(12) UK Patent Application (19) GB (11) 2 137 388 A

(43) Application published 3 Oct 1984

(21) Application No 8308764

(22) Date of filing 30 Mar 1983

(51) INT CL³
G08B 13/24

(52) Domestic classification
G4N 1A 1C1 1C4 1D 2A 4E 4M 4S 5A 5E 5T 6B1 AF

(56) Documents cited
GB 1559205
GB 0866270
EP A1 0050549
EP A2 0033661

(58) Field of search
G4N

(71) Applicant
Bruce Stanley Gunton,
6 Mulroy Road, Sutton Coldfield, West Midlands

(72) Inventor
Bruce Stanley Gunton

(74) Agent and/or Address for Service
Forrester Ketley & Co.,
Rutland House, 148 Edmund Street, Birmingham B3 2LD

(54) Improvements relating to a security system

(57) A security system especially for a motor vehicle includes a portable transmitter (10) and a receiver for setting the system in an active condition, when an appropriate signal is transmitted to the receiver (and may also energize lights situated around the receiver & lock the doors), and for setting the system in an in-active condition when a further signal is transmitted to the receiver. The receiver distinguishes signals with a predetermined frequency and mark-space ratio from other signals and the alarm (eg horn 13, headlights 14) and an ignition inhibiting circuit (58) are actuated by switches 15 operated by the opening of the boot/bonnet etc, or by a torch detection circuit responsive to changes in capacitance between an article (eg aerial) & a body insulated therefrom.

