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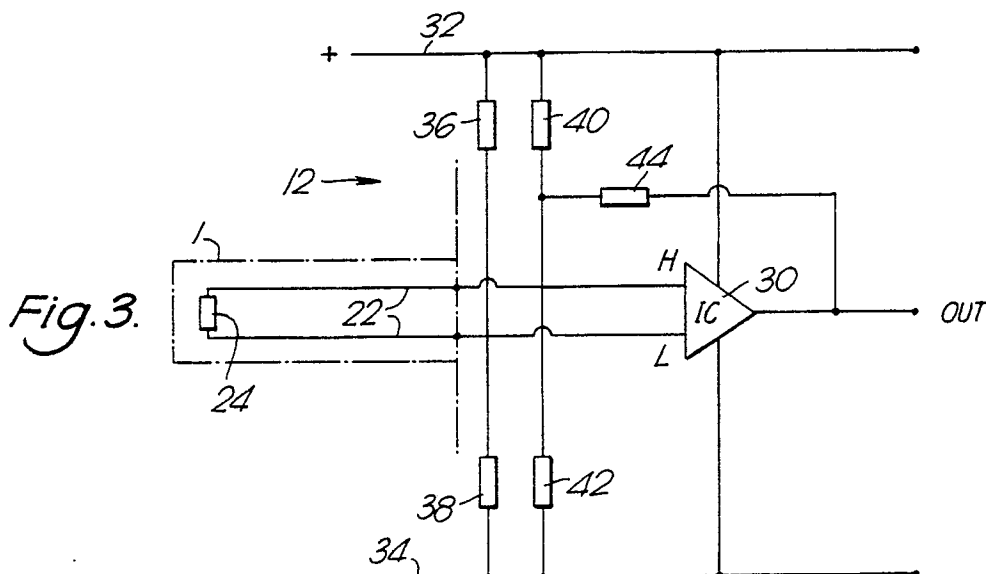
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54 **Anti-theft device.**

57 The anti-theft device comprises a housing on a cable (1). The cable extends from the housing and has a free end which can be locked into the housing. The device contains a cut detector (12) for sensing total or partial severing of the cable and a

proximity detector (10) which detects touching or approach of the device. Each detector activates an alarm (18) when activated. The device is compact and the housing contains a battery power supply.



EP 0 385 800 A1

ANTI-THEFT DEVICE

This invention relates to anti-theft devices, for example devices for securing vehicles, for example bicycles, motor bikes and the like. The invention is also suitable as an intrusion detector, for example for detecting unauthorised entry into a room, as a personal alarm or, as an anti-theft device for luggage or merchandise.

In the past, bicycles and other two-wheeled vehicles have been secured by passing a chain or cable around the frame and through a wheel. One end of the chain is attached to the other, for example by a padlock or combination lock. This type of device has the advantage that a bicycle or similar vehicle be securely chained to fixed railings or other articles of street furniture to provide an added measure of safety. However, the chains or cables may be cut through relatively easily, despite the use of tough materials, and the known devices are not satisfactory in preventing determined thieves.

The present invention aims to provide an improved anti-theft device and accordingly there is provided an anti-theft device, comprising a housing, a cable attached at one end to the housing, the cable being arranged for looping around or through an object to be secured and having a free end detachably connectable with the housing, sensing means operable when the free end of the cable is attached to the housing for sensing whether the cable has been cut or the device approached and for generating a signal in response thereto, and an alarm for activating an audible or visual alarm in response to a signal from the sensing means.

A device embodying invention has the advantage that it not only responds to attempts to cut the cable but also to contact or approach. In a preferred embodiment the sensing means comprise a proximity detector which is preset to activate the alarm when an approacher is within a predetermined distance of the device, for example 5cms. Preferably the proximity detector comprises an internal aerial.

The invention is also applicable to protection of items other than two wheeled vehicles, for example it be used as a luggage or merchandise alarm. The device may be used as a door or window alarm in which case it is desirable to include an external antenna in the proximity detector in order that the alarm may be activated from a greater distance.

