

[54] **PERSONAL DEFENCE DEVICE**
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 [51] **Int. Cl.**..... H01h 9/06
 [58] **Field of Search** .. 340/220, 224, 321; 200/52 R, 200/60, 61.86, 61.93, DIG. 2

[57] **ABSTRACT**

The invention relates to a switching device adapted for use in instruments of personal defence to actuate two or more electrically or mechanically operated components of which at least one is electrically operated and at least one is mechanically operated. The device may be adapted for use in conjunction with the push button system of a torch, the push button system being operable both partially so as to actuate only the circuit for a bulb, and fully so as to actuate also a noise alarm device and mechanically actuate means capable of emitting a spray jet.

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8 Claims, 20 Drawing Figures

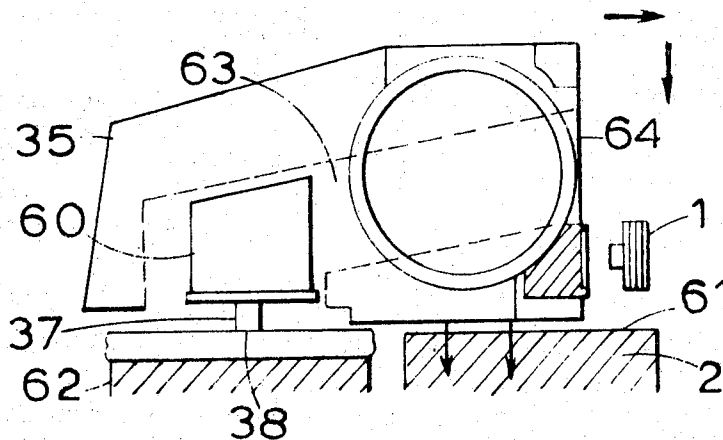


FIG. 1.

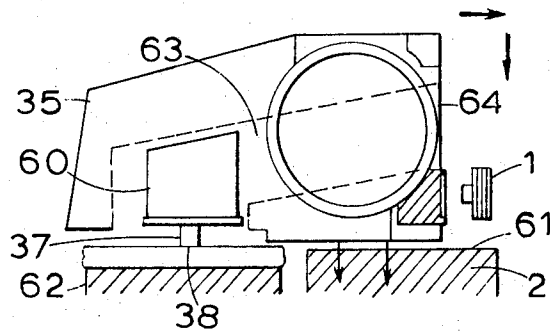


FIG. 2.

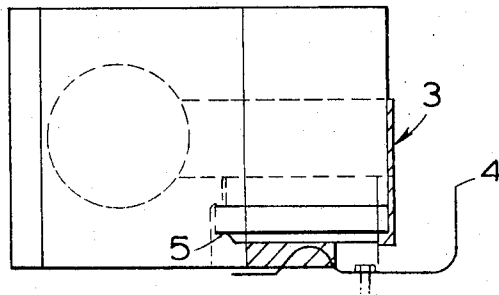


FIG. 3.

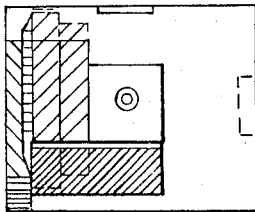


FIG. 4.

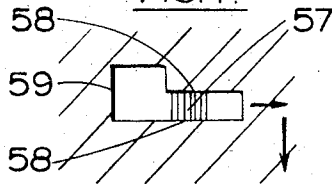


FIG. 5.

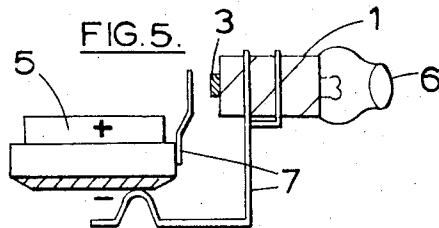


FIG. 6.

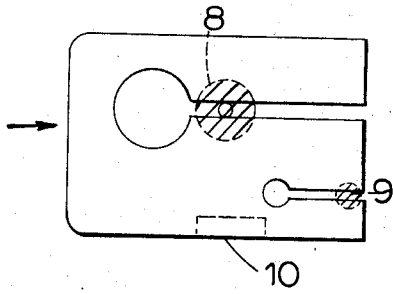


FIG. 7.

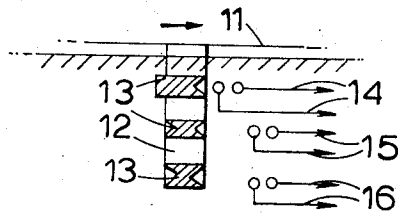


FIG. 8.

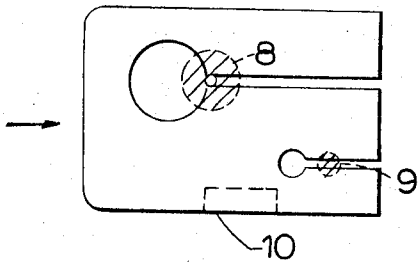


FIG. 9.

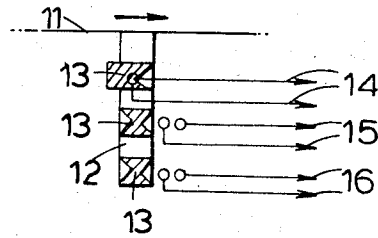


FIG. 10.

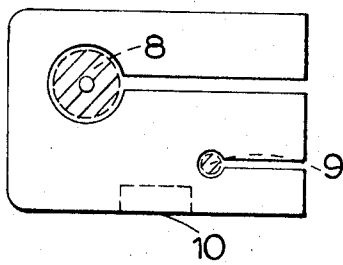


FIG. 11.