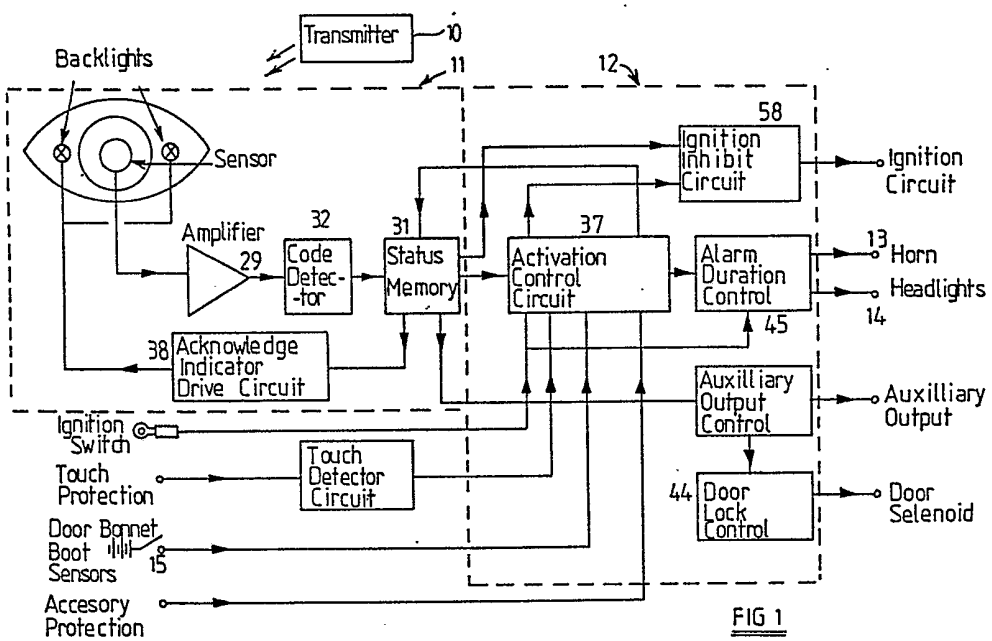

FIG 1

GB 2 137 388 A

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

2137388

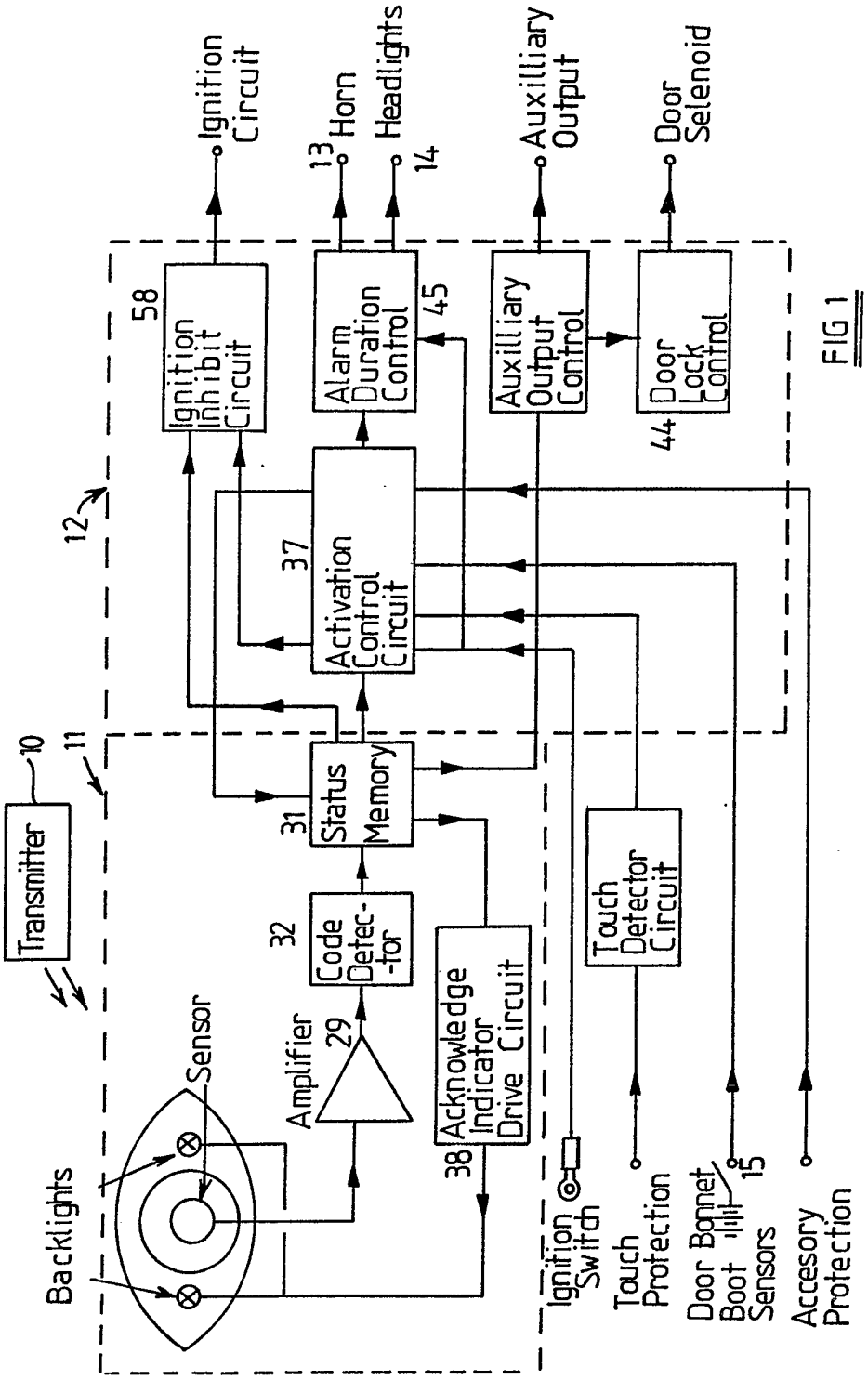