The cable is not necessary for all applications of the invention and a further aspect provides an anti-theft device, comprising a housing, sensing means for detecting approach of the device by a party and for generating a signal indicative thereof, the sensing means comprising an antenna located

inside the housing, and an alarm for emitting an audible or visual alarm in response to signal from the sense means.

The sensing means also include a delay which prevents an alarm signal being generated for a short period after the device is touched or approached so that the operator may set and disable the device without the alarm sounding.

The invention also resides in a proximity detector which may be hung on a door or otherwise arranged to detect the approach of a malefactor to a room. In one preferred construction the device suitable for use as an anti-theft device for a bicycle may be used as the proximity detector. The device be hung over the door handle by the cable and an external antenna attached to the proximity detector so that the alarm will sound even though the potential intruder is a long way from the device.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of an anti-theft device embodying the invention;

Figure 2 is a block diagram of the circuitry of a device embodying the invention;

Figure 3 is a detailed circuit diagram of the cut-detector shown in Figure 2;

Figure 4 is an enlarged view of the cable showing the cable-cut detector wires and the proximity detector antenna; and

Figure 5 is a circuit diagram of the proximity detector of Figure 2.

The device comprises a chain or cable 1 to be passed around the frame of, for example, a bicycle. The cable is fixed in a housing 2 at its one end 3 and is removably connectable to the housing at its other free end 4. The free end 4 (Figure 4) comprises a male terminal which can be inserted into an entrance 5 in the housing and held in position by a key operated lock 6 which clamps a reduced thickness portion of the terminal preventing withdrawal of the cable from the housing. The cable is made from any suitable material and may for example be braided steel cable.

Inside the housing is mounted a proximity detector 10, a cable-cut detector 12 and an alarm device 18,20 (Figure 2), all of which are activated by a switch 8 mounted on the housing. The switch may disable the device (position 0) activate the touch detector alone (position II) or activate both cable-cut and touch detectors (position I). As an alternative, the lock and switch may be incorporated so that the unlocked state corresponds to position 0 of the switch and the key may turn the lock to two locked states corresponding to positions

I and II. In an alternative embodiment (not shown) two further switch positions are added. Position III activates the cut detector alone and position IV is a test position.

Referring to Figure 2, operation of the cable-cut detector will be described first. When position I of the switch 8 is selected, the cable-cut detector 12 is coupled to a power supply (not shown). The detector 12 is also coupled to an amplifier 20 and a loudspeaker 18. The detector is connected to one of the supply rails via a pair of wires which extend along the length of the cable terminating in a resistance 24. While this connection is intact, no current will be passed to the loudspeaker 18. However, when the cable is severed, and with it the wires 22, the loudspeaker will be energised and an audible signal emitted. The wires 22 and the resistor are arranged such that they extend along the whole length of the cable and into the housing when the cable is clamped so that the circuit will always be broken if the cable is cut irrespective of where the cut is.

Figure 3 shows the cable-cut detector 12 in more detail. The detector comprises an operational amplifier 30 connected to positive and negative voltage rails 32, 34 and having High and Low inputs H and L. The low input is set with respect to positive and negative voltage rails 32, 34 by bias resistors 36, 38 and the high level is set by bias resistors 40, 42. The gain of the amplifier is controlled by feedback resistor 44.

The high (H) and low inputs to the amplifier 30 are the wires 22 of the cable. The two wires are joined by the terminating resistor 24 and the broken line 1 represents the cable casing 1. Broken line 2 represents the detector casing 2. In normal use the wires 22 and resistor 24 short circuit the inputs to the amplifier 30 and there is no output to the amplifier 20. However, if one of the wires is cut, the H and L inputs assume their values determined by the values of the biasing resistors 36 and 42 and there will be an output from the cut-detector. This output will be amplified by amplifier 20 and then form the input to loudspeaker 18.