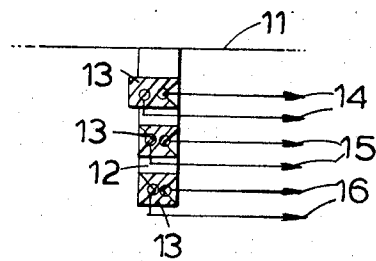
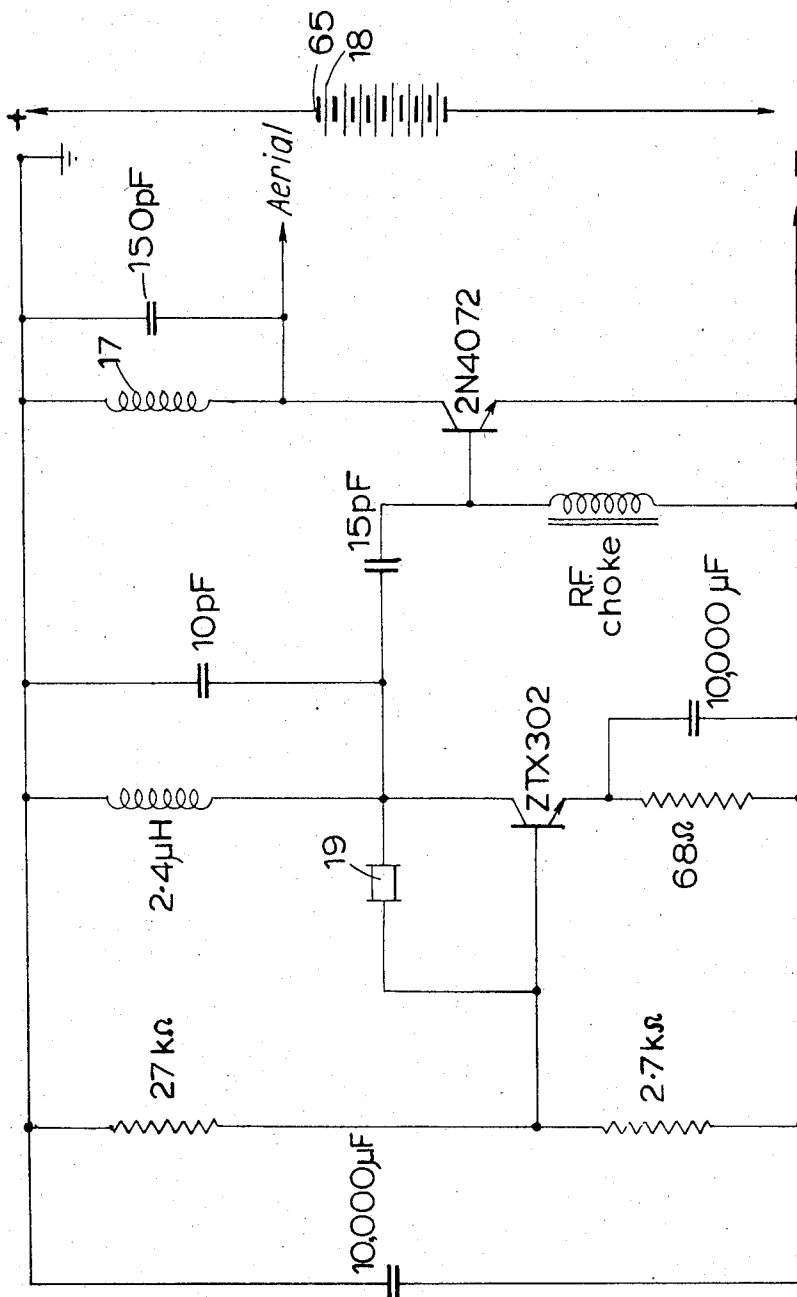


FIG. 12.



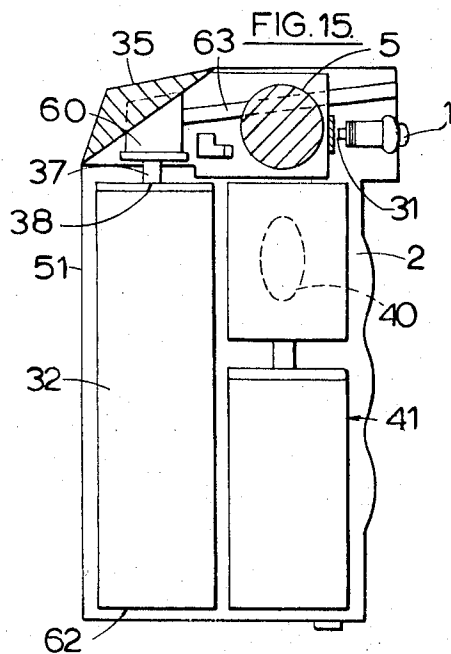
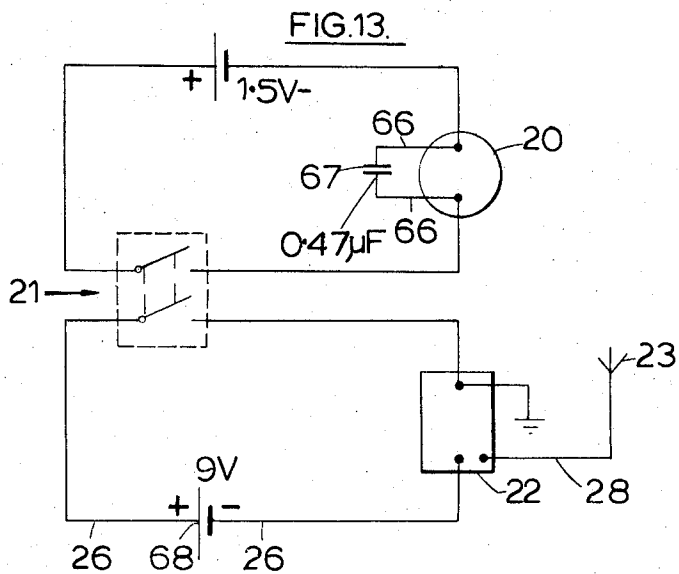


FIG. 14.

