

[54] **FIRE ALARM SYSTEM**

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[22] Filed: **June 1, 1971**

[21] Appl. No.: **148,409**

[52] U.S. Cl.**340/409, 340/309.1, 340/332, 340/286**

[51] Int. Cl.**G08b 1/00, G08b 29/00**

[58] Field of Search....**340/409, 213, 332, 286, 309.1**

[56] **References Cited**

UNITED STATES PATENTS

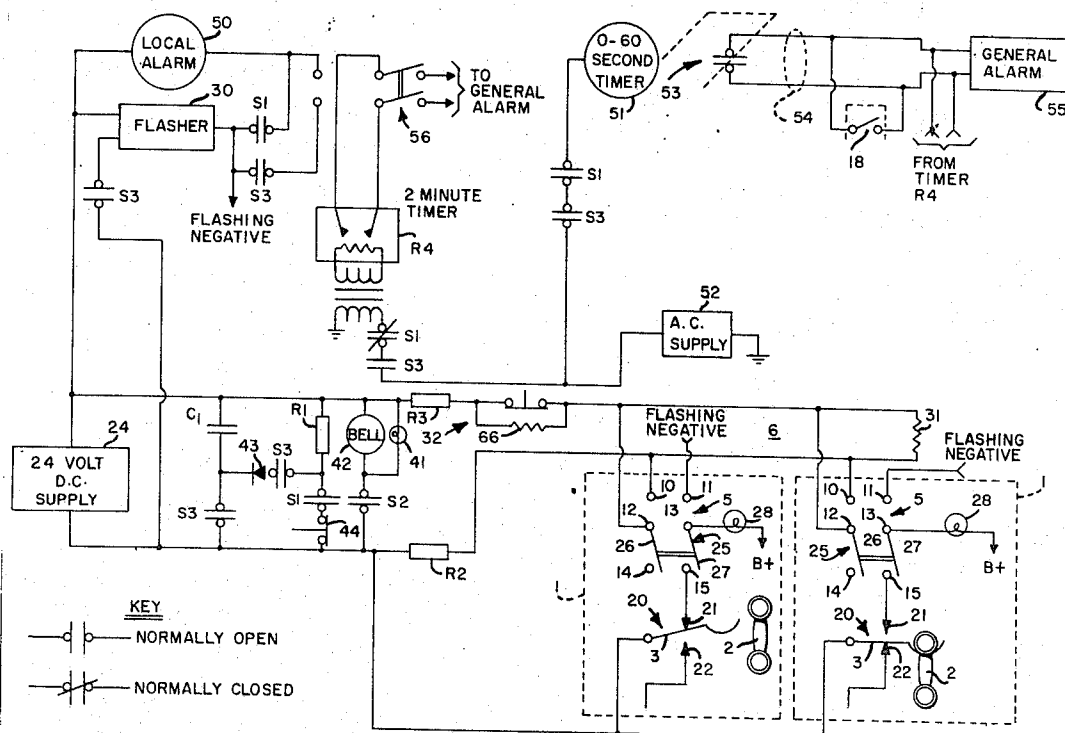
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[57] **ABSTRACT**

An alarm system is provided for use in conjunction with a conventional telephone or intercommunications system in which each telephone comprises a cradle circuit activated upon removal of a handset from its associated cradle. For indicating an alarm, there is provided in each telephone a selflocking alarm switch which is activated by a push-button made accessible only upon removal of the handset from the cradle.

4 Claims, 7 Drawing Figures



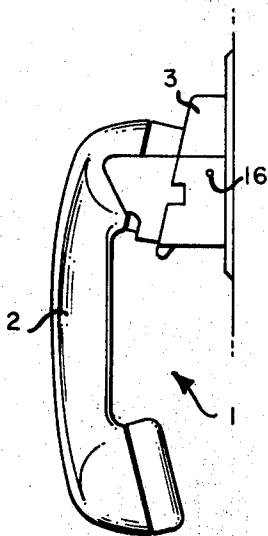


FIG. 1A

FIG. 1B

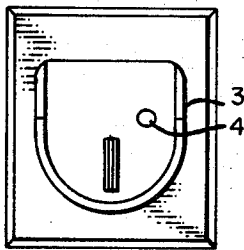
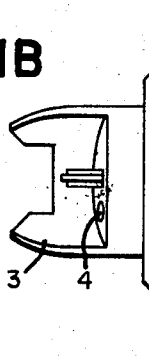