FIG 1

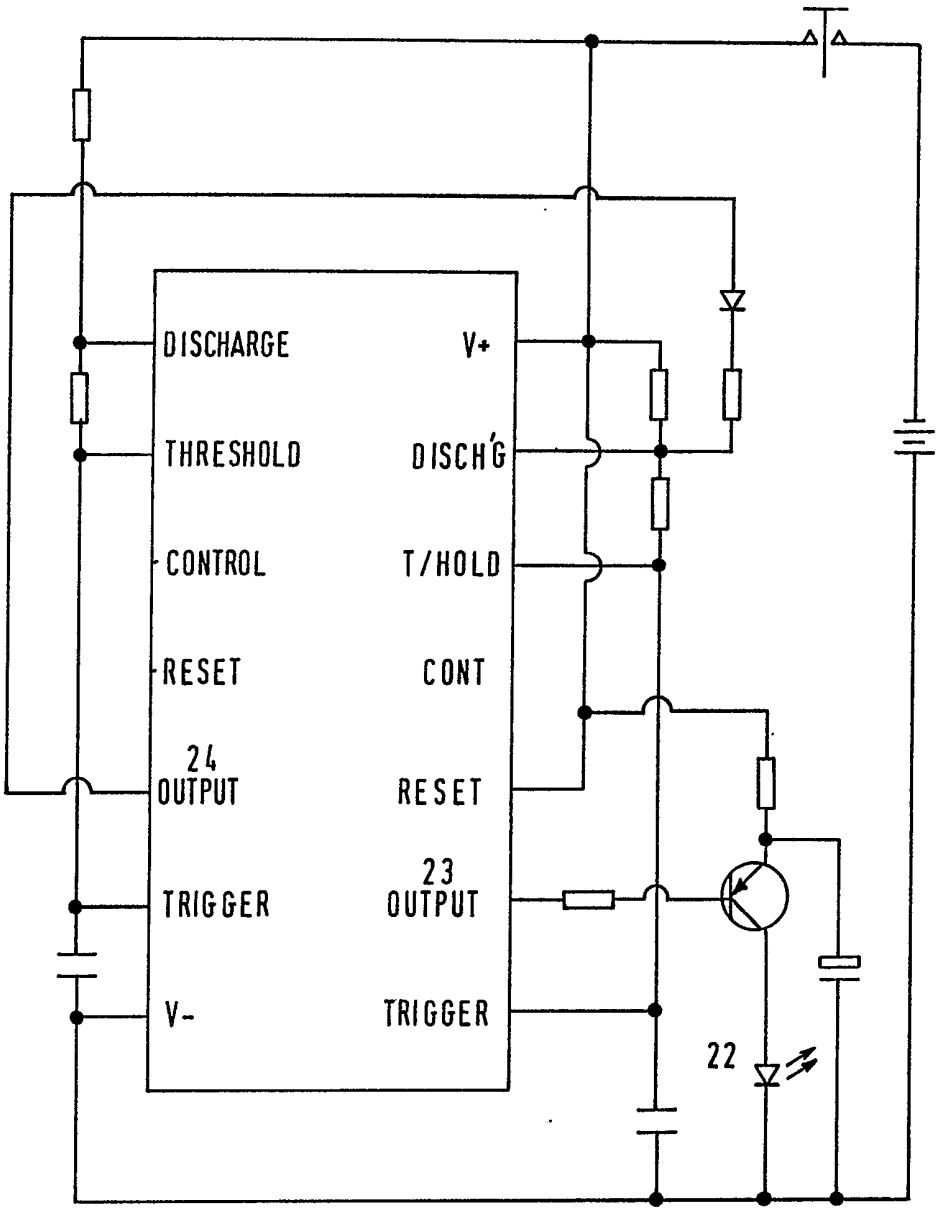
DISCHARGE
V+
THRESHOLD
DISCH'G
CONTROL
T/HOLD
RESET
CONT
24
OUTPUT
RESET
TRIGGER
23
OUTPUT
V-
TRIGGER
22