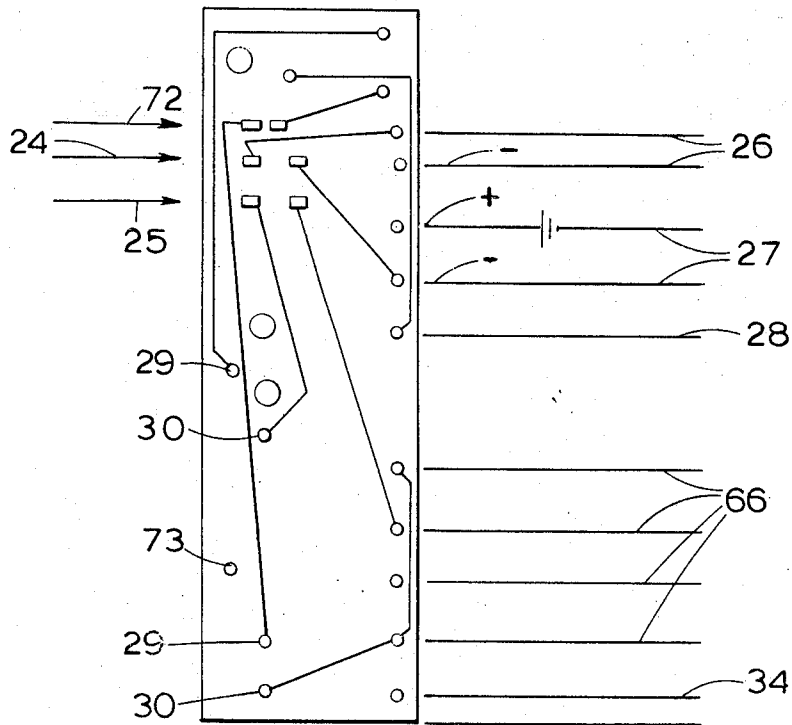
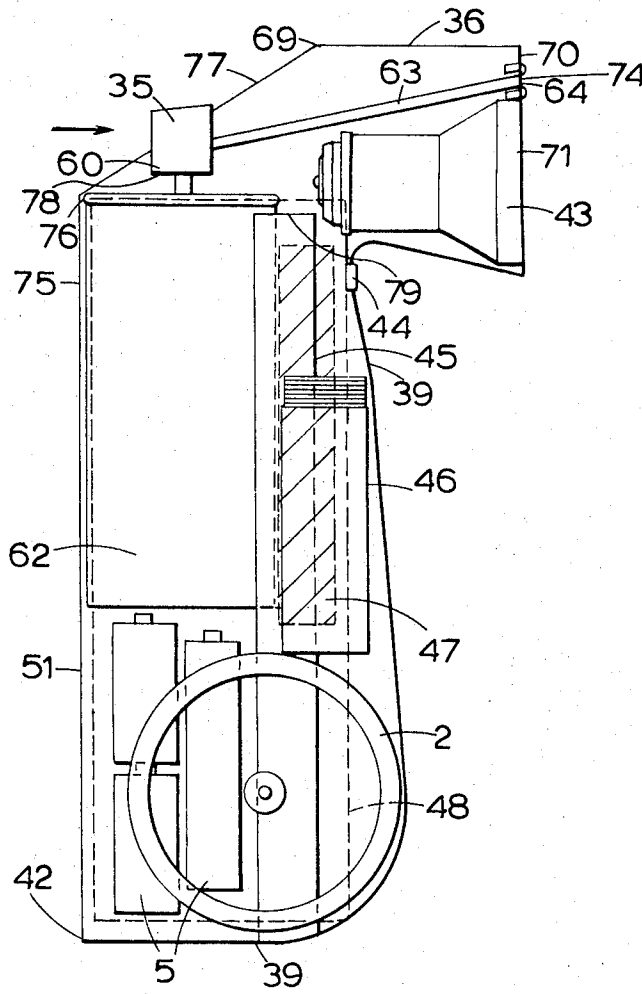


FIG. 16.