The proximity detector 10 is connected in position I. As the proximity detector causes a signal to be passed to the speaker when the device is approached, it is desirable to include a delay 26 in the circuit to enable the operator to enable and disable the device without activating the loudspeaker. The proximity detector includes an internal antenna 28 which is shown schematically in Figure 2. In practice it is preferred to include the antenna inside the cable casing 1 as illustrated in Figure 4. The delay may be set to a convenient time, for example, five seconds. The delay may also be incorporated into the cable-cut detector 12 although this is not shown in Figure 2.

The proximity detector is shown in Figure 5 and is a modification of a standard Siemens touch pad circuit, for example one sold under the circuit identification code S576. The circuit is modified such that the sensor input 100 is the internal antenna input, thus converting a touch detector to a proximity detector.

The person approaching the device provides an alternative path to earth for the field radiated by the antenna and so the potential across the antenna falls. A threshold detector in the circuit detects whether the level has fallen below a given level, and, if so, allows an output signal to be passed from the detector via the amplifier to the loudspeaker.

As a further modification, a switch (not shown) may be included. This switch is coupled to the cable-cut detector and is set when the device is mounted on the frame of the bicycle. An attempt to remove the device will trip the switch and cause the cable-cut detector to transmit a signal to the loudspeaker.

An additional tamper switch may be included to prevent unauthorised removal of the back cover of the casing so that a malefactor cannot remove the battery and so disable the device.

The embodiment described provides an anti-theft device that will sound an alarm when an attempt to cut the cable lock is made. Furthermore, the alarm can be set to sound if the device is approached or tampered with.

An external antenna may be fitted to the proximity detector. This makes the device, with or without the cut-detector fitted, especially suitable for use as a door alarm. The device may hung by the cable or any other attachment which may be fitted on the door of, for example, a hotel room. The external antenna may be fed under the door into a corridor so that the alarm sounds on approach of a malefactor. In fact, the device could be positioned anywhere within a room provided that a sufficiently long antenna is used. The sensitivity of the device is preset but may at the manufacturing stage be varied by adjusting the threshold detector to suit the prevailing conditions and to compensate for losses that will be present if a long external antenna cable is used. Where the device is hung by the insulated cable on one side of a door, the alarm will be activated, regardless of the external antenna, by a hand on the door handle on the other side of the door, provided that the door handle is made of metal. In this case the intruder acts as an earth which triggers the alarm. This is not the case where the door handle is non-conducting.

In addition to the uses described it will be appreciated that the invention may be adapted for use as an anti-theft device in any situation without departing from the scope of the invention. For

example, although described with reference to bi-cycles, the device having a cut detector and cable may be used with any two-wheeled vehicle or with a car, in which case the cable could be extended for extension through the steering wheel. The device could be adapted for use with merchandise or luggage or for use not only as a door alarm but to detect unauthorised entry or approach at any part of a building or vehicle. The device could be used as a window alarm in a building or as a general alarm for a car or the like. In addition the device could be used as a personal alarm. Other uses and modifications within the scope of the invention will occur to the reader skilled in the art.

Claims

1. An anti-theft device, comprising housing, a cable attached at one end of the housing, the cable being arranged for looping around or through an object to be secured and having a free end detachably connectable with the housing, sensing means operable when the free end of the cable is attached to the housing for sensing whether the cable has been cut or the device approached to a given distance and for generating a signal in response thereto, and an alarm activated in response to a signal from the sensing means.

2. A device according to claim 1, comprising locking means for locking the free end of the cable in the housing, the sensing means being operable only when the cable is locked by the locking means.

3. A device according to claim 1 or 2, wherein the sensing means comprises an internal antenna.

4. A device according to claim 3, wherein the internal antenna is located within the cable casing.

5. An anti-theft device, comprising a housing, sensing means for detecting approach of the device by a party and for generating a signal indicative thereof, the sensing means comprising an antenna located inside the housing, and an alarm for emitting an audible or visual alarm in response to signal from the sensing means.

6. A device according to any of claims 1 to 5, wherein the sensing means comprises an external antenna arranged for connection to the housing.

7. A device according to claim 6 wherein the external antenna is detachable.

8. A device according to any preceding claim, comprising a delay device for delaying emission of a signal from the sensing means to the alarm upon sensing approach of the device.

