 42 to an electrical energy source, as more fully set forth hereinafter. Solenoid 37 is so mounted rigidly on the inner surface of wall 11 that, when the solenoid is not electrically energized, the free end of the plunger 39 thereof extends horizontally past the side jamb 13 into the opening in the wall 11 closed by closure device 16, as clearly illustrated in FIGS. 1 and 4 of the drawing.

Electrically operable latch device 36 further includes an L-shaped element having a planar section 43 abutting the indoor surface of stile 18 and rigidly connected thereto, and another planar section 44 extending perpendicularly from planar section 43 parallel to the surface of side jamb 13 when closure device 16 is in its closed position but spaced from side jamb 13 a distance sufficient to clear the same when closure device 16 is swung from its open to its closed position. Planar section 44 of the L-shaped element extends beyond the indoor edge of side jamb 13 and intercepts the central axis of plunger 39 of solenoid 37; planar section 44 being provided at this point of intersection with a hole 45 formed there-through slightly larger in diameter than the diameter of plunger 39 and through which plunger 39 normally extends when solenoid 37 is not electrically energized.

When closure device 16 is forcibly swung upon the hinges 24 against the action of spring 32 to its closed position, it becomes necessary to move the plunger 39 into the exciting coil of solenoid 37 in order to prevent the free end of the planar section 44 of the L-shaped element from contacting the side wall of plunger 39 at a point spaced from its free end. Plunger 39 may be moved into the exciting coil of solenoid 37 against the action of spring 41 by hand. When closure device 16 is disposed completely in its closed position, plunger 39 may be released, and the free end of plunger 39 will then be moved by the action of spring 41 into the hole 45 of planar section 44 of the L-shaped element, thus securely latching closure device 16 in its closed position.

The hereinbefore mentioned conductors 42 connecting the exciting coil of the solenoid 37 to an electrical energy source constitute a portion of a wiring circuit into which are also connected other salient components of the combination forming the subject matter of the present invention. Referring again now to FIG. 1 of the drawing, it will be seen that the wiring circuit includes conductors 46 connected between a source of electrical energy 47, preferably the conventional 110-volt alternating current circuit commonly installed in residential building structures, and a conventional transformer 48 where the EMF is stepped down to 10 volts. Obviously, if desired, electrical storage batteries may constitute the electrical energy source in lieu of the household circuit, and the transformer 48 may then be dispensed with. The wiring circuit further includes con-

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ductors 49 connected between transformer 48 and a thermostatic control, generally designated by the reference numeral 51.

Referring now to FIG. 6 as well as FIG. 1 of the drawing, it will be seen that the thermostatic control 51 includes a control box having a flat bottom wall 52 abutting the inner surface of residential building structure wall 11 and rigidly affixed thereto, a side wall 53 extending around the periphery of bottom wall 52, and a removable cover 54 utilized in closing the control box so defined. The cover 54 is provided with one or more slots 55 cut therethrough for assuring that the air temperature interiorly and exteriorly of the control box remains substantially equal. A block of electrical insulating material 56 is mounted within the control box, and is utilized in securing one end of an arcuate bimetallic element 57; the metallic strip thereof having the higher coefficient of thermal expansion lying along the inner surface of the arc. A metallic electrical terminal 58 is also mounted within the control box and suitably electrically insulated therefrom at a point that, when the air temperature within the residential building structure and within the control box is in the normal range of room temperatures, is spaced relatively near the outer surface of the outer metallic strip of element 57 and near the free end thereof. An end of one of the conductors 49 connected between transformer 48 and thermostatic control 51 is attached to arcuate element 57 and the corresponding end of the other of the conductors 49 is attached to electrical terminal 58. In the event that the temperature within the residential building structure begins to rise, the arcuate element 57 will begin to expand outwardly, and the outer surface of the outer metallic strip thereof will move nearer the electrical terminal 58. The precise preselected position of electrical terminal 58 is such that, as the temperature of the air within the control box reaches a predetermined level, say 150° F., the arcuate element 57 contacts the electrical terminal 58, effectively electrically connecting the ends of the two conductors 49 connected with thermostatic control 51.

One of the conductors 49 connected between transformer 48 and thermostatic control 51, rather than being continuously unbroken along its entire length, is severed at a desired point, and the ends of the conductors 42 remote from solenoid 37 are disposed adjacent the point of severance of the severed conductor 49. Each severed end of this conductor 49 is connected to the adjacent end of one of the conductors 42; in effect connecting solenoid 37 into the wiring circuit in series with electrical energy source 47 and thermostatic control 51. Further, an end of a conductor 59 is connected to each one of the conductors 42 at a desired point intermediate the ends thereof, and the other end of each of the conductors 59 is connected to a conventional electrically operable bell device 61 capable of producing a clearly audible signal; the bell device 61 thereby being also effectively connected into the wiring circuit in series with electrical energy source 47 and thermostatic control 51. The solenoid 37 and the bell device 61, when connected into the wiring circuit as hereinbefore set forth, are each connected in parallel with the other.

Obviously, the arrangement of the conductors within the wiring circuit may be modified, if desired, without altering the function thereof. One such modification, by way of example, might involve the connection of only one conductor 49 between transformer 48 and thermostatic control 51, and then the connection of the end of one of the conductors 42 remote from solenoid 37 directly with transformer 48 and the connection of the end of the other conductor 42 remote from solenoid 37 directly with thermostatic control 51. Likewise, bell device 61 may be connected into the wiring circuit in series with electrical energy source 47 and in parallel with solenoid 37 at other desired points.