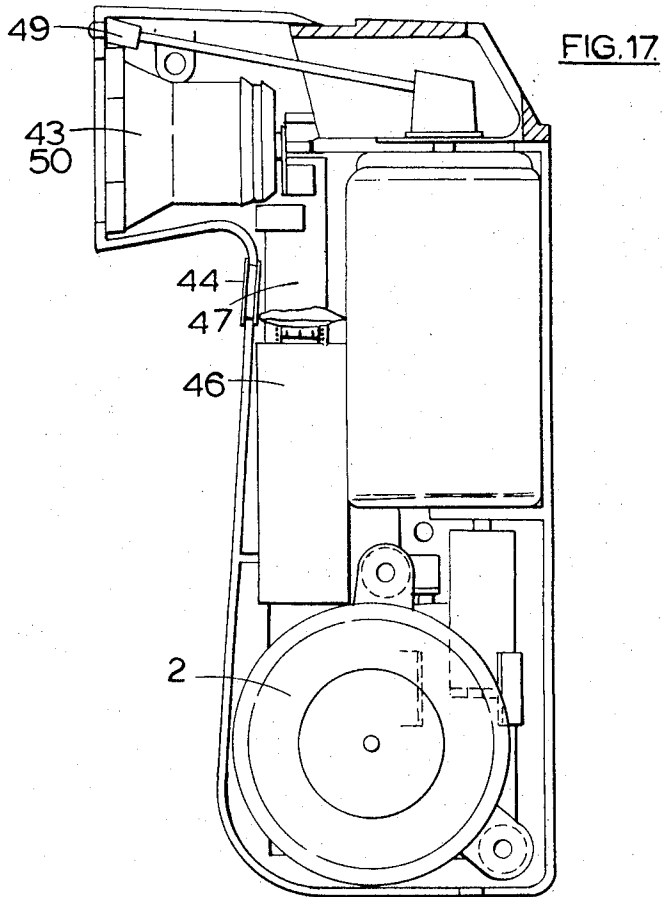
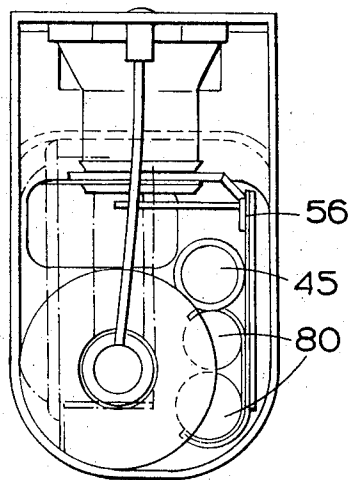
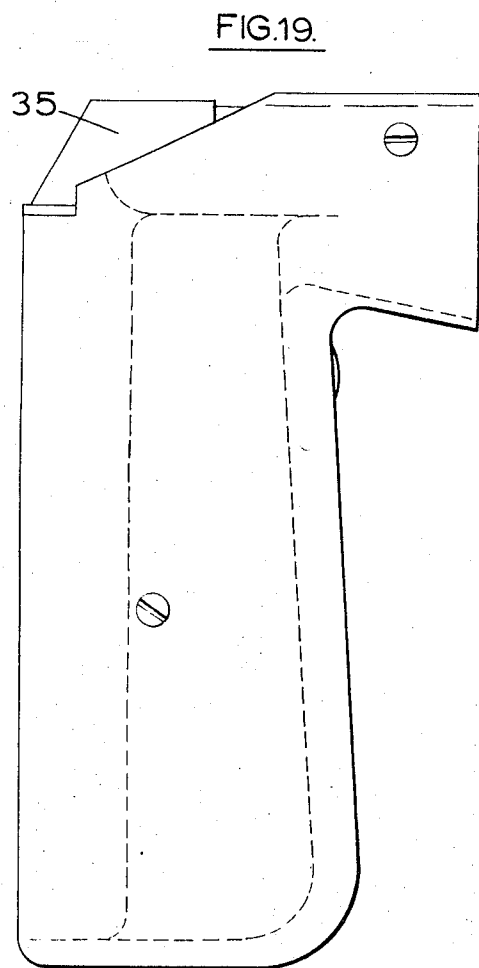
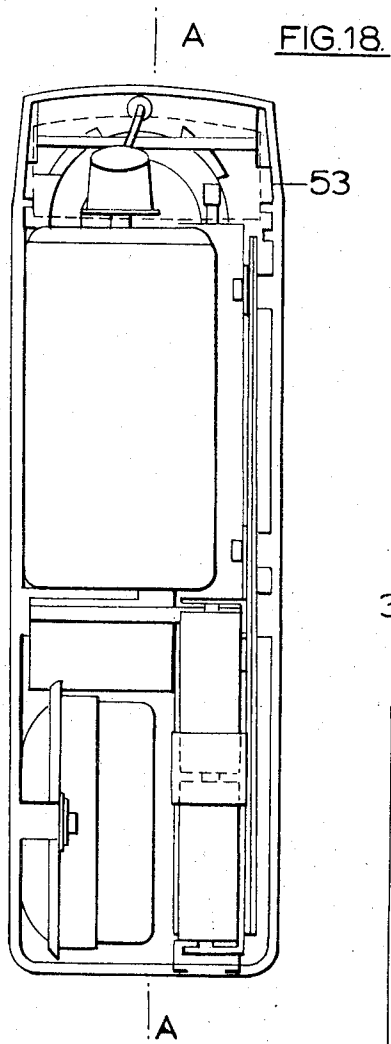


FIG. 20.





PERSONAL DEFENCE DEVICE

BACKGROUND OF THE INVENTION

This invention relates to a novel switching device adapted for use in actuating two or more electrically or mechanically operated components, of which at least one is electrically operated and at least one is mechanically operated.

The requirement is for a switching device of the above indicated kind, wherein the electrically operated components comprise of a bulb; and the mechanically operated components include means capable of projecting a spray jet, e.g. a marker dyke spray, which may be with a malodorous substance, and a gas-operated whistle acting as a noise alarm device.

A second requirement is for a switching device adapted for use as indicated above, wherein the electrically operated components include an electric buzzer acting as an alarm device; a radio transmitter; a bulb; any desired optional components of a separate electrical circuit; a contact for an aerial for the radio transmitter; and an optional actuation system for any desired number of switches for further electrical circuits; and the mechanically operated components comprise an aerosol system capable of projecting a spray jet of a marking substance which may be malodorous.

