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(54) **ELECTRONIC DEVICE FOR CONTINUOUS, OR DISCONTINUOUS, CONNECTION BETWEEN PERSONS AND OBJECTS**

ELEKTRONISCHES GERÄT ZUR KONTINUIERLICHEN ODER DISKONTINUIERLICHEN
VERBINDUNG ZWISCHEN PERSONEN UND GEGENSTÄNDEN

DISPOSITIF ELECTRONIQUE ASSURANT UNE COMMUNICATION PERMANENTE OU
DISCONTINUE ENTRE DES PERSONNES ET DES OBJETS

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Description

The invention concerns alarm and safety devices for persons and mobile objects.

A well-known feature of society today is the increasing frequency of thefts committed with dexterity, and the ease with which people lose wallets, bags, keys and documents.

Elderly people and children get lost in the streets, in gardens, in public places.

All these situations give rise to considerable problems and are the cause of serious trouble.

There are numerous electronic devices, patented and available on the market, that, by means of electromagnetic waves, permit remote connection among people, objects or other people such as children and animals in need of protection, in the main based on two types of electronic apparatus, one being substantially a receiver and the other substantially a transmitter. The devices may both be transceivers.

The transmitter is carried by the person or object to be protected while the receiver is controlled by the person entrusted with their protection.

When the transmitter-carrying person or object strays farther away than the established, adjustable, distance, an electronic threshold is exceeded and an alarm given.

Other devices employing rotary antennas, triangulations or other means can, in addition, find out in which direction the protected object has gone when the distance previously set has been exceeded.

For example, the Nutter Enterprises patent WO A 87 06748 comprises a system of remote control and alarm operating between a transmitter carried by a person or object and a receiver to which alarm signals are sent from a distance by the transmitter.

The coded FM signals are produced at intervals by the transmitter in the form of digital words.

The receiver immediately produces an alarm if at least one of the coded words is not received during any one of the intervals.

The receiver can control two transmitters simultaneously, adjusting the coded words so that they can appear at different intervals.

Even though in theory this apparatus has two transmitters, it does not deal with the problem of supervising several objects, persons or animals with a single receiver, partly for reasons of bulk, partly because of the difficulty of stowing away the different parts when not in use and partly because of the problem of coordinating the operative and idle phases of one or other of the transmitters.

Handling problems may arise or others of interference among the various transmitters, also that of recognition. Operation of various transmitters towards one receiver only can be very time-taking especially tuning up and syntonizing connections.

It is also practically impossible to use known devices

such as communicators to assist in searching for people and objects under trying or extremely difficult environmental conditions, such as when hidden under avalanches or when needing help of some kind.

Purpose of the present invention is to provide an inexpensive and easily carried device able to eliminate or reduce the seriousness of the above accidents by maintaining connections, which may even be continuous, by means of electromagnetic waves between the user and other persons and objects placed under the protection or at least under the control of the user making it easy to raise an alarm, operate means of security and various types of equipment.

Subject of the invention is an electronic unit able to establish continuous, or intermittent, connection among persons or between persons and objects, said unit comprising two devices, the first that here will be called a receiver, and the second formed of one or more bodies that will here be called a transmitter.

The receiver and each of the transmitters are connected by electromagnetic waves, to be employed respectively by the user and by the persons or objects who are under the projection or control of said user.

The electromagnetic waves are, as the case may be, radio waves, microwaves, sound waves, supersonic waves, infrared waves and others.

The receiving and transmitting devices have independent electric feed by batteries and the like or photoelectric panels.

The devices are preferably pocket-size and miniaturized. The signals sent out by the electromagnetic waves can be coded to prevent interference among transmitters.

In one advantageous execution the receiver comprises one or more compartments each carrying one transmitter.

When each transmitter is physically separated from the receiver, there are special devices and circuits to activate the separated receiver and transmitter.

When each transmitter is physically reunited with the receiver, said transmitter becomes deactivated.

When all transmitters are thus reunited, the receiver is deactivated.

The automatic devices for activation and deactivation may be microswitches worked when the transmitter is connected with or disconnected from the receiver.

The means for attraction and disactivation may be magnetic attracting means that simultaneously retain the transmitter in the receiver and activate a magnetic microswitch within the transmitter that deactivates it.

At the moment of deactivation, as there is no magnetic field the microswitch reactivates the transmitter.

