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(54) **AUTHENTIFICATION AND AUTHORIZATION DEVICE**

(57) Authentication and authorisation device of a firearm (11) that comprises an emitting device (20) carried by an authorised operator (15) and a receiving device (21) that unblocks and blocks the use of the firearm (11) based upon a selectable electrical characteristic related to the authentication and authorisation signal generated by the emitting device (20) carried by an authorised operator (15).

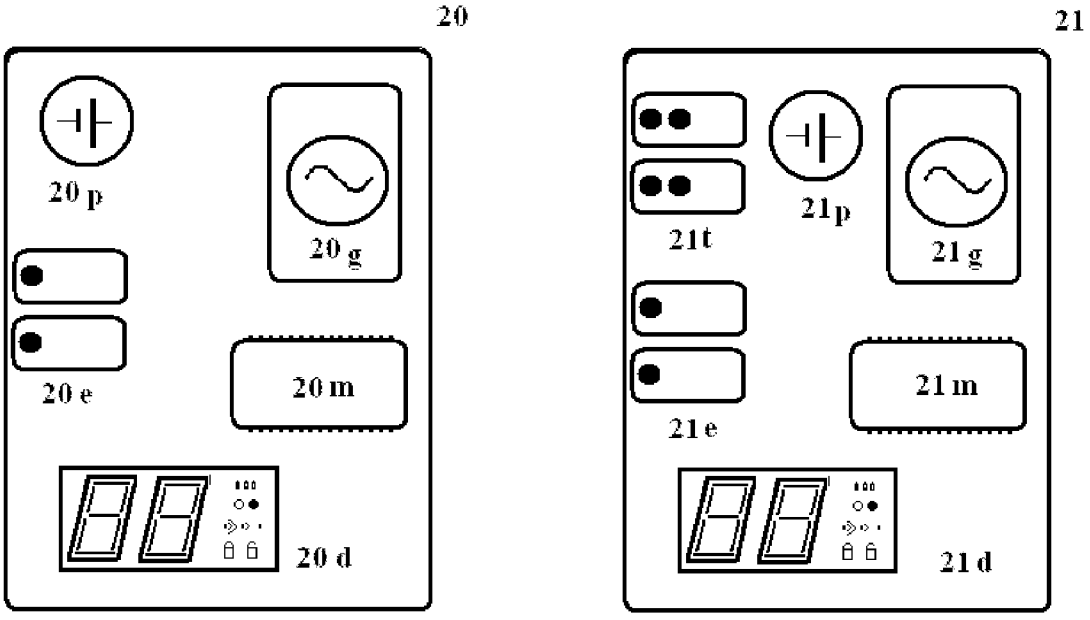

FIG. 2

EP 2 175 225 A1

Description

PURPOSE OF THE INVENTION

[0001] This invention refers to an authentication and authorisation device for the use of a firearm by an operator who is authorised and trained for said use.

STATE OF THE ART

[0002] In general, the use of a firearm is restricted to its availability and to possessing the necessary knowledge to do so, notwithstanding the possession of the corresponding government authorisation. Therefore, in the not so unlikely case that a person authorised to hold and use the firearm, such as a civilian in his home, a member of a police squad or a soldier in a military action, has his regulation firearm stolen or taken, it could be used, even against him, without being able to prevent it.

[0003] Other risk situations arise in the case of a firearm falling and its accidental discharge. Cases are also known where a firearm, briefly neglected by its owner, normally in a safe environment such as the home, is handled by an inexperienced person or a minor, causing fatal accidents by an unexpected discharge.

[0004] In the state of the art, restriction of use systems are known for firearms, for example, from patents US5603179, US6185852, US20030163942, US20030136043 or US20040031180, where identification systems are described through sensors that read some biometric characteristic of the operator, such as a predetermined finger, a predetermined area of the hand, an electronic "image" of a predetermined finger or even the manner in which different parts of a handle are pressed.

[0005] From the American patent application US20030070343, an operator uses a biometric recognition system through an image or through a code to be punched in, which is activated before commencing the risk action and enables the same person to use the firearm, through electromagnetic radiation or ultrasound, provided he is within a certain range, suggested as a few metres. One disadvantage to the aforementioned system is that any person can use the firearm when found within said radius of action, with it being impossible to reduce said area noticeably and ensure its correct operation at the same time.