British Pat. application No. 30,426/71 describes an instrument of personal defence or a torch designed for self-defence, including at least one power supply providing power for a bulb in a bulb holder of a lens-reflector unit system; at least one switch electrically actuating the bulb circuit; and at least one push-button system; operable by means of an emergency switch, both partially so as to actuate only the bulb circuit; and fully so as to actuate also a device creating a noise alarm and to mechanically actuate reversibly means capable of projecting a spray jet from the torch. It is an object of the present invention to provide a switching device of the above-indicated kind adapted for use in conjunction with the push-button system of a torch of the above-indicated kind.

In particular, the above-mentioned torch may further include a button serving to reset the switch actuating the device creating the noise alarm; in which case the emergency switch actuates the alarm switch irreversibly, whereby, when the emergency switch is released, the noise alarm continues to sound after the torch has been extinguished and the ejection of spray jet has ceased. It is a further object of the present invention to provide a switching device adapted for use in a torch of the last-mentioned kind.

More particularly, the instruments or torch described in British Pat. application No. 30,426/71 may include a radio transmitter, powered either in the circuit of the device creating a noise alarm or a separate circuit from the device creating a noise alarm, being operated by a further power supply electrically actuated by a separate switch. The switch actuating the radio transmitter is in turn actuated by the emergency switch. It is a further object of the present invention to provide a switching device adapted for operation from the emergency switch in a defensive instrument or torch of the last-mentioned kind.

In the last above-mentioned torch there may be a secondary switch which may be operated manually to cut off the radio transmitter from its power supply. It is a

further object of the present invention to provide a switching device of the above-indicated kind adapted for use in such a torch.

In the above-mentioned torch, the device creating a noise alarm may be either electrically or mechanically operable, and it is a further object of the present invention to provide a switching device of the above-indicated kind suitable for use in each such case.

It is a further object of the present invention to provide a switching device capable of operating in a desired sequence at least one electrically actuated component and at least one mechanically actuated component and at least one other component.

SUMMARY OF THE INVENTION

The invention will now be described with reference to the accompanying drawings, wherein:

FIG. 1 illustrates a switching device of the invention inside elevation.

FIG. 2 illustrates in plan view the device shown in FIG. 1.

FIG. 3 illustrates a front elevation of the device shown in FIG. 1.

FIG. 4 illustrates an L-shaped groove through which the device shown in FIG. 1 can slide.

FIG. 5 illustrates the device shown in FIGS. 1 to 4 incorporating a light system and including a power supply slidable manually so as to actuate electrically a bulb.

FIG. 6 illustrates diagrammatically the base of a switching device of the invention viewed from the above with the device in the (OFF) position, adapted for use in a torch comprising means capable of projecting a spray jet from the torch, and a radio transmitter.

FIG. 7 illustrates diagrammatically the contact positions of a device of the invention in the (OFF) position.

FIG. 8 illustrates diagrammatically the base of the switching device shown in FIG. 6, with the device operating a bulb of the torch.

FIG. 9 illustrates diagrammatically the contact positions of a device of the invention operating a bulb of a torch incorporating the device.

FIG. 10 illustrates diagrammatically the base of a switching device as shown in FIG. 6 adapted for use in a torch including an electrically operable device creating a noise alarm, with the switching device operating the device creating a noise alarm, the radio transmitter, a contact for an aerial for the radio transmitter and a bulb for the torch.

FIG. 11 illustrates diagrammatically the contact positions of a device of the invention operating a device creating a noise alarm, a radio transmitter, a contact for an aerial for the radio transmitter, a bulb, and an aerosol spray means in a torch incorporating the switching device.

FIG. 12 illustrates a circuit diagram for a radio transmitter and associated aerial suitable for incorporation in a torch including, and actuated by a switching device of the invention.

FIG. 13 illustrates a circuit diagram for a switching device of the invention adapted to actuate electrically a device creating a noise alarm and a radio transmitter for operation from an emergency switch of a torch incorporating the switching device.

FIG. 14 illustrates a circuit board layout suitable for a printed circuit board on which is laid out the circuit

illustrated in FIG. 13, in conjunction with a conventional bulb circuit in a torch incorporating the switching device.

FIG. 15 illustrates in an elevation and partly in cross-section a torch including a bulb, a whistle, and a dye spray jet actuated by a switching device as shown in FIGS. 1 to 4.

FIG. 16 illustrates in elevation and partly in cross-section a torch including a bulb, a buzzer, an aerosol, and a radio transmitter actuated by a switching device as shown in FIGS. 6 to 11.

FIG. 17 illustrates in cross-section view a torch similar to that shown in FIG. 16.

FIG. 18 illustrates in plan view and partly in cross-section the torch shown in FIG. 17.

FIG. 19 illustrates inside view the torch shown in FIG. 17.

FIG. 20 illustrates the torch shown in FIG. 17 in a section al view taken along the line A—A in FIG. 18.

In the device illustrated in FIGS. 1 to 4, a switch part 57 (FIG. 4) is a close-sliding fit on side part 58 of the aerosol button; and an L-shaped groove 59 in each side of the actuator fits as a close fit over a small square protruding portion on the inside surface of the case. Until the switch 35 (FIG. 1) is pushed fully forward, so as to operate a bulb 1, it cannot move vertically with the torch in an upright position, so that this arrangement provides safe controlled operation of further components.

In addition the base of the switch is stepped, so that it rests on the top surface of a spray can button 60, with the torch held in an upright position until pushed forward, as an additional safe guard against accidental projection of the spray jet.

