

FIRE ALARM SYSTEM

This invention relates to a fire alarm system adapted to provide manually operable alarm signal, and more particularly to a system which will both protect the disabled, the sick, the old and bedridden and other physically handicapped people from fire and enable them to effect an alarm signal whenever they want to get in touch with any other person urgently.

Those who have difficulty in walking, moving freely, seeing, hearing and speaking, often cannot easily communicate to others when they discover an unusual situation, such as for example the breakout of fire and intrusion of a robber. Consequently, detection comes too late and this may result in the spread of fire and/or accidental death by fire, or injury obtained from the robber or burglar. Inpatients in hospital can call a doctor or nurse by pushing a switch near their bed, however, in the case of bedridden old people in their own homes, they cannot ask for help by calling others when, for example, their condition takes a sudden change for the worse, because there is no such device in the home. Further, these known devices produce an alarm sound or calling out sound by depression of a push-button switch. However, those who are hard of hearing cannot actually hear the

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alarm sound produced when they push a push-button switch. Further, with a flashing light alarm device, although the alarm signal may be observable to others, it cannot be seen to those having poor eyesight. Therefore, those who have poor hearing and eyesight cannot confirm whether correct alarm sound has been produced, thereby causing them distress.

An object of this invention is to provide for persons who have difficulty with their eyesight and hearing a system which can confirm that an alarm informing the occurrence of an unusual situation has correctly produced, by means of vibration transmitted through the body.

An object of an embodiment of this invention is to provide a fire alarm system for setting up in the home of a disabled person, which is able to detect fire and to produce an alarm directed toward the outside of rooms and/or the house, thereby to make the occurrence of an unusual situation known to the neighbourhood.

According to the present invention there is provided a fire alarm system, comprising a fire sensing means and alarm means actuated by the said sensing means which produce an alarm signal wherein a switch box is provided having a control switch for actuating the alarm means directly and vibration means are provided at the switch box which are also actuated directly by the control switch.

Embodiments of the present invention will now be described by, way of example, with reference to the accompanying drawings: in which

5 Fig. 1 is a perspective view of the main body of a fire alarm system provided with a calling out function according to this invention.

Fig. 2 is a side view showing a mode of use for an embodiment of the system according to this invention.

10 Fig. 3 is an electric circuit of the alarm means of an embodiment according to this invention.

Fig. 4 is a sectional view of a switch box of an embodiment of this invention.

Fig. 5 is an electric circuit for the switch box shown in Fig. 4.

15 In Fig. 1, a main body 10 is shown which includes a stationary body 12 and a movable body 14, and which is mounted in a location sensitive to hot air current caused by a fire to ceiling 16, wall 18 and other structure, by means of wood screws or double
20 sided adhesive tape. The movable body is provided with alarm means for producing an audible alarm

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signal and fire sensing means for sensing fire.

Various structures may be adopted as the alarm means. An example of an electric circuit for alarm means is shown in Fig. 3. The alarm means comprise
5 an oscillator circuit, a control circuit for intermittently controlling the operation of the oscillator circuit, a fire detection element for controlling the above element so as to operate at the time of a fire, an amplifier for amplifying an
10 output signal of the oscillator circuit and a speaker for converting the signal amplified by means of the amplifier into the acoustic alarm.

In the oscillator circuit, an astable multi-vibrator including transistors Tr3 and Tr4 is adopted.
15 The collector of the transistor Tr3 and that of the transistor Tr4 are connected to a lead 20 which is the

common voltage supply line, through respective resistors R7 and R8. Further, the collector of the transistor Tr3 is coupled to the base of the transistor Tr4 through the capacitor C3. The collector of the transistor Tr4 is coupled to the base of the transistor Tr3 through the capacitor C5. The emitter of the transistor Tr3 is directly grounded. The emitter of the transistor Tr4 is connected to the base of the transistor Tr5 as explained below. This astable multivibrator produces an audible frequency signal of, for example, about 700 Hz. On the other hand, a control circuit for intermittently controlling the operation of the astable multi-vibrator includes transistors Tr1 and Tr2. The emitter of the transistor Tr2 is grounded through a time constant circuit T2 consisting of a resistance R3 and capacitor C4 and connected to the bases of the transistors Tr3 and Tr4 through resistances R5, R6 respectively. The base of the transistor Tr2 is connected to the collector of the transistor Tr1 and then to the lead 20 through a common resistor R2. The collector of the transistor Tr2 is connected to the lead 20 through the resistance R4 and then to the base of the transistor Tr1 through the capacitor C2. Between the base and the collector of the transistor Tr1, a time constant circuit T1 consisting of a resistance R1 and a capacitor C1 is connected. The emitter of the transistor Tr1 is directly grounded. In the fire