Transmission by electromagnetic waves is made by using a double, or multiple, carrier technique to improve reception in closed environments or to overcome any blind spots that may be caused by obstacles or reflection of the signal.

The transmitter sends out signals on one or more

different frequencies, which are fixed or dynamically variable over time.

The receiver uses the alternative frequency instead of one which may have been weakened by obstacles or reflection.

The transmitters can comprise a circuit which, due to activation of a special control device on said transmitter or due to emission of a vocal sound, produces a signal towards the receiver which then sends out an alarm signal useful for checking on the safety of children or of any person in need of help. Said vocal sound could be a baby crying.

The transmitters can comprise a circuit containing an acoustic warning which sounds when the transmitter receives from the receiver a certain signal; in this way the transmitter is relocalised when, for example, persons or objects have been found.

A special circuit constantly evaluates the distance between transmitters and the receiver. Said distance is compared with an electronic threshold which the user modifies by means of a special selecting device.

Reaching the threshold sets off in the receiver one or more devices corresponding to alarm or some operative function when a certain distance, representing a given threshold value, is exceeded.

This alarm is acoustic or visual, or of both kinds.

The chosen function is operated by a push button from among those available corresponding to that function.

The device gives rise to an operative function if the threshold value is exceeded because a distance has been reached either greater than that corresponding to the threshold value, or lesser.

The purpose of this is to permit, for example, automatic remote activation of an anti-theft device for an automobile, for a home or some enclosed space, of an automatic closing device on a gate and a door or for deactivating a system, such as lighting or heating, when the user with the transmitter goes away from, for example, the automobile in which the receiver is installed, or else to permit the opposite functions when the user is approaching.

A special circuit and means of control, such as a two-way selector on the receiver, will set off the alarm

- either when the distance between transmitter and receiver is increasing,
- or when the variation of said distance is diminishing the first being useful when for example, persons or objects should not move too far away, and the second when, for example, a search must be made for a lost person or object.

The distance varying between a transmitter and a receiver is visualised numerically on the receiver. The distance can be found by measuring the delay in the echo signal compared with the signal sent out by the device called a receiver to a transmitter.

The distance can be found by measuring the time taken by a signal emitted by a transmitter or by the receiver when ordered to emit it by the other.

A special circuit constantly evaluates the direction between the receiver and one or more of the transmitters visualising said direction on a dial on the receiver.

The direction may be analogically visualised on a linear or circular bar-graph or with pointers or with digits on a numerical display.

The direction may be measured by triangulation techniques. The direction of each transmitter in relation to the receiver can be found by manual or automatic rotation of an antenna on the receiver and measuring the variation in amplitude of the echo signal in relation to that sent out by the device called a receiver, to a transmitter.

The receiving and transmitting devices have independent electric feed by batteries and the like or by photoelectric panels.

Receiver and transmitters can be equipped with already known devices, operating on radio frequencies or with supersonic or infrared waves or by other means and can be completed with acoustic transducers, microphones and loud speakers and with devices suited to transmission and reception of Morse signals and be fitted with suitably powerful batteries to permit use of the device in searching for persons or objects in difficult environmental conditions.

Communication can thus be maintained between underwater divers and their boats on the surface, between emergency aid services and people lost in the snow, in fog or hidden under avalanches.

The invention offers evident advantages.

The possibility of being able to fit all the transmitters when not in use into the places made for them in the receiver assures both minimum bulk and the most effective protection for the transmitters themselves.

Automatic activation and deactivation of transmitters by simply detaching them or putting them away in the receiver greatly facilitates efficiency by making them available quickly and easily if required in an emergency.

It possesses an exceptional degree of versatility which makes it adaptable to many kinds of uses.

By keeping the receiver in an inside pocket or in some similar position or in any case close at hand, the user can be immediately informed if some person or object, to whom or to which a transmitter has been associated, goes away or is removed beyond the distance set by the receiver.

The user can therefore be warned if a thief steals his wallet in some crowded means of public transport, or if he forgets his umbrella or to supervise his baggage.

The advantages are also clear from the possible concrete examples of how the invention can be used.

Entering a cafe, the user places his umbrella, to which one of the invented transmitters is attached, in an umbrella stand. On leaving he forgets to collect it.

After walking away for a certain distance (the dis-

tance is that which said user has set on the device) the invented receiver, in the user's coat pocket, sounds a warning signal.