When the device is in the pushed-forward position, after the bulb 1 has been operated, the lower surface of the switch 35, with the torch held in an upright position, is in contact with or close to the top surface 61 of a whistle 2 acting as an alarm device, and can be depressed vertically in this position so as to compress vertically the whistle 2. This movement cannot be effected until after the bulb 1 has been operated.

The device can fit over the spray can button 60 and is so shaped in relation thereto, that it can slide forwards horizontally with the torch held in an upright position, a sufficient distance to operate the bulb 1 without depressurizing a spray can 62 for which the part 60 is the button. Provision is made through the centre of the device for the passage of an aerosol extension tube 63 from the button 60 to the exit point 64 at the front of the case. The spray can 62 is operated in the same manner as, and simultaneously with the whistle 2, by vertical depression of the device with the torch held in an upright position after the bulb 1 has been operated. In FIG. 2 there is shown a bulb holder 4 for the bulb 1.

The axes of the spray can 62 (FIG. 1) and the whistle 2 lie in a plane approximately parallel to the surface of the palm of the operator of the torch when the torch is held in a hand, whereby the torch has its largest dimension to the hand, being parallel to the latter.

Secondly, because the spray can 62 is longer than the whistle 2 and its aerosol gas supply 41 (FIG. 15) combined, and employs an extension tube 63, it lies behind the whistle 2 when the torch is held in an upright posi-

tion, so that the spray jet is projected via the extension tube 63 over the top of the whistle 2.

In FIG. 5, the arrangement of the bulb system is shown in which a lens-ended bulb 1 is used.

One terminal of the battery 5 is in permanent contact with a metal clip 7, which holds the bulb 1 in position, its lens 6 protruding through a hole in the container of the torch in which the device is to be contained. On actuation of the light switch, the battery 5 is moved forward so that a second contact 7 contacts the end contact 3 (FIGS. 2 and 5) of the bulb 1 so completing the circuit. In this instance no other circuitry is required. In the base of a switching device of the invention, illustrated in FIG. 6, the complete configuration is shown.

In normal use the device may be held in either hand, when in an upright position having its long axis vertical and the edge, from the top of which the bulb 1 (FIGS. 1, 5 and 15) and tube 63 (FIG. 1) protrude, facing forwards.

To operate the bulb 1 the user pushes the device fully forward using the thumb. The device may now be used for the sole purpose of maintaining operation of the bulb 1 but is also in the 'activated' position for immediate emergency use to operate further components. Thus for emergency use, the operator simply presses the device further.

As long as a manual button is held down by pressure (and assuming the spray can 62 is not discharged and empty) the device will operate the means capable of projecting a spray jet and the device creating a noise alarm. It will generally be desired to operate the two last-mentioned components sporadically rather than continuously; the manual button should therefore be pressed and released repeatedly between its second and first positions rather than maintained in its second position.

After emergency use any drops of spray substance should be shaken or wiped from a spray tube end and preferably the whole torch placed in a waterproof container.

In FIGS. 6, 8, and 10 there are shown an aerosol button 8 and an aerial 9 in the positions adopted respectively when the device is in the 'OFF' position, in the position such as to operate only the bulb 1 (FIGS. 1, 5 and 15) and in FIG. 10, when the device is in the position such as to operate only the bulb 1 (FIGS. 1, 5 and 15), a buzzer 2 (FIGS. 16 and 17), a radio transmitter 47 and a contact for an aerial 45 (FIGS. 16 and 20) for the radio transmitter 47 (FIGS. 16 and 17) and an aerosol spray means. In FIGS. 6, 8, and 10 the part 10 represents electrical switches.

In FIGS. 7, 9 and 11 there are shown contact positions of a device when in the respective positions corresponding to FIGS. 6, 8, and 10. In FIGS. 7, 9 and 11 the part 11 represents the base of the device, the part 12 an electrically insulating portion of the device, and the parts 13 metal electrical contact portions of the device electrically insulated from each other. The parts 14, 15, 16 represent respective pairs of electrical contacts for the bulb 1 (FIGS. 1, 5 and 15) the buzzer 2 (FIGS. 16 and 17) and the radio transmitter 47.

In FIG. 12 there is shown a circuit diagram for the radio transmitter 47 (FIGS. 16 and 17) and associated aerial 45 (FIGS. 16 and 20) suitable for actuation by a switching device of the invention. The transmitter 47 (FIGS. 16 and 17) generates a continuous wave using

a quartz crystal oscillator 19 (FIG. 12). It gives a power output of from approximately 100 to 400 mW using a 9-V battery 18 as a power supply, dependent on the size of the battery 18. The transmitter 47 (FIGS. 16 and 17) is used with the telescopic aerial 45 (FIGS. 16 and 20) extended automatically. The positive terminal 65 (FIG. 12) of the battery 18 is held at earth potential and a suppression capacitor in applied to the buzzer 2 (FIGS. 16 and 17) by connecting a capacitor 67 (FIG. 13) across the terminals 66 of the buzzer 20 (FIGS. 16 and 17), to prevent interference with the signal generated by the radio transmitter 47. Such earthing is effected by connection of the positive 65 (FIG. 12) to the operator of the torch. The coil 17 is matched to the impedance of the aerial 45 (FIGS. 16 and 20).

In FIG. 13 there is shown a circuit diagram for a device of the invention including the circuits employed for the buzzer 20 and the radio transmitter 22, which circuits are switched simultaneously, but are quite separate apart from such parallel connection. The circuit for the bulb 1 is of a conventional nature incorporating two 1.5-V cells. As mentioned above the circuit for the buzzer 20 includes a capacitor 67 connected across the buzzer 20 at terminals 66. The circuit for the radio transmitter 22 incorporates a power supply 68 used with the positive terminal 69 thereof kept at earth potential by being connected directly to the operator of the torch via a metal plate 44 (FIGS. 16 and 17) in the casing of the torch.