9. A device according to any preceding claim, comprising means for activating the alarm in response to attempted removal of the device from a mounting or attempted dismantling of the device.

10. A device according to any preceding claim, wherein the sensing means comprises a proximity detector having a variable sensitivity whereby an operator can set the device to be activated when an approacher is within a predetermined distance of the device.

Fig.1.

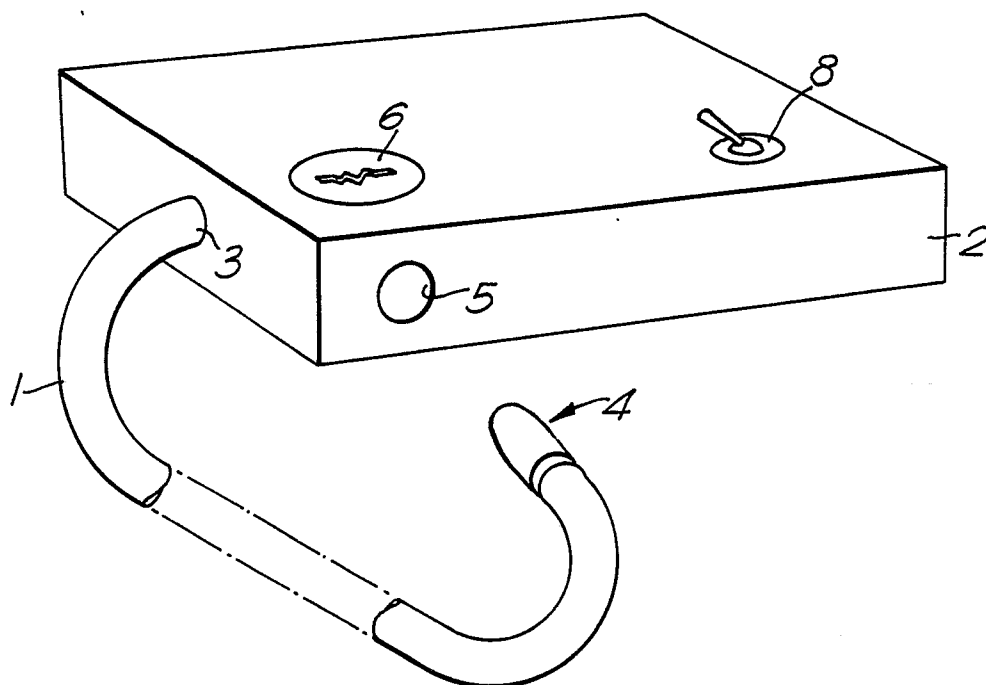


Fig.4.