A parent does not want his little boy, playing in a park, to get too far away, for example not more than 40 m. Using the knob of the potentiometer he sets this distance on the receiver and puts a transmitter into the child's clothing.

If the child disobeys and goes off to far, the warning will sound and the parent be told.

A thief enters an apartment at night but one of the invented transmitters has been mounted on the door, after careful measurement, also done by the device, of the distance between the door of the apartment and the occupier's bed.

On opening the door the thief brings the transmitter closer to the receiver, on the occupier's bedside table for example, thus setting off the warning signal.

A shortsighted person does not remember where he has put down his glasses or the remote control to which the invented transmitters are applied, or else he wants to find his cat who likes to hide away and who has a transmitter on him.

The user sets a low value (e.g. 50-100 cm) on the receiver and then searches every corner in the house until a warning informs him that he is close to his glasses, his remote control device or to his cat.

In situations of extreme environmental difficulty, such as snow, fog, under water and others, the arrival of help is enormously facilitated.

Automatic activation of alarm signals can be made in automobiles, at work, in the home, for closing gates and doors, for turning off lights, heating and other useful functions when the house occupier leaves home or gets out of his car.

Said functions, even without specific action by the user, ensure protection in cases of forgetfulness or inability.

On returning, the user can obtain automatic deactivation of alarm systems, opening of gates, doors and anything else. Generally speaking, with the electronic unit described the chances of losing people and objects are greatly lessened, while activation and deactivation of alarms and systems generally, opening and closing of doors, structural and electronic means of protection are all facilitated, to the great comfort of the user.

The electronic unit described is extremely simple in its structure, is inexpensive and practical to use, thus permitting universal diffusion.

Characteristics and purposes will be made still clearer by the following examples of its execution illustrated by figures.

- Fig.1 The receiver of the electronic unit subject of the invention.
 Fig.2 One of the transmitters.
 Fig.3 Receiver with four transmitters.
 Fig.4 Layout of the receiver

- Fig.5 Layout of the transmitter.
 Fig.6 Layout of the receiver with alternating logic of the carriers, for measuring distance.
 Fig.7 Layout of the receiver with alternating logic of the carriers for detection of direction.
 Fig.8 Layout of receiver-transmitter for two-way communication by voice and Morse.
 Fig.9 Layout of receiver-transmitter for relocalizing a transmitter.

The receiver 10 of electromagnetic waves, shaped like a flat box, has a compartment 11 to house the transmitter 30 of electromagnetic waves, this too shaped like a small flat box.

The receiver 10 comprises a battery 12 for electricity, a microswitch 13 for connection to this electric feed, an antenna 14, an AF demodulator filter 15, a preamplifier 16, a decoder amplifier 17, a comparator 18, a potentiometer 19 with graded scale 20, a slide selector 21, an output stage 22 for a visual or acoustic alarm signal, an analogico-digital converter 23, a 3-figure display 24, an electric ringer 25.

The transmitter 30 comprises a battery 31 for electric feed, a microswitch 32, an oscillator 33, a variable condenser 34, an amplifier 35, a modulator 36, an antenna 37, a LED 38.

The receiver 40 possesses the essential features of the receiver 10 but instead has four compartments 41-44 substantially the same as the compartment 11 of the receiver 10 housing the transmitter 30 and the transmitters 52-54 substantially the same as the transmitter 30.

When idle the transmitter 30 is put in the housing 11 of the receiver 10.

When so placed the switch 13 of the receiver 10 and the switch 32 of the transmitter 30 are in the open position and therefore the electronic unit formed of the receiver 10 and of the transmitter 30 is deactivated.

Extraction of the transmitter 30 from the receiver closes the above switches 13 and 32 which activates the receiver and the transmitter.

In the oscillator 33 of the transmitter 30, a carrier is generated at the previously established frequency, by means of the variable condenser 34.

Said carrier, suitably amplified in the amplifier 35 and modulator in the AF modulator 36, is sent to the antenna 37 for transmission of the signal.

The receiving antenna 14 picks up the signals transmitted by the transmitter 30 and these are sent to the AF demodulator filter 15.

This filter eliminates the carrier and extracts the modulator superimposed over it, on condition that the transmitter 30 has been tuned in, through the variable condenser 34, to the frequency of the receiver 10.