The circuit for the radio transmitter 22 (FIG. 13) has three terminals; the earthed positive, and the negative terminals 27 (FIGS. 13 and 14) and a terminal connection 28 (FIG. 13) for the contact for the aerial 23. The respective circuits for the bulb 1 (FIGS. 1, 5 and 15), the buzzer 20 (FIG. 16) and the radio transmitter 22 are laid out on a printed circuit board 48 (FIG. 16), to which are attached also the aerial 45, the plate 44, the capacitor 67 (FIG. 13) and a battery clip 56 (FIG. 20) and the connectors 7 (FIG. 5).

In FIG. 14 the circuit board layout shown illustrates the precise spatial arrangement of switches 24, 25 and 72 respectively for the radio transmitter 47 (FIGS. 16 and 17), the buzzer 2 and the bulb 1 (FIGS. 1, 5 and 15); battery terminals 26, 29 and 30 (FIG. 14); and a battery clip 73; the terminals 27, 28 and 66; and an aerial fixing 34.

In FIG. 15, a torch is shown in the form of a cylinder, containing a self-reflecting bulb 1 having direct electrical contact between the terminal 31 thereof and the power supply 5; and whistle 2. In general, it is likely to be desirable to sound the whistle 2 for a longer period than that which over the spray jet is projected. The light switch is of the type illustrated in FIG. 1, the second 'ON' position being used most frequently, thus acting as an emergency switch, and is mounted along an edge of the body of the torch near to the top face. The button 60 operates a valve 38 via a stem 37 of the spray can 62 containing a harmless substance 32, when an emergency switch 35 is depressed, thus projecting a spray jet along the extension tube 63. A location pip 40 is situated in whistle 2 so that the valve (not shown) of the whistle 2 can be operated repeatedly. The whistle 2 is supplied for its operation with gas from an aerosol supply 41.

A second such torch shown in elevation in FIG. 16 is similar to that illustrated in FIG. 15. It incorporates further the feature of the transmitter 47 housed adjacent

to the spray can 62 and actuated by depression of the emergency switch 35. Depression of the switch 35 also operates the aerosol means for projecting a spray jet, by depression of the button 60 until it is released. Simultaneously, on the first depression, a buzzer circuit for a buzzer 2 and a transmitter 47 is completed, the desired noise alarm is created and the transmitter 47 is activated. For reasons of space a buzzer 2 creating the alarm is situated below the spray can 62.

The radio transmitter 47 is powered from a power supply 46 on a separate circuit from that of the bulb 1 (FIGS. 1, 5 and 15) and buzzer 2 (FIGS. 16 and 17), which are powered from a power supply 5 (FIGS. 16 and 20). The bulb 1 (FIGS. 1, 5 and 15) is provided with a reflector unit 43 (FIGS. 16 and 17). The printed circuit board 48 is shown in FIG. 16, the spray can 62 being located securely away from the printed circuit board 48; the metal plate 44 is inserted in the case 51 of the torch, on the vertical face 39 thereof with the torch held in an upright position, to provide the desired earth connection via the user of the torch. A hole (not shown) is provided at one side of the base 39 of the torch to permit the automatic aerial 45 to extend and a further hole (not shown) on the centre line 42 of the base 39 to provide a fixing point for a hand strap (not shown). A vertical grille (not shown) on one side of the case 51 assists in the emission of the noise from the buzzer 2.

The bulb 1 (FIGS. 1, 5 and 15) and its associated lens-reflector unit system incorporating the reflector unit 43 (FIGS. 16 and 17), fit into the forwardly projecting portion 36 of the upper part 69 of the case 51 and on the front surface 70 of the portion 36 are provided, a hole 71 of relatively large diameter which hold the lens 6 (FIG. 5) of the lens-reflector unit system and a relatively small hole 64 (FIGS. 1 and 16) locating the forward end 74 (FIG. 16) constituting the orifice of the extension tube 63.

The switch 35 fits in the rear edge 75 of the case 39 at its top corner 76. A cutaway portion 77 is provided for this purpose and the switch 35 slides into the allotted position. The switch 35 is prevented from falling out of the case 51 by a lip (not shown) on its base 78 which locates against the edge portion 77 of the case 51 when the switching device is in the 'OFF' position, as described above. Thus the switch 35 cannot be drawn back outside the case 51.

In the torch shown in FIG. 17, the part 49 represents a grommet, and the part 5 (FIGS. 17 and 20) represents a cover for the reflector 43 in FIG. 18 is shown a click stop 53 for the switch 35 in FIG. 20 are shown a clip 56 for the batteries 5 and two separate power supplies 80 respectively for the bulb 1 (FIGS. 1, 5 and 15) and the buzzer 2 (FIGS. 16 and 17).

In normal use, to operate the bulb 1 (FIGS. 1, 5 and 15), the operator of the torch pushes forward the switch 35 (FIGS. 1, 15 and 16) manually until resistance is felt as the switch 35 comes onto a stop.

For emergency use the torch must be maintained in the vertical position. Whether or not the bulb 1 (FIGS. 1 and 15) is already operated, the radio transmitter 47 (FIGS. 16 and 17), the aerial 45 (FIG. 16) and buzzer 2 are brought into operation by pushing the switch 35 to the full extent of its travel. Then the means for projecting a spray jet can be operated, as required, by pressing down the button 60 which will now be uncovered and unlocked.