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sensing means a bimetal system fire detection element 22 is adopted. The fire detection element is connected between the lead and the positive terminals of batteries 24 and 26 which are power sources
5 provided within the main body. The fire detection element may be a thermistor, a ballister or some other semiconductor element.

The amplifier circuit consists of a transistor Tr5. The collector of the transistor Tr5 is connected
10 to the positive terminals of the batteries as the power source through the speaker 28. The negative terminals of the batteries are grounded. The base of the transistor Tr5 is connected to the emitter of the transistor Tr4 as mentioned above.

15 When the fire is detected by means of the fire detection element, a current is supplied to the astable multivibrator and the control circuit from the battery. When a voltage is applied to the base of the transistor Tr2 through the resistance R2 the
20 transistor Tr2 becomes conductive. The capacitors C1 and C2 are gradually charged through the resistance R4. When along with the charge of the capacitors, the base voltage of the transistor Tr1 becomes higher than the threshold level, the transistor Tr1 is
25 brought into the conductive state. As a result, the transistor Tr2 is cut off. The capacitor C4 is

sufficiently charged before the transistor Tr2 becomes conductive and then cut off. When the transistor Tr2 is cut off, the capacitor C4 is gradually discharged through the resistance R3, where
5 whereby the terminal voltage across the capacitor C4 is gradually decreased. When it reaches a certain determined level, the astable multivibrator starts to oscillate. During this time, the capacitor C1 is discharged through the resistance R1, while the
10 transistor Tr1 is cut off after the lapse of a certain determined time. As a result, a voltage is again applied to the base of the transistor Tr2 through the resistance R2, so that the transistor Tr2 is brought into the conductive state. Thus, the terminal voltage
15 across the resistor R3 increases and the astable multivibrator stops the operation. The operation is repeated while the fire detection element is detecting the fire. The intermittent oscillation signals from the astable multivibrator are amplified by means of the
20 transistor Tr5 and produced as an acoustic alarm from the speaker 28. The oscillation frequency of the astable multivibrator is almost determined with the time constant of the resistance R6 and the capacitor C3 and that of the resistance R5 and the capacitor C5.
25 When the time constant of the resistance R6 and the

capacitor C3 is chosen differently from that of the resistance R5 and the capacitor C5, the tones of the acoustic alarm are conveniently made different. Further, the emitter of the transistor Tr4 is grounded through the base of the transistor Tr5, so that it is advantageous if the value of the collector resistor R8 of the transistor Tr4 is chosen somewhat smaller than that of the collector resistor R7 of the transistor Tr3 in such a manner that the voltage drop between the base and the emitter of the transistor Tr5 is compensated. A diode D connected in parallel with a driving coil of the speaker will protect the transistor Tr5.

Two batteries are connected in parallel with each other in order to avoid a drop in the terminal voltage of the batteries. Check means consisting of an ammeter 30 and a voltage dividing resistance R9 and a switch 32 are connected in series with the batteries. Whenever the switch is closed, the battery voltage can be checked by means of the ammeter. Further, when checking whether each circuit of the main body is operating normally, a switch 34 is connected in parallel with the fire detection element.

The electrical circuit described consists of

transistors, resistances and capacitors in a discrete manner, however, it may also be formed with field-effect transistor (FET) or linear integrated circuits so as to effect the same functions as mentioned above.

There is an external speaker 36 which serves as other alarm means in series with the above speaker 28, and is connected to a jack 38 of the main body through a jack 40 and a wire 42. The external speaker 36 is set up outside a room or to the exterior of a house, when preferably, those of a waterproof type are used. As shown in the drawing, when the external speaker is connected in series with the speaker of the main body, the amount of consumption of the batteries will become smaller compared with the case when it is connected in parallel with that of main body, so that it can be sounded for a long time.