FIG. 1C

FIG. 2A

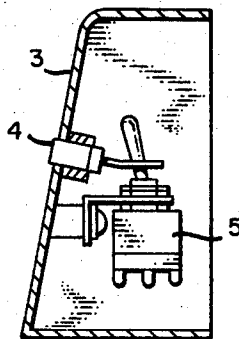
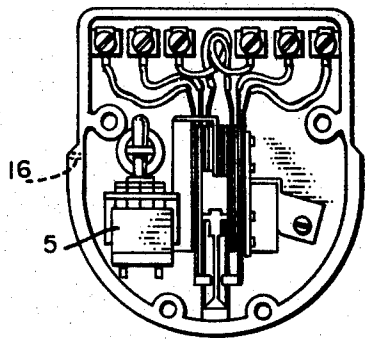


FIG. 2B

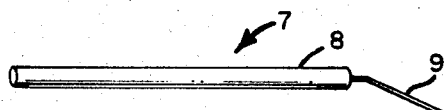
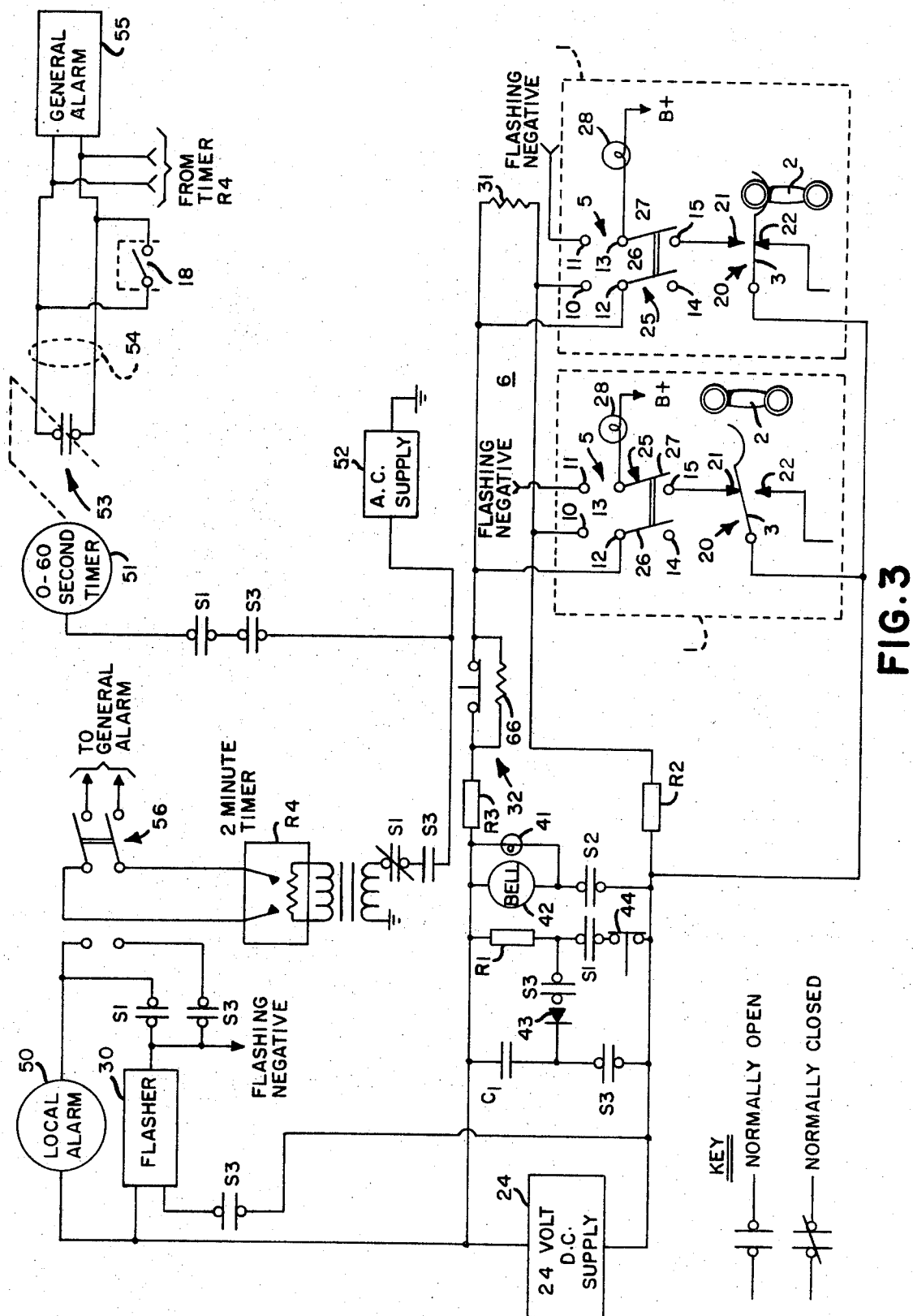


