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(54) **SECURITY ALARM DEVICE WITH FUNCTION OF ALARM SIGNAL TRANSMISSION TO THE COMPUTERIZED USER DEVICE**

(57) The invention relates to security alarm devices and can be used as alarm device for registration of touches or approaching to the protected object. The invention also provides signal transmission to the computerized user device (smartphone, tablet computer etc.) For achieving above said goals, proposed security alarm device with the function of alarm signal transmission to the computerized user device, comprising the independent current source, control, signaling, indicating unit, whose input port is connected with process controller, safety

sensor. According to the invention, process controller has the form of Bluetooth LE microcontroller. At least one capacitance proximity sensor with active shielding and make-break electrodes is used as the safety sensor, which is connected with platen selector and Bluetooth LE microcontroller. Capacitance proximity sensor is combined with control, signaling, indicating unit on the one printed circuit, Bluetooth LE microcontroller and active shield, which has the form of printed circuit track.

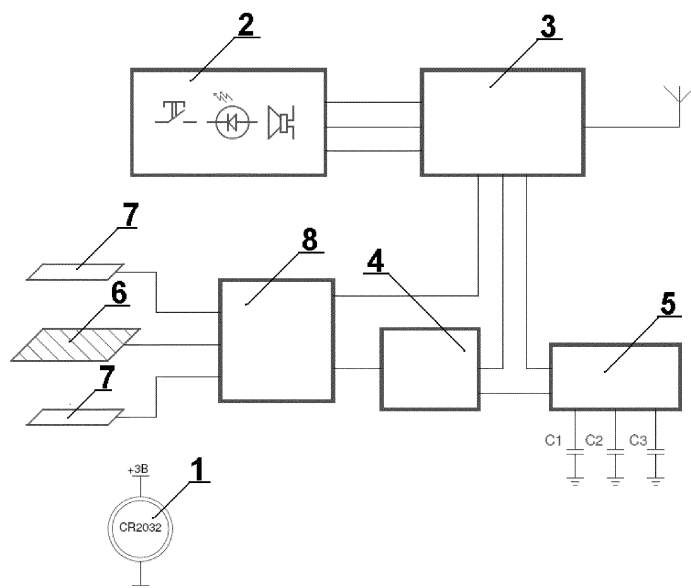


FIG. 1

Description

[0001] The invention relates to security alarm devices and can be used as alarm device for registration of touches or approaching to the protected object. The invention also provides signal transmission to the computerized user device (smartphone, tablet computer etc.)

[0002] Today there is a problem of prevention losses of various things (for example, as a result of the owner's negligence or theft). Owner usually wants to know where the controlled object is (or if it is near the owner or disappeared because of some reason). And if the disappearance of the object took place, owner should be informed about its movement. It is also desirable to make the usage of such object impossible for third parties or thieves.

[0003] Known key ring with alarm function (Patent RF № 86063, IPC H04B7/00, G08B13/00, Publ. 20.08.2009) includes the body, chip, radio transmitter, radio receiver, flasher and/or display and sounder, service button (keys, switches and others). There is radio-communication between key ring and another key ring(s) or another device with radio channel. When radiocommunication is lost or becomes weaker, key ring gives light and /or sound and/or vibro- signals. If user puts the key ring, which is connected with the mobile phone, on the belt or in the pocket, he (she) will know about loss or moving it away as soon as key ring is at 10-meters distance from the mobile phone. User also will know about disappearing of the mobile phone even if the distance is less than 10-meters when there is a higher level of danger, using the service button (for instance, in the public transport). Several key rings may be connected with mobile phone, and then the mobile phone will fulfill the function of «base» for the other key rings. In this case one key ring should be in the safe place (on the belt or in the inside pocket) and the others may be in the wallet, bag etc. Therefore, if the wallet/bag is lost, key rings start signaling about the breaking the contact with «base». Disadvantage of known device is limited functionality of key ring, because if the distance is more than 10-meters between key ring and protected object, the device will not work. Moreover, device should be permanently on voltage that causes the failure of power supply unit.

[0004] Known device (Patent of RF № 99293, IPC A45C11/00, Publ. 20.11.2010) for mobile phones protection against loss and theft includes the small rectangular metal body (to 20 Sm) which is fixed on the owner's belt by fastening element. This element contains the heavy tie which can be stretched as measure tape. The end of this tie is attached to the special fasten element which every mobile phone has. There is special button on the body of the phone. This button provides the fixation of the tie. But this device does not inform the user about theft if the mobile phone was not fasten to the user.