FIG 2

2137388

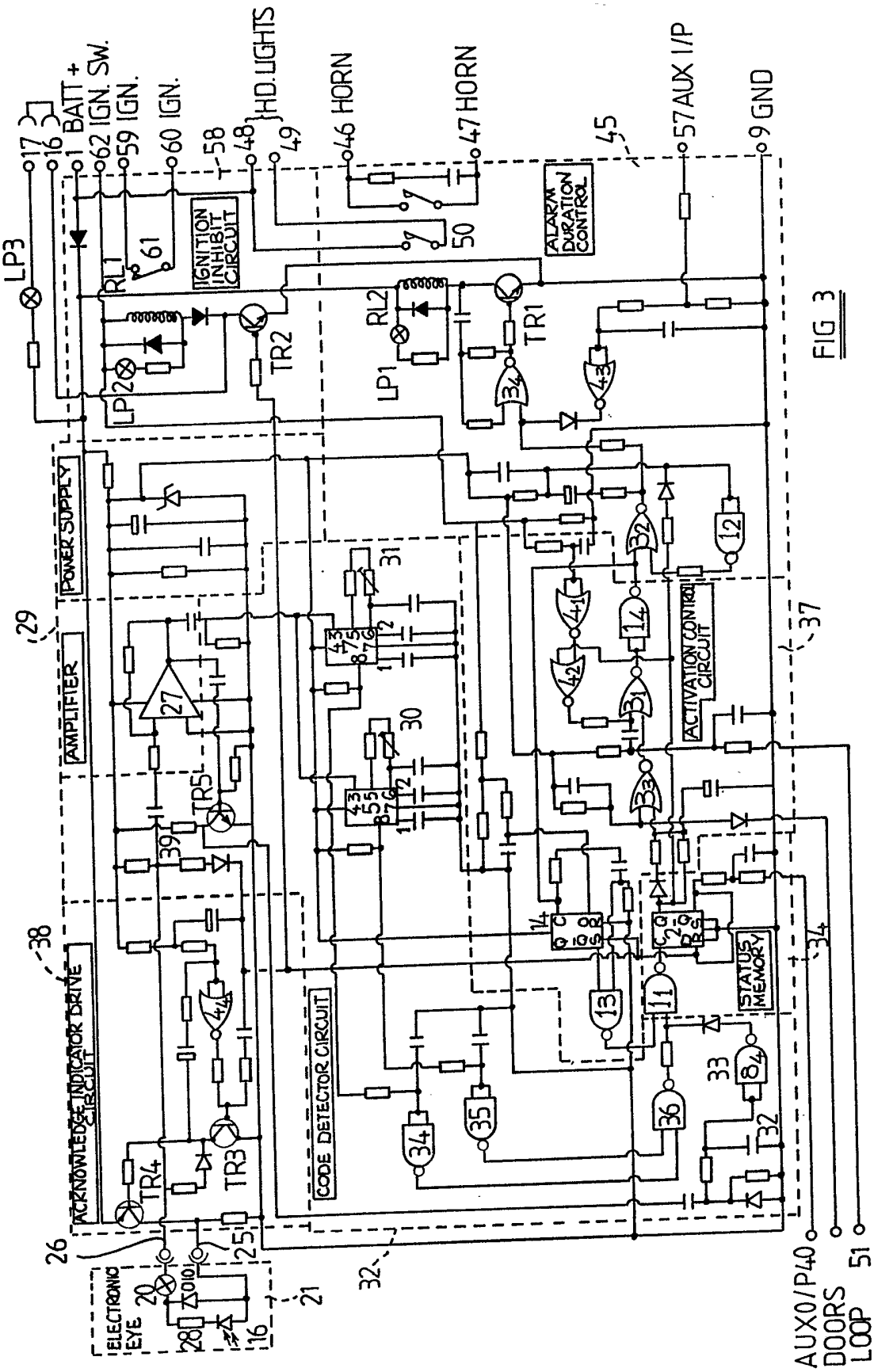

FIG 3

2137380

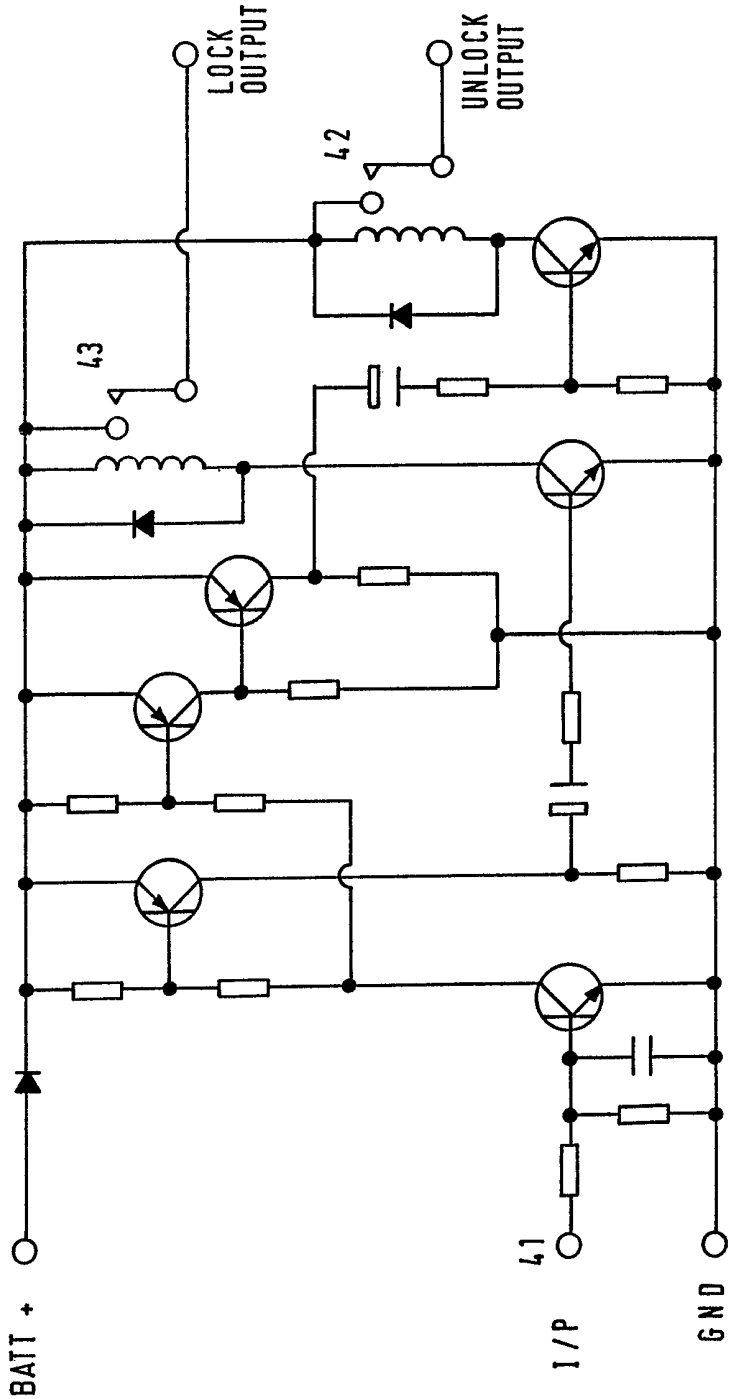

FIG 4

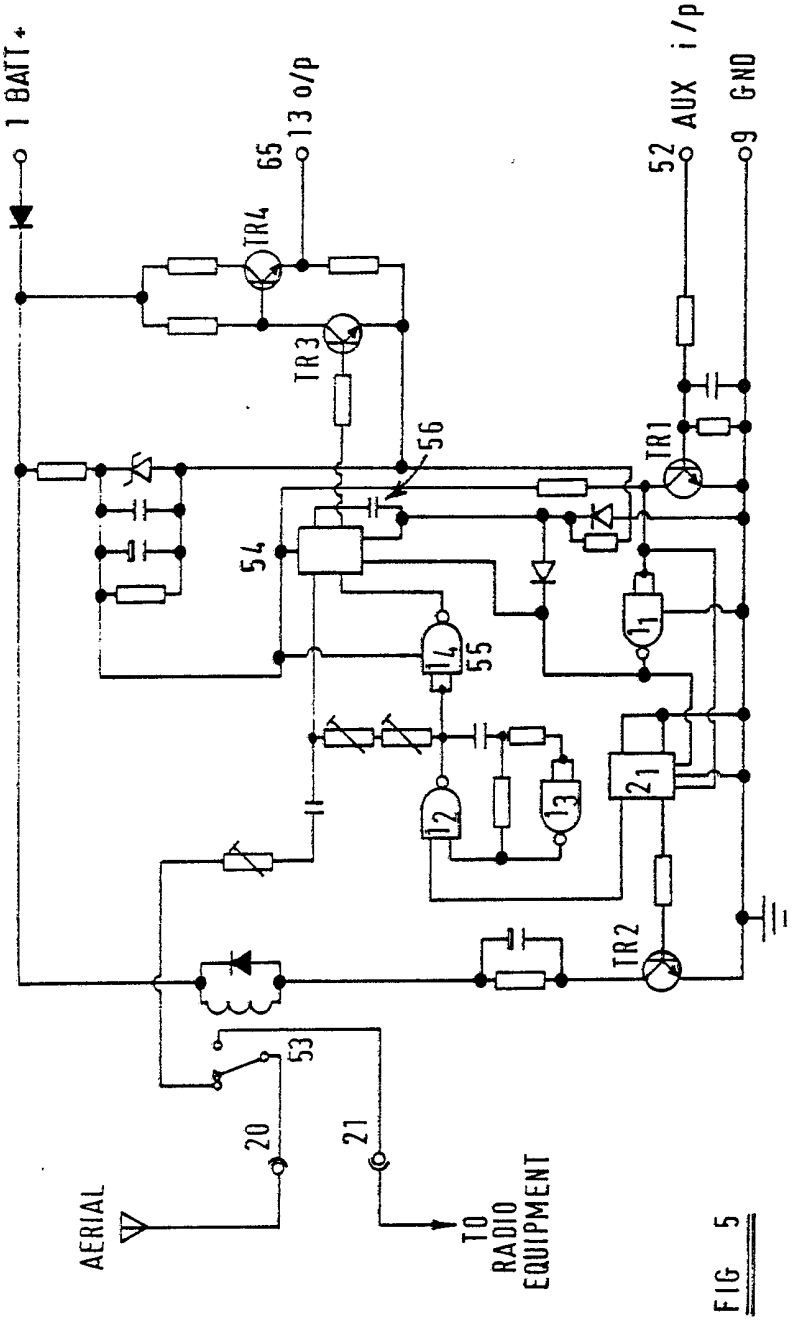
1 BATT+
13 o/p
65
TR4
TR3
56
54
55
52 AUX i/p
9 GND
TR1
TR2
53
20
21
AERIAL
TO RADIO EQUIPMENT

FIG 5

SPECIFICATION

Improvements relating to a security system

From one aspect, the present invention relates to a security system comprising an operating unit, a receiver associated with the operating unit and a transmitter which, in use, is separated from the receiver. The transmitter is used to transmit to the receiver a signal which sets the operating unit in a selected condition. When in an active condition, the operating unit may respond to interference with a protected enclosure, for example the opening of a car door, by providing an alarm signal. The security system is primarily intended for use on a motor vehicle or other structure defining an enclosure, access to which is to be restricted.

According to a first aspect of the invention, there is provided a security system comprising a transmitter, a receiver and an operating unit wherein the transmitter is adapted to radiated energy in wave form at a predetermined frequency and wherein the receiver is adapted to respond to energy radiated to the receiver by the transmitter.

The transmitter preferably operates to interrupt and to resume the radiaton of energy with a predetermined relation (this relation being called herein the mark/space ratio) between respective durations of the interruptions and the respective durations of the intervals during which the energy is radiated, the receiver being adapted to compare the frequency and the mark/space ratio of radiant energy received by the receiver with said predetermined frequency and predetermined mark/space ratio and to provide to the operating unit an output signal which indicates when both the frequency and the mark/space ratio of energy radiated to the receiver are equal respectively to the predetermined frequency and predetermined mark/space ratio.