[0006] From the American patent US6678984, it is learned that an operator, through a transmitter, sends his identification to the firearm by using a current conducting circuit for this, without describing how he obtains secure electrical connections throughout the entire circuit or the closing path of the electrical circuit from the firearm to the operator's transmitter.

[0007] From the known states of the art, it is learned that the current operator identification and authorisation systems are inaccurate, since there can be difficulties during the reading of the biometric characteristics of the operator, due to the fact that the operator will not always handle the firearm in the same manner, nor will the sensor be located exactly under the same precise body area, based upon the speed with which a situation requires one to grab the firearm.

[0008] In other situations, the reading area can be impregnated with sand, mud or water or covered by thick gloves recommended for the weather. In other words, the operator can become surprised or compromised because the identification system does not identify and authenticate him correctly, and the operator is unable to use the firearm in said situation.

[0009] Therefore, it is necessary to develop a device that allows the reliable authentication and authorisation of a predetermined operator to use a predetermined firearm, securely restricting the number of operators that can use the firearm.

CHARACTERISATION OF THE INVENTION

[0010] This invention seeks to resolve one or more of the problems stated above, through an authentication and authorisation device for firearms as is claimed in claim 1. Embodiments of the invention are established in the subsequent claims.

[0011] A purpose of the invention is to provide an authentication and authorisation device for a firearm that restricts the use of the aforementioned firearm to at least one predetermined authorised operator, and therefore the use of the same by unidentified and unauthorised third parties is prevented.

[0012] Another purpose of the invention is to provide an authentication and authorisation device that comprises an emitting device that generates a predetermined authentication and authorisation signal consisting of an electric field with a reduced field intensity that is transmitted through a capacitive coupling to the body of the operator, and from this, through another capacitive coupling to a receiving device included in the firearm.

[0013] Yet another purpose of the invention is to provide an emitting device that is transportable on the body of the operator or on any article of clothing that belongs to the very clothes of the operator, or that is included in another object that the operator carries, such as a portable electronic device, a mechanical device and/or portable electromechanical device such as a watch or something similar.

[0014] Furthermore, another purpose of the invention is to provide an emitting device that generates and emits, through one of its outputs, a predetermined authentication and authorisation signal to the receiving device included in the firearm. Once said signal is received and processed by the receiving device, the operator is verified and authorised to use the firearm.

[0015] Yet another purpose of the invention is to provide an authentication and authorisation device that comprises a programmable emitting device and receiving device to facilitate adding or removing an operator from the

operators authorised to use the firearm.

[0016] Still yet another purpose of the invention is to provide a receiving device that once it receives the authentication and authorisation signal from an emitting device used by the operator that wishes to use the firearm, it is capable of generating and transmitting an unblocking signal to one of its outputs, which allows the operator to use the firearm from that moment on, while the receiving device continues receiving the authentication and authorisation signal.

[0017] At the moment when the device stops receiving the aforementioned signal, the receiving device generates and transmits a blocking signal from one of its outputs, and therefore the firearm cannot be used. Alternatively, the receiving device stops generating and transmitting an unblocking signal from one of its outputs, and the firearm is blocked.

[0018] Yet another purpose of the invention is that the receiving device generates and transmits an electrical blocking and/or unblocking signal to an electromagnetic system included in the firearm, which acts upon the operation of the kinematic firing chain and/or upon any of its safeties, releasing or blocking its operation. In the case of firearms with electrical and/or electronic activation, the blocking and/or unblocking signal blocks or allows the progression of a electrical firing signal.

[0019] As a result of the reduced range of the characteristics of the signal generated by the emitting device, only a few centimetres, the use of the firearm is restricted to an authorised operator that is close to or in contact with the firearm.

[0020] Yet another purpose of the invention is to provide an emitting and receiving device that are powered electrically through an electrical power source such as a long-lasting rechargeable cell or battery.

[0021] Another purpose of the invention is to provide an emitting and receiving device that includes on each of them a viewing screen to show useful information for the authorised operator. For example, information regarding the state of blocking or unblocking of the firearm, state of the charge of the corresponding electrical energy source or similar.

[0022] Yet another purpose of the invention is to provide a light authentication and authorisation device that is smaller in size and simple to use. Likewise, in the case of an anomaly or malfunctioning of the same, the authentication and authorisation device can be disabled temporarily by the operator, in such a manner that the firearm can be used by any operator.