Apart from the main body, there is a switch box 44, on which a control switch 46 is provided so as to operate the alarm means directly (Fig. 4). The control switch is connected in parallel with the fire detection element of the alarm means, when a jack 52 is connected to a jack 50 provided on the main body. Preferably, the control switch is a

push-button switch with a lock. This push-button switch with lock will operate in such a manner that when the switch button is pushed once, it will remain in a locked state and when it is pushed again its unlocked state is restored. Therefore, once a disabled person has pushed the switch button, a locked state is maintained without continuous pushing of the button, which is especially convenient to such people. The switch box provided with rubber legs on its back may rest on a table or the like, attached thereon with double sided adhesive tapes or screws, or hung down with suitable fastness.

If the switch box is placed near the pillow or the like of a disabled person confined to a bed 54, he can produce an audible alarm signal through respective speakers provided on the main body, outside the room or exterior to the house, by pushing (closing) the control switch, whenever he wants to call for help.

Figs 4 and 5 show vibration means within a switch box 44 and controlled by a control switch 46. By way of example, an electro-magnetic vibrator which will mechanically vibrate when electricity is supplied can be used as the vibration means. A vibrating type buzzer 56 is shown in the drawing. The buzzer is attached to a base plate 58 in the switch box, preferably

at one spot by means of a support 60, so that when the switch is closed, a vibration sound is produced as well as the whole switch box vibrating.

Therefore, the vibration can be transmitted to those persons having difficulty with hearing or
5 eyesight through the switch box, thereby making known to them that an alarm signal is being produced. If the weight of a switch box is too small, a suitable weight 62 may be attached. Further, a jack 64 is connected to a jack 66 which is connected to
10 the negative side of the batteries.

In another embodiment of the invention, battery meter and vibration means are provided in a switch box and these are controlled by means of a control switch. A lamp whose operation is
15 controlled by the control switch may also be provided. The meter is provided for connection with jacks 50 and 66 of the main body. When the control switch is closed, residual charge in the batteries can be checked by mean of the deflection of
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the meter needle so that persons having difficulty in hearing can also confirm visually that an audible alarm signal is being produced.

- Further, by means of jacks of the main body,
- 5 branch devices may be connected thereto, each having a fire detection element and being provided at remote locations from the main body, for example, in neighbouring rooms or different rooms (not shown in the drawing).

CLAIMS

1. A fire alarm system, comprising a fire sensing means and alarm means actuated by said said sensing means which produce an alarm signal wherein a switch box is provided having a control switch for actuating the
5 alarm means directly and vibration means are provided at the switch box which are also actuated directly by the control switch.
2. A system according to claim 1, wherein the alarm means are provided on a main body and at a position
10 remote from said main body.
3. A fire alarm system comprising a main body for mounting to a ceiling, wall and other structures, which has fire sensing means for sensing the presence of fire and alarm means for producing an alarm signal; further alarm
15 means are also provided for producing an alarm signal at a position remote from the main body; and a switch box separate from said main body; which has a control switch and vibration means for causing vibration, said alarm means and said vibration means being actuable by
20 said control switch.
4. A system according to claim 1, 2 or 3, wherein the vibration means comprise a buzzer.
5. A system for disabled people according to any preceding claim, wherein the switch box is located at



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a position such that the disabled, sick bedridden old persons, and other persons having difficulty in hearing, eyesight, speaking and the like can operate it at any time.

5 6. A fire alarm system having calling out function comprising a main body for attaching to a ceiling wall and other structures, which is provided with a fire sensing means for sensing the presence of fire, alarm means for producing an alarm signal and batteries serving as a power source for these means;
10 further alarm means for producing alarm signals at positions remote from the main body; a switch box which is separate from said main body, and a control switch, a battery meter and vibration means located within
15 as well as said battery meter and said vibrations means being controlled by said control switch.

7. A system according to claim 6, wherein the switch box has a lamp whose operation is controlled by the control switch.

20 8. A fire alarm system substantially as herein described with reference to Figures 3 to 5 with or without reference to either of Figures 1 and 2 of the accompanying drawings.