There is also provided according to the invention a method of controlling an operating unit wherein there is associated with the operating unit a receiver, energy in wave form is radiated from a transmitter to the receiver at a predetermined frequency, the radiation of said energy is interrupted and resumed repeatedly with a predetermined mark/space ratio, the receiver compares the frequency and the mark/space ratio of radiant energy received by the receiver with a predetermined frequency and a predetermined mark/space ratio and the receiver provides to the operating unit an output signal which indicates when both the frequency and the mark/space ratio of the energy radiated to the receiver are equal respectively to the predetermined frequency and the predetermined mark/space ratio.

During a series of bursts of radiant energy transmitted from the transmitter to the receiver, one or both of the mark/space ratio and the frequency may change. Thus, the duration of successive interruptions in radiation of energy may vary and the duration of intervals between these interruptions may vary. The frequency may be changed from one predetermined value to another predetermined value during a series of bursts of radiant energy and the frequency may vary between more than two predetermined values.

In a security system in accordance with the invention, the operating unit is preferably settable in active and inactive conditions, the condition of the operating unit being changed from one of said conditions to the other whenever a predetermined signal is transmitted from the transmitter to the receiver and being changed from said other condition to the one condition if the transmission of the same signal from the transmitter to the receiver is repeated. With this arrangement, if the signal is repeated a number of times, the operating unit will cycle between its active and inactive conditions.

There is also provided according to the invention the combination comprising an operating unit, signalling means and a receiver which includes an input element and which responds by providing an output signal to the operating unit whenever there occurs in a field to which the input element is subjected a predetermined change or sequence of changes, or whenever there occurs in radiant energy incident on the input element a predetermined change or sequence of changes, wherein the signalling means is adapted to radiate visible light from an area which surrounds the input element.