The AF demodulator filter 15 generates at its output a signal that is suitably preamplified in the preamplifier 16 and sent to the amplifier-decoder 17.

Recognition of the code of modulation and ampli-

cation takes place here. Said signal is compared in the comparator block 18, with a threshold, set by the user by means of the potentiometer 19 with a rotating shaft.

According to the position of the slide selector 21 present on the box holding the receiver 10, an output warning signal will then be generated in one of the following cases:

- if the signal sent out by the transmitter goes beyond the established threshold because the distance between the transmitter that is moving away and the receiver exceeds a certain value;
- if the signal sent out by the transmitter goes beyond said threshold because the distance between the approaching transmitter and the receiver is less than said value.

The alarm signal is sent to the output stage 22 of the receiver 10 for a visual signal, by means of a LED 38, or an acoustic signal.

Said alarm will therefore mean that the distance between the transmitter and the receiver is lesser or greater than a previously established value.

Simultaneously the signal sent out by the transmitter is sent to an A/D converter 23 and there changed into a numerical signal that appears on a display 24 to show the actual distance in metres between transmitter and receiver.

Operation at high frequency and the possibility of mounting the device with SMD circuits mean that both parts composing the invented device can be miniaturized, greatly reducing bulk and making it possible for one of them, particularly the transmitter, to be incorporated into objects in use at the time of their manufacture.

Fig. 6 diagrammatically shows the use of a double carrier technique to find the distance between the receiving device 59 and the transmitter 30.

The receiver 60 at A frequency alternates with the receiver 61 at B frequency by means of the carrier alternating logic 62.

The circuit 63 finds the amplitude variations on the basis of which said distance is visualised in the circuit 64.

When the above mentioned threshold is exceeded the alarm is given activating the pilot light 65.

Figure 7 shows in diagrammatic form how the double carrier technique is used to detect the angular position between the receiving device 69 and the transmitter 30.

The receiver 70 at A frequency alternates with the receiver 17 at B frequency by means of the carrier alternating logic 72.

By rotation of the revolving head 74 controlled by the circuit 75, circuit 73 finds the amplitude variations in accordance with which the angular position between the receiver 69 and the transmitter 30 is visualised in the circuit 76.

Indication of this position facilitates continuity of

connection between the user who has the receiver and the person or object to be protected in possession of the transmitter.

Figure 8 shows in diagrammatic form an improvement to the electronic unit described by addition of receiver-transmitters for communication by voice as well, useful in the presence of snow, fog and the like, and also of the Morse system for communication under water.

The receiver device 80 comprises the receivers 81 and 82 which by two-way radio control 93 are connected alternatively to transmitters 91 and 92 of the transmitter 90. The microphone 86 and loudspeaker 87 can be seen.

Morse type announcement or reply can be made it pushbutton 88.

Transmitters 84 and 85 in the receiver 80 are alternately connected to the receivers 94 and 95 in the transmitter 90 by the two-way radio control 83.

The microphone 96 and loudspeaker 97 can be seen.

Morse type announcement and reply can be made with the pushbuttons 88 and 98.

Figure 9 shows diagrammatically an electronic unit with receiver and transmitter in sealed shockproof containers provided with circuits for relocalizing the transmitter and therefore persons or objects to be controlled and protected in the event of contact having been lost.

The receiver 100 comprises the receiver circuits 101 and 102 which are connected, at normal power, with the transmitter circuits 101 and 102 of the transmitter 100.

If the circuit 113 shows an interruption in the signal, by means of the pushbutton 118 a maximum power signal can be sent to the receiving circuits 104 and 105 in the transmitter 100 by the transmitting circuits 114 and 115, and diffused by the loud speaker 106.

This acoustic signal assists in finding the object or person connected to the transmitter, by the user connected to the receiver.

Said acoustic signal can function automatically if the connection has gone too far away or is lost.

The transmitter will in any case emit the maximum power in making the acoustic signal increasing the power of emission of its own localizing signal so as to re-make the lost connection.

Claims

1. Electronic unit for continuous or discontinuous connection between persons and objects comprising two miniaturized and pocket-sized devices with independent electric feed, possibly even by photovoltaic panels, the first device here called a receiver (10,40,59,69, 80, 110) and the second, consisting of one or more bodies, here called transmitters (30, 52-54,90, 100), said devices being connected by radio waves, microwaves, sound waves, ultrasonic

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