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It will further be noted that the electrically operable latch device 36 may be rearranged, if desired, by mounting solenoid 37 upon stile 18 of closure device 16 with the plunger 39 extending toward side jamb 13. In such case, a hole bored into side jamb 13 into which plunger 39 may extend when fully withdrawn from solenoid 37, cooperating therewith to prevent relative movement between closure device 16 and side jamb 13, might be used in lieu of the L-shaped element of latch device 36, or the L-shaped element of latch device 36, suitably modified, might be mounted upon side jamb 13 for similar cooperation with plunger 39. If the solenoid is so mounted upon the stile 18 of closure device 16, the conductors 42 interconnected therewith could then be led along one of the intermediate rails 23 to leave closure device 16 at the edge thereof adjacent hinges 24.

In the event that fire breaks out within a residential building structure in which the system forming the subject matter of the instant invention is installed, the temperature of the air therewithin and within the control box will begin to rise. When the air temperature reaches the preselected critical level, the arcuate element 57 of thermostatic control 51 contacts the electrical terminal 58 thereof, completing the wiring circuit and simultaneously electrically energizing bell device 61 and the exciting coil of solenoid 37. As the audible signal produced by bell device 61 warns the occupants of the residential building structure of their danger, the current flowing through the exciting coil of the solenoid 37 sets up a magnetic field which draws plunger 39 into the solenoid coil, and the free end of plunger 39 emerges from the hole 45 formed in the planar section 44 of the L-shaped element carried by the closure device 16. Closure device 16, under the influence of spring 32, then swings outwardly to substantially a position of perpendicularity with respect to wall 11, thereby opening up an emergency exit route through wall 11 affording the occupants of the residential building structure an avenue of escape therefrom.

Obviously, many modifications and variations of the present invention are possible in the light of the foregoing teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A fire hazard alleviation system adapted to be installed in a residential building structure having an exterior wall provided with a building structure occupant traversable opening and carrying a closure device normally maintainable by resilient means in substantially a position of perpendicularity with respect to said wall yet swingable about a hinge line to a position for closing said wall opening, said fire hazard alleviation system comprising:

an electrical energy source;
an electrically operable signal device adapted to produce an audible signal when electrically energized;
an electrically operable latch device adapted to releasably interconnect said closure device and said wall for overriding the action of said resilient means and maintaining said closure device in said position for closing said wall opening, said latch device including a member moveable in response to the establishment of an electromagnetic field from a first position to a second position, said moveable member when in said first position being disposable to extend between and interengage said closure device and said wall, and means for establishing an electromagnetic field to move said moveable member from said first position to said second position;
normally open circuit means connecting said electrically operable signal device and said means for establishing an electromagnetic field of said latch device in series to said electrical energy source; and

thermostatic control means connected into said normally open circuit means responsive to a rise in the temperature of the air therearound to a critical level for closing said normally open circuit means, thereby electrically energizing said electrically operable signal device and said electrically operable latch device.

2. The fire hazard alleviation system according to claim 1 wherein said normally open circuit means includes electrical conductors connecting said electrically operable latch device and said thermostatic control means in series with said electrical energy source, and connecting said electrically operable signal device and said thermostatic control means in series with said electrical energy source.

3. The fire hazard alleviation system according to claim 1 wherein said thermostatic control means includes an arcuate bimetallic element in contact with a metallic electrical terminal when the temperature of the air therearound attains said critical level.

4. The fire hazard alleviation system according to claim 1 wherein said means for establishing an electromagnetic field of said electrically operable latch device comprises the electrically energizable exciting coil of a solenoid, and said moveable member of said electrically operable latch device comprises a magnetizable metallic solenoid plunger moveable within said exciting coil.

5. The fire hazard alleviation system according to claim 4 including spring means for normally maintaining said solenoid plunger withdrawn from said solenoid exciting coil.

6. For use in a residential building structure having an exterior wall provided with a framed opening traversable by building structure occupants, a fire hazard alleviation system comprising:

a closure device adapted to be connected by hinges to said framed wall opening for swinging movement between substantially a position of perpendicularity with respect to said wall and a position for closing said framed wall opening;

resilient means connected to said closure device and adapted to be further connected with said wall for normally maintaining said closure device in said position of perpendicularity with respect to said wall;

an electrical energy source;

an electrically operable latch device adapted to releasably interconnect said closure device and said wall for normally overriding the action of said resilient

means and maintaining said closure device in said position for closing said framed wall opening, said electrically operable latch device including a solenoid having an electrically energizable exciting coil and a magnetizable metallic plunger adapted to move in and out of said exciting coil, said solenoid being positionable with said plunger, when withdrawn from said exciting coil, extending between and interengaging said closure device and said wall;

normally open circuit means electrically interconnecting said exciting coil of said solenoid and said electrical energy source in series;

an electrically operable audible signal producing device electrically connected into said normally open circuit means in series with said electrical energy source; and

thermostatic control means connected into said normally open circuit means responsive to a rise in the temperature of the air therearound to a predetermined critical level for closing said normally open circuit means thereby electrically energizing the exciting coil of said solenoid to draw said plunger thereinto and electrically energizing said audible signal producing device.

7. The fire hazard alleviation system according to claim 6 wherein said electrically operable latch device includes spring means for normally maintaining said solenoid plunger withdrawn from said solenoid exciting coil.

8. The fire hazard alleviation system according to claim 6 wherein said thermostatic control means includes an arcuate bimetallic element in contact with a metallic electrical terminal when the temperature of the air therearound attains said critical level.

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