The signalling means and input element may together present an appearance resembling that of an eye, seen from the front.

There is also provided in accordance with the invention a combination comprising an operating unit, signalling means and a receiver which includes an input element and which responds by providing an output signal to the operating unit whenever there occurs in a field to which the input element is subjected a predetermined change or sequence of changes or whenever there occurs in radiant energy incident on the input element a predetermined change or sequence, wherein the signalling means is adapted to radiate visible light when the signalling means is energised and where in the signalling means and the input element form a unit which is connected electrically with the remainder of the receiver by two conductors only.

The invention includes a method of receiving a signal and providing an acknowledgement of that signal, wherein there is provided control means and a unit comprising an input element for receiving the signal and an electrically energisable light source, the unit is connected electrically with the control means by two conductors, said signal is fed from the input element to the control means along said two conductors and the light source is then energised by current flowing from the control means along said two conductors.

There is also provided in accordance with the invention a security device in combination with an article for which protection is required, wherein the security device includes means for responding to a change in the capacitance between the article and a body insulated from the article caused by a person touching the article.

The body may be the ground, a member on which the security device is mounted or a member of the security device itself.

The invention also includes a method of signalling

an unauthorised contact between a person and an article, wherein a change in the capacitance between the article and a body insulated from the article which occurs when the person touches the article is sensed and an alarm is then energised.

An example of a security system in accordance with the invention and which is used in a method in accordance with the invention will now be described, with reference to the accompanying drawings, wherein:-

Figure 1 shows a block diagram of the system;

Figure 2 is a circuit diagram of a transmitter of the system;

Figure 3 is a circuit diagram of a receiver and certain associated parts of the system;

Figure 4 is a diagram of a door lock control circuit of the system; and

Figure 5 is a diagram of a touch detector circuit of the system.

The system illustrated in the drawings is primarily intended for use on a motor vehicle to provide an alarm signal when an attempt is made by an unauthorised person to enter or otherwise interfere with the vehicle. The system includes a transmitter 10 which can be removed from the vehicle and conveniently carried on the person of a user. The system further comprises a receiver 11 and an operating unit 12 permanently mounted on the vehicle.

The operating unit 12 is electrically connected with sensors 15 (only one of which is shown) which respond to opening of doors, bonnet or boot lid of the vehicle. Typically, these sensors may be light switches, for example light switches operated by opening of the doors of the vehicle. The operating unit is also connected with means for protecting accessories mounted on the vehicle, for example fog lamps. Such means may include an insulated conductor which extends from the operating unit to the or each accessory which is to be protected and is so arranged that the accessory cannot be removed from the vehicle without interrupting the conductor.

The operating unit is further connected with electrically energisable alarm devices, for example a horn 13 of the vehicle and headlights 14 of the vehicle. The operating unit 12 is settable in an active condition and alternatively in an inactive condition. When the unit is in the active condition and one of the switches 15 is closed, the unit energises the horn 13 and headlights 14. Such energisation may be intermittent and may be of limited duration. When the operating unit is in its inactive condition, closing one of the switches 15 does not bring about energisation of the horn and headlights.

The receiver 11 is connected with the operating unit 12 for providing thereto a signal which changes the condition of the operating unit. The receiver includes an input element 16 adapted to receive and respond to energy radiated by the transmitter 10. This energy constitutes a signal which can be distinguished from other signals by the receiver 11. The signal is passed from the input element 16 through an amplifier 29 to a code detector 32 which compares the frequency at which energy is radiated to the input element 16 with a predetermined frequency and also compares the mark/space ratio of the signal with a predetermined mark/space ratio. If both the frequency and the mark/space ratio are equal to the predetermined frequency and mark/space ratio, a signal is passed by the code detector 32 to a status memory 34, from which the output signal is provided to the operating unit 12. An acknowledgement signal is also provided from the status memory 34 to signalling means in the form of a pair of electrically energisable light sources 20.

The light sources 20 are physically associated with the input element 16 in a unit 21 which is mounted inside the passenger compartment of the vehicle, at a position where it can readily be seen through a window of the compartment. This unit includes an approximately elliptical sheet of translucent material disposed in front of the light sources 20 to a shield these from direct view. At the centre of the sheet of translucent material, there is a black region where the input element 16 is mounted in an opening in the sheet of translucent material. When the light sources 20 are energised, an area completely surrounding the input element 16 is illuminated and the unit has the appearance of an eye. The light sources 20 are connected in parallel with each other and only one of these is shown in Figure 3.

The transmitter 10 is preferably adapted to radiate electro-magnetic energy in the infra-red part of the spectrum. Alternatively, the transmitter may be adapted to radiate sonic energy. A known transmitter may be used. The circuit of a suitable transmitter is shown in Figure 2. This circuit is based on a dual timer chip, for example 7556. From an output terminal 23 of this chip, there is provided to an infra-red transmitting device 22 a signal with a frequency having either one of two predetermined values. The frequency is varied between these values by a signal provided from terminal 24 of the chip and having a further predetermined frequency, for example two cycles per second.