[0005] Known mobile phone with function "assistance"

(Patent of Ukraine № 83534, IPC H04M 1/02, Publ. 10.09.2013, Bul. № 17) comprises body with the controls in the form of keyboard, display, microphone, loudspeaker, satellite system, digital camera, vibration system, solar panel which is connected with power supply unit, extra power supply in the form of watch battery or another small accumulator. The body of mobile phone also has extra unnoticeable emergency call button, which is situated on the back side of mobile phone or another part of phone body, but not near the keyboard. Pressing on the emergency call button, mobile phone switches on with the microphone and connects to the security console, which can be switched off only if special code on the keyboard is input. This code is changeable and only security service knows code. If the basic power supply unit is retrieved from the mobile phone, extra power supply starts working. Therefore mobile phone will be on even if the sim-card is absent. The device is useful when it is necessary to set connection with competent authority in the emergency case (for instance, traffic accident or unexpected health problem of owner).

[0006] The most relevant device to the presented invention is alarm mobile device (Patent of Ukraine № 81947, IPC G08B 13/02, Publ. 25.02.2008), comprising the independent current source, which produces the supply voltage to all components of device, acoustic radiator, whose input port is connected with amplifier output, break-wire sensors. The device includes control assembly, which is based on the microcontroller, and motion sensor. The first output port of control node, which is based on the microcontroller, is connected with the amplifier input. The first input port of control assembly, which is based on the microcontroller, is connected with the output port of break-wire sensors through the connector and the second input port of control assembly is connected with the sensor motion. The device includes indicating unit. Input port of indicating unit is connected with the second output port of control assembly, which is based on the microcontroller. The disadvantage of alarm mobile device is the usage of motion sensors, which allows to indicate the movement of thief, but do not provide the indication of thief's touches to the protected object. The device does not provide the ability to react to the theft, using the alarm signal. Another disadvantage is a complicated construction and large quantity of extra elements - technical facilities with different functions. Therefore, it causes difficulties of device control.

[0007] The object of presented invention is improvement of construction of the security alarm device with the function of signal transmission to the computerized device. The device provides new apparatus solution, which enhance the safety of object, fast informing of object's owner by alarming with simultaneous notification to the owner's phone, using the means of wireless communication. The device is easy-to-use and can be carried in the protected object.

[0008] For achieving above said goals, proposed se-

curity alarm device with the function of alarm signal transmission to the computerized user device, comprising the independent current source, control, signaling, indicating unit, whose input port is connected with process controller, safety sensor. According to the invention, process controller has the form of Bluetooth LE microcontroller. At least one capacitance proximity sensor with active shielding and make-break electrodes is used as the safety sensor, which is connected with platen selector and Bluetooth LE microcontroller. Capacitance proximity sensor is combined with control, signaling, indicating unit on the one printed circuit, Bluetooth LE microcontroller and active shield, which has the form of printed circuit track.

[0009] Moreover, computerized devices of user is smartphone or tablet computer, which are based on the Android or IOS platforms, notebook computer and/or personal computer with installed software. Computerized devices is intended on the connection with Bluetooth LE microcontroller.

[0010] The usage of capacitance proximity sensor in the security alarm device allows register touches or approaching to the protected object (wallet, purse etc.) in which the present device is situated and give sound or informational signal (on the proposed device and /or computerized user device).

[0011] Present security alarm device with function of alarm signal transmission to the computerized user device has the name "keeper".

[0012] For further details of the invention, reference may be made to the accompanied drawings.

[0013] The security alarm device with function of alarm signal transmission to the computerized user device comprises independent current source 1, which powers all components of device, control, signaling, indicating 2 unit, whose input port is connected with process controller, which has the form of Bluetooth LE microcontroller 3, capacitance proximity sensor 4, which is connected with platen selector 5 and Bluetooth LE microcontroller 3. Capacitance proximity sensor 4 is combined with control, signaling, indicating 2 unit on the one printed circuit, Bluetooth LE microcontroller 3 and active shield 6, which has the form of connection strips on the circuit. Capacitance proximity sensor 4 has the sensors conductors 7 on the printed circuit which are connected through the commutator 8 to the control, signaling, indicating 2 unit. All above mentioned elements are situated in the body which is made of the nonmagnetic substance for providing the consistency of device.

[0014] Bluetooth LE microcontroller includes next assembly units:

- programmed Intel 8051 - single-chip microcontroller;
- nonvolatile program memory;
- random access memory;
- high-frequency transceiver for 2,4 GHz, which is comparable with specification Bluetooth v4.1;
- set of programmed input/output lines;

- programming and debug interface on serial protocol SPI (Serial Peripheral Interface);
- pulse converter (voltage switch converter).

[0015] The microcontroller is characterized by ultra-low energy consumption and may run on the lithium battery (current source 1) of form factor CR2032 on the term to one year.