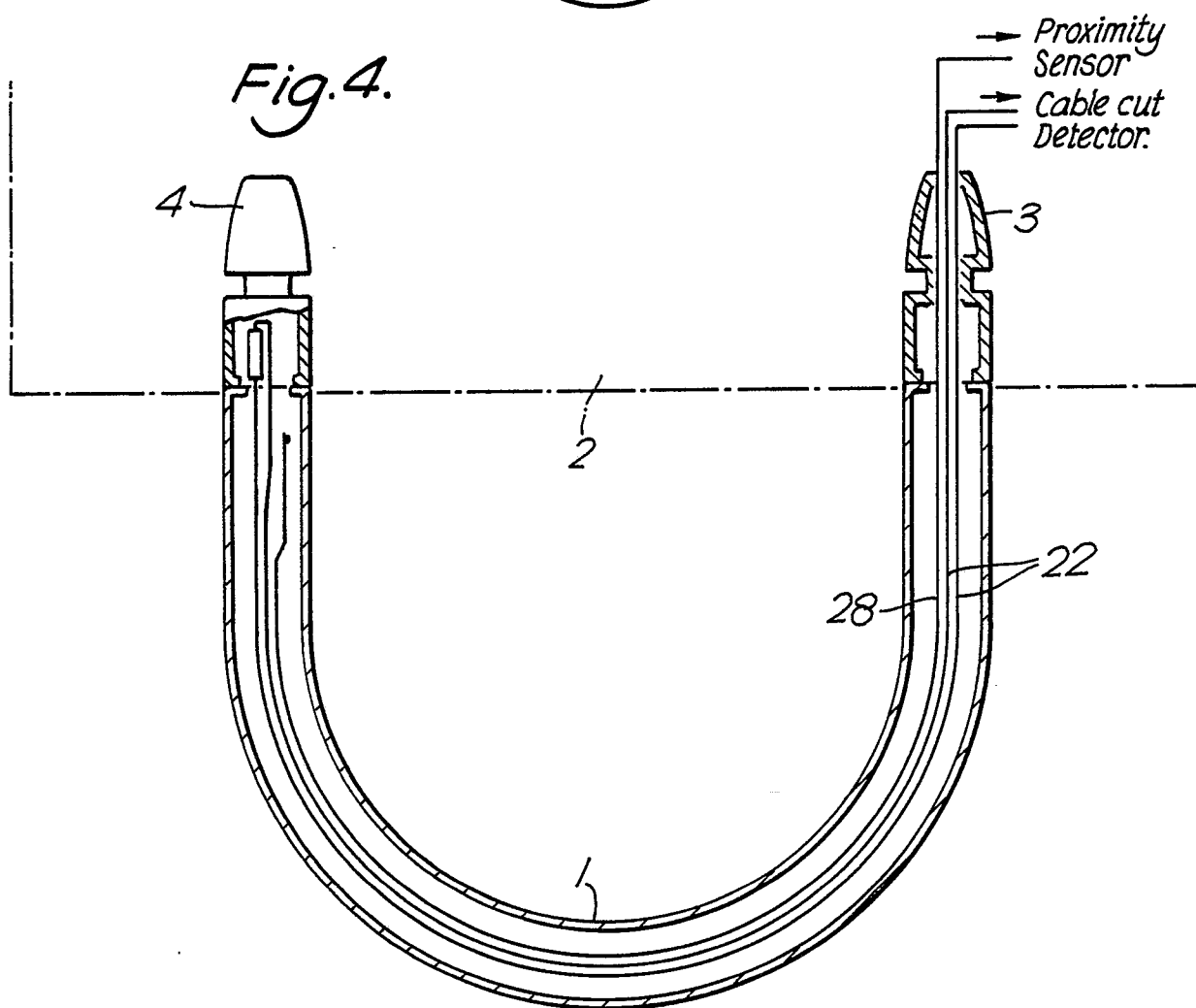


Fig. 2.