In a case where the transmitter is adapted to radiate infra-red light, the input element 16 is preferably a photo-transistor. The element 16 is connected by a first lead 25 with a grounded terminal 9 of the system and by a second lead 26 with an operational amplifier 27, which may be a type 714 chip. As shown, there are interposed between the input element 16 and the lead 26 the light sources 20 and a resistor 28. However, these components do not significantly affect the signal which is applied to the amplifier 29 comprising operational amplifier 27.

The unit 21 which comprises the input element 16 and the light sources 20 is conveniently mounted at a position remote from the amplifier 29 and other parts of the receiver. As shown in Figure 3, the leads 25 and 26 may include releasable connectors and these leads may have a length in the region of one metre.

The output from the amplifier 29 is fed to a pair of tone decoder chips 5 and 7, both of which may be type 567 chips. These decoders form part of a code detector circuit and there are associated with the decoders 5 and 7 respective variable resistors 30 and 31, by means of which the decoders can be adjusted

to respond to input signals of the predetermined frequencies at which the device 22 of the transmitter can be energised.

The code detector circuit is also responsive to a predetermined mark/space ratio of the signal received by input element 16. If the mark/space ratio is less than 10%, capacitor 32 is charged by transistor TR5 and a signal is provided by gate 33 to a status memory circuit 34. The code detector circuit may be modified to accept signals having a mark/space ratio within some other range.

If a signal having the appropriate frequencies is applied to the tone decoders 5 and 7, the outputs of both of these go low and a signal is passed by gates 34, 35 and 36 to the status memory. If capacitor 32 also is charged by the signal received by the input element 16, the state of the flip-flop 2 is changed. The flip-flop provides an input to an activation control circuit 37 to set that circuit in either an active condition or an inactive condition.

When the state of the flip-flop 2 is changed, a signal is also provided to an acknowledge indicator drive circuit 38 connected, via the leads 25 and 26, the unit 21. The circuit 38 includes a transistor TR3 which is normally non-conducting. The circuit 38 does not then interfere with the transmission along the leads 25 and 26 from the input element 16 to the amplifier 29 of signals received from the transmitter 10. When the state of the flip-flop 2 changes, transistor TR3 becomes conducting for a brief period and the application to the amplifier of further signals received from the transmitter 10 is temporarily inhibited. Thus, the change in the state of the flip-flop cannot be reversed immediately. When transistor TR3 conducts, transistor TR4 also conducts and effectively connects the lead 25 with the positive supply to the system. A potential difference approaching 12 volts is applied to the light sources 20 to energise these. It will be noted that the light sources are energised through the leads 25 and 26 which are also the sole leads used to transmit signals from the input element 16 to the amplifier 29.

The circuit 38 is so arranged that the duration of the period for which the sources 20 are energised depends upon the state of the flip-flop 2. Accordingly, a user can recognise whether the activation control circuit has been set in an active condition or has been set in an inactive condition. When the activation control circuit is in an inactive condition, resistor 39 acts to reduce the sensitivity of the amplifier 29, relative to the sensitivity of this amplifier when the activation control circuit is in its active condition. Accordingly, when the intensity of radiation incident on the input element 16 is only just sufficient to set the activation control circuit in the inactive condition, a subsequent signal which is incident at the element 16 with the same intensity will fail to set the activation control circuit in the active condition.

A terminal 40 of the activation control circuit 37 is connected with a terminal 41 of the door lock control circuit shown in Figure 4. This circuit closes relay contacts 43 for a brief period whenever circuit 37 is set in its active condition and closes relay contacts 42 for a period of the same duration whenever the circuit 37 is set in its inactive condition. The relay contacts 42 and 43 are connected in series with solenoids arranged in a known manner to operate locks of the motor vehicle.

The activation control circuit 37 and door lock control circuit are included in the operating unit 12 which further includes an alarm duration control circuit 45. This circuit has terminals 46 and 47 for connection in parallel with a switch provided in the motor vehicle to control energisation of a horn of the motor vehicle (not shown) and terminals 48 and 49 for connection in parallel with a light switch of the vehicle. The alarm duration control circuit includes a relay 50 having a first pair of contacts connected in series with the terminals 46 and 47 and a second pair of contacts connected in series with the terminals 48 and 49. If, when the activation control circuit 37 is in its active condition, that circuit receives a signal from a switch 15, the contacts of the relay 50 are closed to energise the horn and lights of the vehicle for a predetermined period. This period is typically one minute and energisation during this period may be intermitternt.

A terminal 51 of the activation circuit is connected to ground by means of a long lead which is mechanically connected with accessories on the vehicle in such a manner that removal of those accessories would necessitate severing of the lead. If the connection of the terminal 51 to ground is discontinued in this way, the relay 50 is energised.