FIG. 2C

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FIRE ALARM SYSTEM

All of the alarm switches are coupled in parallel to form an alarm loop. In normal use, when a handset is removed from its associated cradle an annunciator lamp at a central switchboard is coupled to a source of steady dc power through the alarm switch. When in the event of an alarm, an alarm switch is activated, the annunciator lamp is switched from said source of steady dc power to a source of pulsating dc power to identify the origin of the alarm. Activation of the alarm switch further serves to short out a line termination impedance provided at the end of the alarm loop for energizing an alarm relay. The alarm relay controls a number of switches which serve to activate a local alarm at the central switchboard calling attention to an alarm condition and, at the same time, start a first timer for sounding a general alarm after a predetermined lapse of time. Means are further provided to inactivate the local alarm and first timer for permitting a determination of the nature of the alarm condition and the need for sounding a general alarm. Inactivation of the first timer starts a second timer which will either restart the local alarm or sound the general alarm after a second predetermined lapse of time unless the system is reset in the interim. Means are also provided for preventing resetting of the alarm circuits before all alarm switches are reset and for continuously monitoring the continuity of the alarm loop comprising the alarm switches.

BACKGROUND OF THE INVENTION

Conventional general alarm and evacuation signal systems are found in most if not all hospitals, hotels, schools and other public buildings. These systems provide for sounding a general alarm upon the activation of any one of a multiplicity of alarm indicating stations. To avoid the needless evacuation of a large building when a condition giving rise to an alarm is localized, it has been the practice to install plural, separate and distinct alarm systems or to code a particular alarm to indicate the origin of the alarm signal. The plural systems are obviously quite expensive to install and maintain and the coded systems do not generally appraise the public of the particular area in which an alarm condition exists or the nature of that condition. This lack of understanding is often found to cause fear and confusion and serious interruption of the daily routine and more often than not results in a general evacuation as a precautionary measure. Not infrequently, certain members of the public will initiate a false alarm which has the same effect. By generating a pre-alarm signal at a central switching station for purposes of identifying the existence of an alarm condition, its origin and nature, greater control can be had over the evacuation of a building or area. If such a system further provides for an automatic general alarm upon the lapse of a predetermined length of time, building and area security is preserved. Furthermore, if such a system is provided with means for checking the continuity of the alarm circuits running to each of the remote or outlying alarm indicating stations, alarm system security is preserved.

SUMMARY OF THE INVENTION

Accordingly, there is provided with the present invention an alarm system with means for continuously

checking an alarm loop comprising remote station alarm indicators for preserving alarm system security.

A principal feature of the present invention is the provision for a multiplicity of telephone assemblies each of which is provided with a switch assembly including an alarm push button which may be depressed by a caller to indicate an alarm. When a button is depressed, a local alarm is sounded at a central switching station and an indication is provided of the telephone assembly from which the alarm originated. Simultaneously, a first timer is started. This will cause, unless interrupted, a general alarm signal after a predetermined length of time. Means are provided at the central switching station to interrupt the local alarm and said first timer to permit an operator at the switching station to determine by means of the telephone the nature of the alarm and the requirement for sounding a general alarm. Interruption of the first timer, however, starts a second timer which will automatically sound a general alarm after a predetermined lapse of time unless in the interim the alarm system is reset.

These and other objects, features and advantages of the present invention will be apparent in the detailed description and the drawings described hereinafter.

DESCRIPTION OF THE DRAWINGS

FIG. 1a is an elevation view of a handset and cradle assembly used in the present invention.

FIG. 1b is a planed view of FIG. 1a.

FIG. 1c is a side elevation view of FIG. 1a.

FIG. 2a is a partially cut-a-way elevation view of the cradle assembly of FIG. 1a showing the alarm push button placement.

FIG. 2b is a partial cut-a-way side elevational view of FIG. 2a.

FIG. 2c is a perspective view of a special tool used in resetting the alarm system.