[0023] Yet another purpose of the invention is to provide an authentication and authorisation device with great operating autonomy, since both the emitting device and the receiving device are embodied through electronic circuits with low power consumption that remain in a state of rest until receiving an activation signal, and deactivate and return to the state of rest or low power consumption when they stop receiving the activation signal.

[0024] Another purpose of the invention is to show, through the viewing screen, other information inherent to the firearm, such as the temperature of the barrel, the number of cartridges fired or the number of cartridges available in the firearm.

BRIEF DESCRIPTION OF THE FIGURES

[0025] A more detailed explanation of the invention is given in the description that follows and is based upon the attached figures:

[0026] Figure 1 shows in a flow chart of an authentication and authorisation device according to the invention,

[0027] Figure 2 shows schematically an emitting device and a receiving device included in the authentication and authorisation device according to the invention, and

[0028] Figures 3a and 3b show in a perspective view a possible location of the receiving device in a short firearm and in a long firearm according to the invention.

DESCRIPTION OF THE INVENTION

[0029] In relation to figures 1, 3a and 3b, a flow chart of the authentication and authorisation device 10 is illustrated for a firearm 11, for example, a pistol and a rifle.

[0030] Authentication and authorisation device 10 comprises an emitting device 20 carried by an operator 15 that is verified and authorised to use the firearm 11, and a receiving device 21 that is located in the firearm 11.

[0031] The emitting device 20 generates and emits to the firearm 11, through one of its outputs, authentication and authorisation signals related to an electrical characteristic of an electric field, to the receiving device 21. Likewise, the emitter 20 is capable of receiving signals generated and transmitted from the receiver 21 to the same, in order to be used by the operator that is verified and authorised to use the firearm 11. For example, if the firearm 11 is unblocked or blocked, the load state of an electrical power source relative to receiver 21 or any relevant information of firearm 11.

[0032] The same body of the authorised operator 15 can serve as the means for two-way transmission of signals exchangeable between the emitter 20 and the receiver 21.

[0033] Figure 2 illustrates a diagram of an embodiment of the emitter 20 that comprises a first programmable logic means of control or microprocessor 20m, a first signal generator 20g and a first electrical power source 20p such as a battery, cell or similar item that powers the remaining components of the emitter 20.

[0034] Furthermore, the emitter 20 includes some first electrical input/output terminals 20e, such as some electrodes 20e that do not require being electrically in contact with the body of the operator 15 authorised to use the firearm 11, so that the authentication and authorisation signals generated by the first generator 20g based upon the information provided from the microprocessor 20m, flow through the body of the authorised operator 15 to

the receiving device 21. Also, the emitting device 20 comprises a first viewing screen 20d where it shows information related to firearm 11.

[0035] Analogously, figure 2 also schematically illustrates an embodiment of the receiver 21 that comprises a second programmable logic means of control or microprocessor 21 m, and a second electrical power source 21 p such as a battery, cell or similar item that powers the remaining components of the emitter 21.

[0036] The receiver 21 includes some second electrical input/output terminals 21 e, such as some electrodes 21e that likewise do not require being electrically in contact with the body of the operator authorised to use the firearm 11, to receive the authentication and authorisation signal emitted from the emitting device 20, in turn generating and transmitting an unblocking signal through some third electrical terminals 21t, so that the firearm 11 is operational for shooting.

[0037] Likewise, the signals generated by the second generator 21 g, based upon the information provided from the microprocessor 21m, are transmitted to the emitting device 20 through the second terminals 21 e, flow through the body of the authorised operator and generate an electrical signal on the first terminals 20e that go to the first programmable logic means of control or microprocessor 20m.

[0038] Also, the receiving device 21 comprises a second viewing screen 21 d where it shows information related to firearm 11.

[0039] In relation now to figures 3a and 3b, where it shows the location of receiver 21 on firearm 11 such as a rifle, pistol or similar firearm. The second viewing screen 21 d is placed preferably around the aiming system of the same firearm 11, so that the screen in the same is oriented towards the sight of the authorized operator 15, and therefore within his field of vision of the aiming system.

[0040] Obviously, emitter 20 is carried by the authorised operator 15. The activation of the same is done through an action on an on/off switch, not shown in the drawings.