Terminal 40 of the activation control circuit is also connected with a terminal 52 of the touch detector circuit illustrated in Figure 5. This circuit includes a relay 53 having contacts which are interposed between an aerial and a radio receiver of the vehicle. When the activation control circuit 37 is in its inactive condition, contacts of the relay 53 connect the aerial directly with the radio receiver. When the activation control circuit is in its active condition, the relay 53 is de-energised to disconnect the radio receiver from the aerial and to connect the aerial with a flip-flop 54, which may be a type 4013 chip. Signals are fed to both a data terminal D and a clock terminal C of this flip-flop from an oscillator. The signal is applied to the clock terminal via an inverter 55. The phase relation between the signals applied to the data and clock terminals depends upon the capacitance between the data terminal and earth. The variable resistors are adjusted to provide that the signals applied to the data terminal and to the clock terminal are normally 180° out of phase. The flip-flop 54 does not then provide an output. If a person touches the car radio aerial, the capacitance between the data terminal and earth is changed and flip-flop 54 provides an output to terminal 65 of the touch detector circuit. For a brief period after the person ceases to touch the radio aerial, an output is maintained at terminal 65 due to the action of capacitor 56.

Terminal 65 of the touch detector circuit is connected with terminal 57 of the alarm duration control circuit 45. Whenever an output is provided at terminal 65, the relay 50 is energised to sound an alarm.

The touch detector circuit shown in Figure 5 may

be associated with other articles which are to be protected, to sound an alarm if an article is subjected to unauthorised contact by the body of a person or by some other. The circuit is intended to be associated with articles which have a sole or primary function other than that of responding electrically to contact with a body.

The operating unit 12 further includes an ignition inhibit circuit 58 having terminals 59 and 60 connected in series with an ignition switch of the vehicle. These terminals are connected with the contacts of a normally closed relay 61. A further terminal 62 is connected with the ignition switch of the vehicle and if a signal is applied to this terminal by closing of the ignition switch whilst the activaton control circuit 37 is in its active condition, the relay is energised. However, a change in the condition of the activation control circuit during a period, throughout which the ignition switch of the switch of the vehicle is closed, does not result in energisation of the relay 61.

CLAIMS

1. A security system comprising a transmitter, a receiver and an operating unit, wherein the transmitter is adapted to radiate energy in wave form at a predetermined frequency and the receiver is adapted to resond to energy radiated to the receiver by the transmitter.

2. A system according to Claim 1 wherein the transmitter operates to interrupt and to resume the radiation of said energy with a predetermined mark/space ratio and the receiver is adapted to compare the frequency and the mark/space ratio of radiant energy received by the receiver with said predetermined frequency and said predetermined mark/space ratio and to provide to the operating unit an output signal which indicates when both the frequency and the mark/space ratio of energy radiated to the receiver are equal respectively to the predetermined frequency and predetermined mark/space ratio.

3. A method of controlling an operating unit wherein there is associated with the operating unit a receiver, energy in wave form is radiated from a transmitter to the receiver, the receiver compares the frequency and the mark/space ratio of said energy with a predetermined frequency and a predetermined mark/space ratio and the receiver provides to the operating unit an output signal which indicates when both the frequency and the mark/space ratio of energy radiated to the receiver are equal respectively to the predetermined frequency and the predetermined mark/space ratio.

4. A security system according to Claim 1 wherein the operating unit is settable in active and inactive conditions, the condition of the operating unit being changed from one of said conditions to the other when a predetermined signal is transmitted from the transmitter to the receiver and being changed from said other condition ot the one condition if transmission of the same signal from the transmitter to the receiver is repeated.

5. A method of controlling an operating unit which is settable in an active condition and in an inactive condition, wherein there is associated with the operating unit a receiver, the condition of the operating unit is changed from the active condition to the inactive condition when there is transmitted to the receiver a predetermined signal and wherein the condition of the operating unit is changed from the inactive condition to the active condition when transmission of said predetermined signal to the receiver is repeated.

6. In combination, an operating unit, signalling means and a receiver which includes an input element and which responds by providing an output signal to the operating unit whenever there occurs in a field to which the input element is subjected a predetermined change or sequence of changes or whenever there occurs in radiant energy incident on the input element a predetermined change or sequence of changes, and wherein the signalling means is adapted to radiate visible light from an area which surrounds the input element.

7. In combination, an operating unit, signalling means and a receiver which includes an input element and which responds by providing an output signal to the operating unit whenever there occurs in a field to which the input element is subjected a predetermined change or sequence of changes or whenever there occurs in radiant energy incident on the input element a predetermined change or sequence of changes, the signalling means is adapted to radiate visible light when the signalling means is energised and wherein the signalling means and the input element form a unit which is connected electrically with the remainder of the receiver by two conductors only.

8. A method of receiving a signal and providing an acknowledgement of that signal wherein there is provided control means and a unit comprising an input element for receiving the signal and an electrically energisable light source, the unit is connected electrically with the control means by two conductors, said signal is fed from the input element to the control means along said two conductors and the light source is then energised by current flowing from the control means along said two conductors.

9. A security device in combination with an article for which protection is required, wherein the security device includes means for responding to a change in the capacitance between the article and a body insulated from the article caused by a person touching the article.

10. A method of signalling an unauthorised contact between a person and an article, wherein a change in the capacitance between the article and a body insulated from the article which occurs when the person touches the article is sensed and an alarm is then energised.

11. A security system substantially as herein described with reference to and as illustrated in the accompanying drawings.

12. Any novel feature or novel combinaton of features disclosed herein or in the accompanying drawings.

Printed in the UK for HMSO, D8818935, 7/84, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.