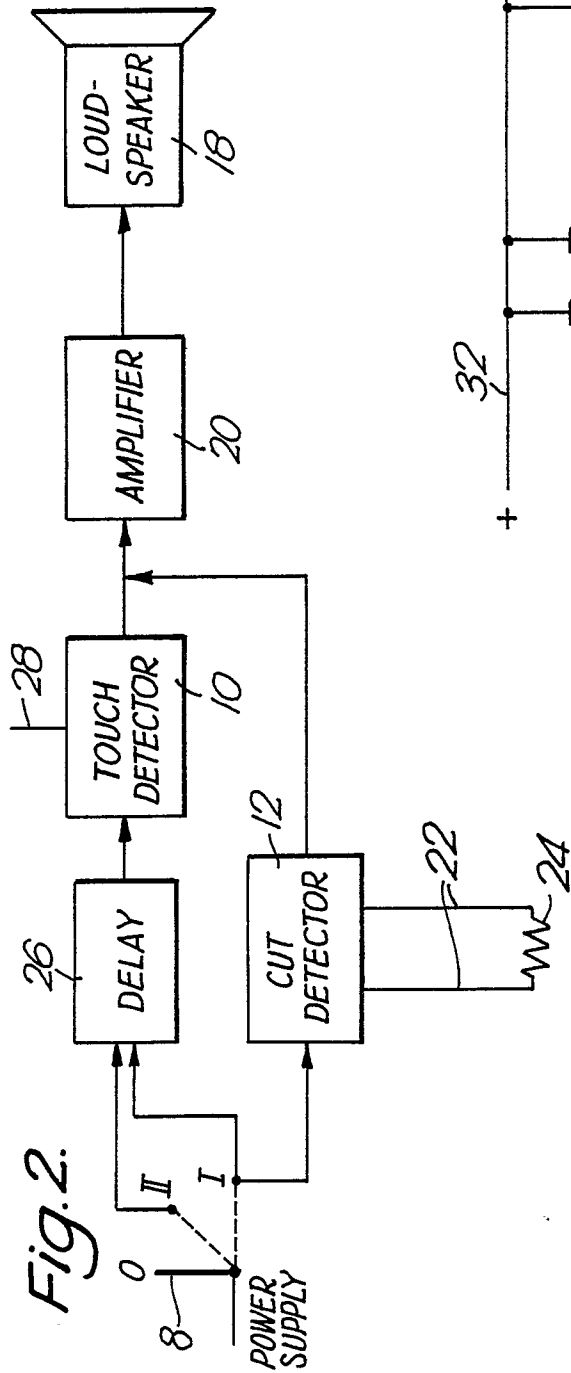
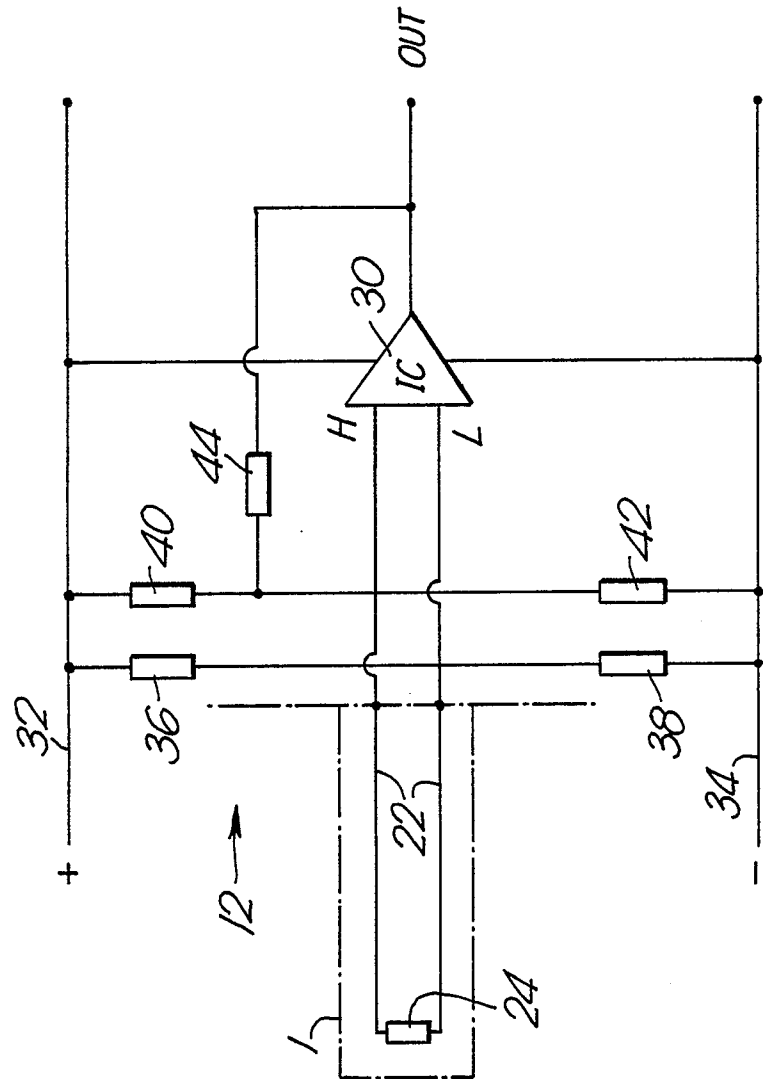


Fig. 3.