After emergency use, the aerial 45 is fed back into the case 51 (the torch still being held in a vertical position) and the switch 35 is pulled back to the 'OFF' or first 'ON' position as required. Any drops of spray that may have accumulated at the exit 64 of the spray tube 63 should be shaken or wiped away to prevent marking of the hands or clothing of the operator of the torch.

On actuation of the switch 35 the aerial 45 thus extends from the torch in a manner which causes a minimum of interference with the handling of the torch. The outer tube (not shown) of the telescope of the aerial 45 is fixed in the case 51 and a centre shaft of the aerial 45 is held ready for use and free of actuation of the switch 35.

For reliability of operation the spray can 62 is used in a near-vertical position with the torch in an upright position. For this reason the major axis of the case 51 is simultaneously in a parallel direction, whereby the spray jet can be projected substantially horizontally. The major axis of the buzzer is substantially horizontal when the torch is in an upright position.

A small gap is left between the printed circuit board 48 and the case 51. The aerial 45 runs the length of the case 51. The buzzer 2 is normally placed against the left side of the case 51, so that the torch is adapted for use by a right-handed operator and his hand does not muffle the noise alarm and therefore the printed circuit board 48 is accordingly placed against the right side of the case 51. The arrangement also allows for the projected spray jet to tend to fall into the light beam from the bulb 1 (FIGS. 1, 5 and 15), whereby the light beam may be used as a sighting line for direction of the spray jet.

With the switch 35 (FIGS. 1 and 15) in the 'OFF' position or the first 'ON' position, there is no possibility of accidental projection. It is not necessary that the second 'ON' position of the switch 35 projects the spray jet, but only that the jet is freed on this movement and a third 'ON' position at which the projection of the spray jet becomes actuated mechanically is a preferred feature. No undue force is required to operate any of the above-mentioned components of the defence instrument or torch and the manual movement of the operator of the torch is along a linear path.

An aerosol 'lock' (not shown) is preferably included taking the form of a shaped hole in the base plate (not shown) of the switch 35. With the switch 35 in the 'OFF' position or the first 'ON' position, the width of the hole immediately under the button 60 is small enough to prevent the button 60 from moving down to depressurise the spray can 63. A further forward movement of the switch 35 causes the wider part of the last-mentioned hole to align with the button 60, allowing the latter to be depressed manually if required.

The aerial 45 is freed in a similar manner also using a hole (not shown) in the base plate of the switch 35. The centre (thinnest) segment of the aerial 45 has an enlarged portion at its upper end 79 which, with the switch 35 in the 'OFF' position, is held in a slot (not shown). Forward movement of the switch 35 to its second 'ON' position causes a hole (not shown) of diameter larger than the slot width, to align with the end 79 of the aerial 45 which said end can then fall through the last-mentioned hole, causing the aerial 45 to be extended from the base 39 of the case 51.

The electrical circuits are activated by metal connectors attached to one side of the base of the switch 35.

These connectors slide on the back surface of the printed circuit board 48 and as the switch 35 is pushed forward they close the appropriate circuits.

"In FIG. 20 are shown a clip 56 for the batteries 80, and two separate power supplies 80 respectively for the bulb 1 (FIGS. 1, 5, and 15) and the buzzer 2 (FIGS. 16 and 17)."

I claim:

1. A personal defence device comprising:
 - a hand-held casing;
 - a plurality of operable components comprising:
 - means for producing a noise alarm located within the casing;
 - and an aerosol spray can located within the casing to project a spray of a fluid from the device;
 - and an operating button carried by the casing and manually shiftable relative to the casing to and from a first position wherein neither of said components are operated; and
 - a second position wherein both of said components are operated by the operating button.
2. A device according to claim 1 wherein said aerosol spray can includes a spray button to actuate the spray when depressed, said means for producing a noise alarm comprises an aerosol operated whistle actuated by depression of the whistle towards aerosol can, and wherein said spray button and whistle are depressed by virtue of movement of said operating button from said first to said second position.
3. A personal defence device comprising:
 - a hand-held casing;
 - a plurality of operable components including:
 - an electric light bulb carried by the casing to project a light beam from the device;
 - an aerosol spray can located within the casing to project a spray of a fluid from the device, and
 - means for producing a noise alarm located within the casing;
 - a source of electrical power located within the casing;
 - an electric circuit including switch means within the casing to energize said light bulb from said source when said switch means is closed.
 - a spray button attached to said aerosol spray can to actuate said spray by depression of said button; and
 - a multiposition operating button carried by the casing and manually shiftable relative to the casing sequentially from
 - a first position wherein none of said components are operated, to a second position in which said switch means is closed by the operating button to energize said electric light bulb, to a third position in which said switch means remains closed, said spray button is depressed and said noise alarm is operated by the operating button.
4. A device according to claim 1 wherein said means for producing a noise alarm comprises an aerosol operated whistle.
5. A device according to claim 1 wherein the direction of the movement of said operating button from the second to third position is substantially at right angles to the direction of its movement from the first to second position.
6. A device according to claim 3 wherein said means for producing a noise alarm comprises an electrically operated buzzer energized from said source of electric

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cal power by an electric circuit including a second switch means and said second switch means is closed by the operating button in said third position.

7. A device according to claim 3 wherein said operable components further include a radio transmitter energized from a second source of electrical power located within the casing by an electric circuit including third switch means and said third switch means is

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closed by the operating button in said third position.

8. A device according to claim 7 wherein said radio transmitter has a telescopic aerial normally entirely located in the casing but releasable to extend out of the casing, and said aerial is released only by the shifting of said operating button into the third position.

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