FIG. 3 is a schematic and block diagram of an alarm system in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. 1a-1c, there is provided in accordance with the present invention a telephone handset and cradle assembly 1 comprising a telephone handset 2, a cradle assembly 3 and an alarm push button 4 which is provided in cradle assembly 3. Push button 4 is mounted flush with the surface of cradle assembly 4 to avoid inadvertant activation by replacement of the handset on the cradle. It is made accessible to an operator thereof upon removal of handset 2 from cradle assembly 3. As shown in FIG. 2a-2b, push button 4 is mechanically coupled to an alarm switching means 5, such as a double-pole, double-throw switch. When push button 4 is depressed by an operator, it is normally maintained sufficiently flush with or below the surface of cradle 3 such that it is not able to be used for resetting switch means 5. A tool 7, shown in FIG. 2c is normally kept at the central switching station for use in resetting switch means 5. Tool 7 is provided with a handle portion 8, such as a dowel, and a relatively stiff wire 9 extending from one end thereof. Wire 9 is bent at an angle to dowel 8, such as 45°.

For resetting switch 5, the wire 9 of tool 7 is inserted through a pinhole 16 provided in the wall of cradle as-

sembly 3 adjacent switch 5 and is used to engage the toggle of switch 5 to return it to its normal position.

While described herein with respect to a single pair of telephone assemblies 1, it is to be understood that a plurality of more than two of such assemblies 1 and their associated switches 5 will be normally coupled in parallel to form an alarm loop 6, as shown in FIG. 3.

Referring to FIG. 3, alarm switch means 5 is provided with six contacts 10-15. Contact 14 is normally unconnected. Contact 15 is electrically connected to a switch 20 comprising contacts 21-22 and cradle 3. When handset 2 is removed from cradle 3, cradle 3 engages contact 21. A source of continuous dc power 24, of typically 24 volts, is coupled via cradle 3 and contact 21 of switch 20 to contact 15 of switch 5. A wiper 25 comprising a pair of conductive members 26, 27 is normally positioned between switch contacts 12 and 14 and switch contacts 13, 15, respectively. Power on switch contact 15 is thereby passed, via switch contact 13, to a central console or switching station, not shown, to steadily illuminate an annunciator room lamp 28 for indicating which ones of said multiplicity of telephone handsets 2 have been removed from its associated cradle 3.

It is understood that except as hereinafter described with respect to indicating an alarm, telephone handset and cradle assemblies 1 are used in a conventional manner as in any telephone or intercom system. When, however, a caller or operator of the telephone handset and cradle assembly 1 depresses a button 4, switch 5 coupled thereto will be switched from its normal position, making contact with contact 14, 15, to its alarm position whereby conductive members 26, 27 make contact with contacts 10, 11, respectively. With switch 5 in the alarm position, power to the console annunciator room lamp 28 associated therewith is switched from the steady or continuous direct current power source 24 to a source 30 of discontinuous or pulsating power commonly called a flasher. Flasher 30 is coupled across source 24 via a normally open switch S3 for generating said pulsating dc when S3 is closed in response to an alarm indication as will be described. This provides for identifying among the several handset and cradle assemblies 1, the assembly 1 from which an alarm is originating. Simultaneously, the switching of conductive member 26 from contact 14 to contact 10 of switch 5 causes a shorting out of a line termination impedance 31 located across the end of alarm loop 6. Shorting out impedance 31 initiates a local alarm signal at the central switching station.

Impedance 31 also serves to provide a continuous current loop for alarm loop 6 which is continuously checked for continuity by means of a supervisory relay R2 coupled in series with impedance 31, supply 24, an alarm relay R3 and a room reset push button 32.

For convenience, each of the relays used in the present invention are designated by an R and each switch controlled by a relay is designated by an S. Thus relay R2 controls switch S2. Relay R3 controls switch S3. As shown in the drawing and explained in the key, switch S2 is normally open. A switch with a diagonal line cutting across its contacts is normally closed.

There are provided in the present invention four relays, a hold relay R1, a loop supervisory relay R2, an alarm relay R3, and a thermal time out relay R4. These relays are used in the following sequence.

An alarm loop supervisory current from supply 24 is continuously passed through the coil of R2 through the line termination impedance 31 to relay R3 by way of normally closed room loop reset push button 32, the function of which will be hereinafter described. The supervisory relay R2 is adjusted to pull in or energize on the current due to the normal loop impedance. The alarm relay R3, however, is adjusted to only pull up or energize when the end of line terminating impedance 31 is shorted out of loop 6 upon the switching of one of the alarm switches 5. Supervisory relay R2, when de-energized, closes normally open switch S2 coupled in series with a trouble light 41 and a trouble alarm bell 42 connected in parallel across the 24 volt power supply 24 to indicate a break in continuity in alarm loop 6.