[0016] The microcontroller 3 has the function of connection with the computerized device (smartphone/tablet computer/notebook computer/desktop computer/etc. - hereafter referred to as «host»), viz.: command acquisition (command reception), information transmission about sensor 4 status (sensor condition), signal strength (RSSI-Received Signal Strength Indication) and charging of current source 1. It also provides device/assembly units control, using the input/output lines. For instance, the microcontroller is switching bearing capacities for sensor 4, selecting discharge electrode, scanning the signals of tactile button, which is located on the control, signaling, indicating unit, signaling on the piezoceramic radiator.

[0017] Control, signaling, indicating 2 unit comprises such elements: tactile button which is being tested by program and has many purposes, depending on the device operating regime; two-color light-emitting diode provides operating regime by flickers, piezoceramic radiator, which provides the alarm audio-ranging signal (long squeak sound or siren with the frequency of ~ 4 kHz). Function of the unit 2 is alarm signal transmission to the computerized device of user when there is no telecommunication or the capacitance proximity sensor 4 is activated.

[0018] Using the platen selector 5, one of the standard capacitors is connected to the microcircuit of capacitance proximity sensor 4, which regularly compare it with the capacitance of sensor plates (electrodes). Human body has own capacitance, which influences (for example, approaching of hand) on the electrodes and may be identified (detected) by present device.

[0019] The ability to change platen provides the ability to regulate sensitivity of sensor 4. It can be useful when the conditions around the device have been extremely changed (it is located near the person or, for instance, in the pocket, bag or another protected object).

[0020] Active shield 6 constitutes the piece of copper foil inside the printed circuit, which is connected with electric field of the same electric polarity as sensor's 4 electrodes 7. Electric field on the electrodes is repulsive to the side, which is opposite to the active shield 6. It is necessary for prevention of false responses (for instance, as the reaction on owner's body, when the device is in the pocket).

[0021] Proposed device have next operating regimes (modes):

- Active waiting mode (standby mode). First LED blinks with the t_1 interval. In this mode on the special

(advertisement) channels Bluetooth LE the notification of device detection and the readiness to the telecommunication session. The notification is available for all hosts in the range of communication. If there is no connection with the device during N1 seconds, the device enters into passive sleeping mode.

- Passive waiting mode. In this mode device communicator turns off, minimizing power consumption. The light indication is absent. Active mode can be activate by click on the button of unit 2 (or take out and put into supply source).
- Operating mode. When the telecommunication session with the host was established successfully, this mode is activated. The device becomes unavailable for another hosts, since (according to the specification Bluetooth LE) it is disappeared from the advertisement channels and enter in the mode of pseudorandom frequency jump and traffic encryption. Second LED blinks with the t2 interval. In this regime device is controlled by special hosting software and provides the ability to monitor alert status or battery charge level; change the sensitivity of sensor 4; fulfill the search of device on the territory where there is a signal in the range of activity, depending on the signal level, which is monitoring, etc.
- Security mode. The host's command activates this mode. In this mode capacitance proximity sensor 4 switches on. First LED blinks with the t3 interval. When the sensor is triggered the e-mail with the alert signal will be sent on the host, signal is transmitted on the piezoceramic radiator. Warning alarm lasts for N2 seconds and then device enters in the security mode again.
- Mode of connection loss. Mode is activated in the case of connection loss. Hosting software gives the alarm signal about connection loss and the device enters the waiting mode for N3 >> N1 seconds (providing the ability of rerouting. After the expiry of N3 seconds, if the connection were not established, device would revert to the passive waiting mode.

[0022] It should be noted that described modes is programmed and may be changed in the future as a result of adding new functions.

[0023] Present device can be used in such a way. Special software, particularly mobile app, is installed on the computerized user device, which has Bluetooth module (smartphone or/and tablet computer, which are based on the Android or IOS platforms, notebook computer and/or personal computer). The mobile app is working online and its aim is connection with security alarm device. After device is switched on, corresponding program on the device should be chosen. The insensitive side of device is put in the protected object, for instance, in the bag (to

the reverse side of bag). If the security mode is activated on the device, capacitance sensor reacts to the unauthorized activity (for example, when the bag is stolen), gives audiovi-ranging signal to the piezoceramic radiator and mobile app's software, which provides the sound and informational signal transmission to the computerized user device. Therefore, bag's owner will be informed about unauthorized activity with his/her property.

[0024] Present technical solution is multi-functional, portable and easy maintainable. The device works without substitution of supply source during 10-12 months and enhances safety of the object, protects the object which is remote (withdrawn) from the owner, providing the user with information by giving the sound or sound / informational signal on the computerized device of owner/user.