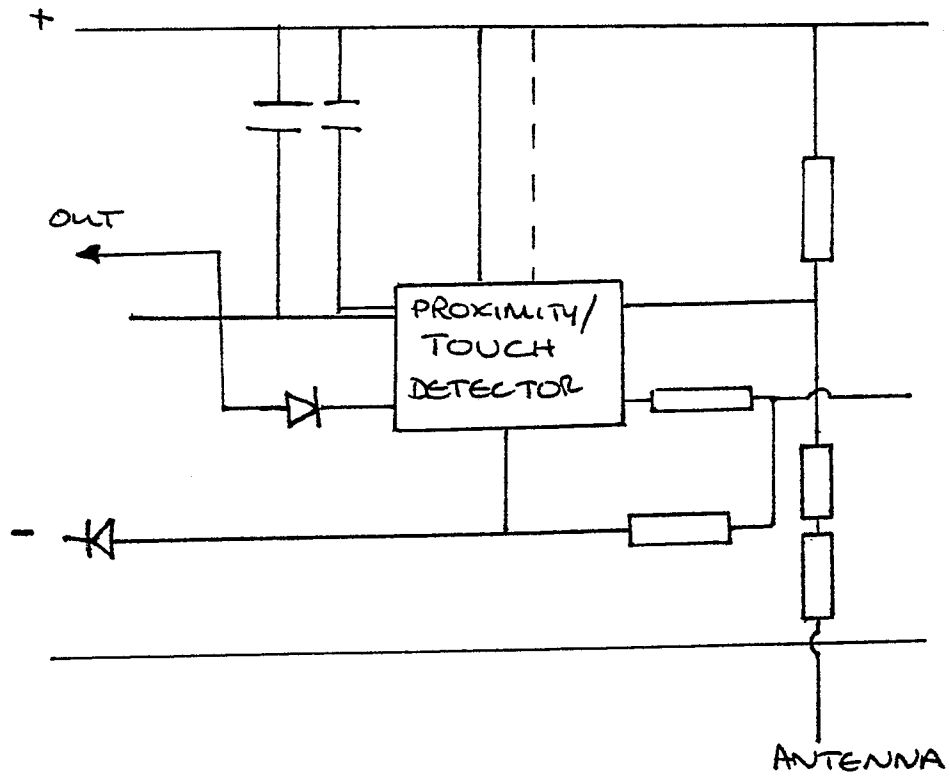


FIGURE 5



DOCUMENTS CONSIDERED TO BE RELEVANT															
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)												
A	GB-A-2 148 248 (DUNLOP) * figure 2; abstract * ---	1,2,9	G 08 B 13/12												
A	US-A-4 621 258 (CAMPMAN) * figure 1, abstract, column 2, lines 37-68 * ---	3,4,6													
A	GB-A-2 066 536 (BAJIUS) * figure 1, abstract * ---	6													
A	US-A-3 772 645 (ODENZ et al.) * figure 1, abstract * ---	9													
A	US-A-3 896 425 (ERICHSEN) * figures 4-6; abstract, column 4, lines 21-37 * -----	1,5													
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)												
			G 08 B E 05 B												
The present search report has been drawn up for all claims															
Place of search BERLIN		Date of completion of the search 10-05-1990	Examiner DANIELIDIS S												
<table border="0"><tr><td>CATEGORY OF CITED DOCUMENTS</td><td>T : theory or principle underlying the invention</td></tr><tr><td>X : particularly relevant if taken alone</td><td>E : earlier patent document, but published on, or after the filing date</td></tr><tr><td>Y : particularly relevant if combined with another document of the same category</td><td>D : document cited in the application</td></tr><tr><td>A : technological background</td><td>L : document cited for other reasons</td></tr><tr><td>O : non-written disclosure</td><td>.....</td></tr><tr><td>P : intermediate document</td><td>& : member of the same patent family, corresponding document</td></tr></table>				CATEGORY OF CITED DOCUMENTS	T : theory or principle underlying the invention	X : particularly relevant if taken alone	E : earlier patent document, but published on, or after the filing date	Y : particularly relevant if combined with another document of the same category	D : document cited in the application	A : technological background	L : document cited for other reasons	O : non-written disclosure	P : intermediate document	& : member of the same patent family, corresponding document
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