When alarm relay R3 is energized, all normally open and normally closed switches S3 controlled by relay R3 change state. When alarm relay R3 is energized, current is applied to the coil of hold relay R1 from a capacitor C1 of large value, typically 50 μ fd, via a diode 43 and a normally open switch S3. This current energizes relay R1. Since normally open switch S1 coupled thereto is then closed, R1 is held by a back contact supplying current via a normally closed hold push button 44. Energizing of R1 further starts a local alarm or signal generator 50 coupled across flasher 30 and a first timer 51 coupled to an ac supply 52 through normally open switches S1 and S3 which are then closed.

A normally open switch 53 is mechanically coupled as shown in dotted lines to timer 51. Timer 51 closes switch 53 and shorts out a normally opened pair 54 coupled to a general alarm signal generator 55 for sounding a general alarm signal. Typically timer 51 is set to closed switch 53 within 15 seconds after an alarm indication is provided by the switching of a switch 5 in any one of telephone and handset assemblies 1.

To determine the existence of an alarm condition, its nature and the need for a general evacuation, provision is made, however, for an operator at the central console receiving the initial alarm signal to press a hold button 44 which is coupled to and releases hold relay R1 transferring the power from timer 51 to a second timer R4, typically a thermal time out relay coupled to ac supply 52 by a normally open switch S3 and a normally closed switch S1. Typically, timer R4 provides 2 minutes for the operator to reset the system before a general or local alarm is automatically sounded. A double-pole, double-throw switch 56 is provided for selectively coupling of the output of relay R4 to local alarm 50 to re-initiate starting of alarm 50 or to general alarm 55 for sounding a general alarm as is desired in a particular application. There is also coupled to general alarm 55 a switch 18. Switch 18 is located at the central switching station and is used to short normally open line pair 54 for sounding a general alarm immediately if such action is determined to be required.

Flasher 30 is coupled to the power supply 24 and local alarm 50 through normally open switches S1 and S3. The output of flasher 30 is also applied to each of telephone handset and cradle assemblies 1 to provide the pulsating dc current for flashing the annunciator lamp on the central switching console, when switch 5 is in the alarm position.

Re-setting of the alarm system of the present invention before switches 5 are re-set or returned to normal is prevented by a resistor 60 bridging the room reset

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push button 32 which maintains sufficient current flow in loop 6 to hold the alarm relay R3 energized. Re-setting all of switches 5 in the telephone handset and cradle assemblies 1, however, transfers the associated room annunciator lights 28 from the source of pulsating power, flasher 30, to the source of steady dc power supply 24 giving notice to the central console operator to re-set the room reset button 32. Depressing button 32 then de-energizes relay R3 and returns the entire alarm system to normal.

It will be appreciated that in the event relay R4 is coupled to local alarm 50 or general alarm 55 and the system is not re-set within two minutes after pressing of hold button 44, local alarm 50 or general alarm 55, as the case may be, will begin sounding through the output of the thermal relay R4.

What is claimed is:

1. An alarm system comprising an alarm loop a first switching means coupled to said alarm loop, a first local alarm signal generating means, a second general alarm signal generating means, a first timer, a second timer; a second switching means coupled to said first switching means and said first alarm signal generating means for generating a first local alarm signal in response to switching of said first switching means, a third switching means coupled to said first switching means and said first timer for starting said first timer in response to switching of said first switching means; a fourth switching means coupled to said first timer and to said second general alarm signal generating means for generating a second general alarm signal after said first timer has run for a first predetermined period of time; a fifth switching means coupled to said first local alarm signal generating means, said first timer and said second timer for selectively interrupting the operation

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of said first alarm signal generating means and said first timer and starting said second timer; and means coupled to said second timer for generating a third alarm signal after said second timer has run for a second predetermined period of time.

2. An alarm system according to claim 1 further comprising switch means coupled to said second timer and to said first local alarm generating means and said second general alarm generating means for selectively generating said local and said general alarm.

3. An alarm system according to claim 1 further comprising means coupled to said first switching means for continuously checking the continuity of said alarm loop.

4. An alarm system according to claim 1 further comprising: a source of continuous power; a source of pulsating power; a telephone handset and cradle assembly coupled to a central console wherein an annunciator lamp is normally coupled to said source of continuous power when said handset is removed from said cradle; means for mounting said first switching means within said handset; and means coupled to said first switching means for changing said first switching means from a first state to a second state, said changing means being so positioned within said assembly that it is normally accessible only upon removal of said handset from said cradle; and said first switching means comprises means for switching said annunciator lamp from a said source of continuous power to said source of pulsating power when said first switching means is changed from said first state to said second state for indicating that said first switching means has been switched in said telephone handset and cradle assembly.

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