Claims

1. Security alarm device with the function of alarm signal transmission to the computerized user device, comprising the independent current source, control, signaling, indicating unit, whose input port is connected with process controller, safety sensor comprising that process controller has the form of Bluetooth LE microcontroller, at least one capacitance proximity sensor with active shielding and make-break electrodes is used as the safety sensor, which is connected with platen selector and Bluetooth LE microcontroller; and capacitance proximity sensor is combined with control, signaling, indicating unit on the one printed circuit, Bluetooth LE microcontroller and active shield, which has the form of printed circuit track.
2. Security alarm device of claim 1, wherein computerized devices of user is smartphone or tablet computer, which are based on the Android or IOS platforms, notebook computer and/or personal computer with installed software, intended on the connection with Bluetooth LE microcontroller.

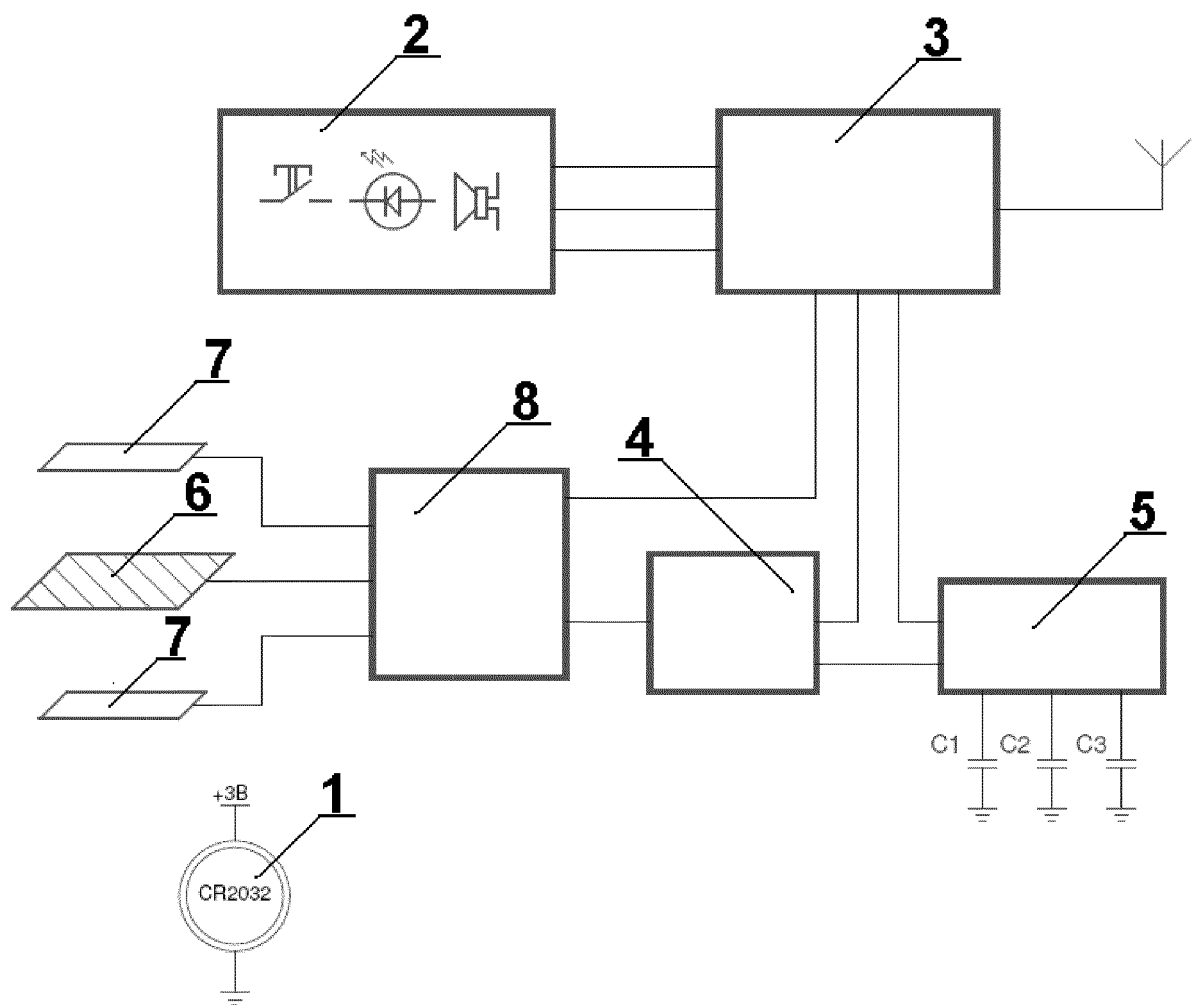


FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- UA 99293 [0004]
- UA 83534 [0005]
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