[0041] Given that the emitting device 20 can have different locations based upon its physical dimensions, such as a watch, bracelet, insertable into an article of clothing that is worn by the authorised operator 15, within the same body of the operator 15, consequently, the switch will adopt an appropriate shape to its location and its activation/deactivation will also be adapted to said location.

[0042] When the emitting device 20 is activated, the first generator 20g, based upon information received from the first microprocessor 20m, generates a continuous authentication and authorisation signal and/or with a predetermined frequency programmable through the first microprocessor 20m, which is transmitted through the first output terminals 20e to the firearm 11 through the body of the same authorised operator 15.

[0043] The first signal generator 20g comprises a electric field generator that transmits to the user 15 through a capacitive coupling, i.e. without direct electrical contact between electrodes 20e and the authorised operator 15. The transmission of the signal is performed when the separation between the electrodes 20e and the body of the operator 15 is lower than a predetermined distance measured at a few centimetres, being interrupted when the value of the distance that exists between the emitter 20 and the operator 15 is greater than the aforementioned distance.

[0044] The signals transmitted to the operator 15 in the form of a weak electric field are transmitted from him to the firearm 11 in the same manner, being picked up by the second input/output terminals 21e of receiver 21, without the need for direct electrical contact with the operator 15. Likewise, the transmission of the signal is performed when the separation between the body of the operator 15 and the electrodes 21e is lower than a predetermined distance measured at a few centimetres, being interrupted when the value of the distance that exists between the operator 15 and the receiver 21 is greater than that distance.

[0045] When the authentication signal is received at receiver 21 through electrodes 21e, it goes to the second programmable logic means of control or microprocessor 21 m, which analyses it to see if it has been emitted from an authorised emitter 20, i.e. each emitter-receiver set is characterised by an encoded electric field, for example, by frequency, amplitude and/or phase modulation.

[0046] Once the authentication signal received has been evaluated based upon values stored in a second storage memory, not shown in the figures, connected electrically to the second microprocessor 21 m or included in the same, the microprocessor 21 m generates and transmits the corresponding unblocking signal through third terminals 21t, to the electromagnetic device, not shown in the figures, for unblocking the firing mechanism of firearm 11, with the same being able to actuate.

[0047] On the contrary, when the receiver 21 stops receiving the authorisation signal and/or it does not come from an authenticated and authorised emitter 20, the electromagnetic device keeps the firing mechanism of firearm 11 blocked, preventing it from being fired.

[0048] The electromagnetic device mentioned includes a magnetic core that in its operation interferes with the movements of the kinematic firing chain of firearm 11 or any of its mechanical safeties, preventing and permitting the normal operation of firearm 11.

[0049] In another embodiment, the magnetic core of the electromagnetic device is at least one of the parts of the same kinematic firing chain of firearm 11 or one of its mechanical safeties.

[0050] In electrical and/or electronic action firearms, the aforementioned electromagnetic device is replaced by an electric circuit that electrically transmits and/or cuts the transmission of a firing signal of firearm 11.

[0051] In those cases where firearm 11 could not be unblocked due to exceptional circumstances, i.e. low lev-

el of voltage from the battery or cell or malfunctioning of the electrical circuits, the firearm 11 would remain, until these abnormal conditions disappear, in a permanent blocked or unblocked state, at the will of the authorised operator 15, through a button placed for this purpose or due to device 10 being thus programmed.

[0052] Both the emitter 20 and the receiver 21 are programmable. The emitter 20 through buttons placed for this purpose, and receiver 21 from the emitter 20, using what has been described in the above paragraphs as the means for transmitting information. In this manner, it is possible to add or remove one or more emitters 20 related to authorised operators 15, and receivers 21 can be added or removed related to the corresponding firearms 11. Therefore, independent groups of authorised operators 15 can be created that are associated with a firearm or group of firearms 11.

[0053] The programming of the emitter 20 and the receiver 21 can be done remotely and independently, using an air interface, electromagnetic radiation (not) visible to the human eye or through electric fields or similar means.

[0054] The receiver 21 of the authentication and authorisation device can be manufactured as a component that is coupled to, stored or wrapped in the frame of firearm 11 or in any of its components, so that in the event it is equipped with the second screen 21 d, this screen is viewed at all times by the operator 15 when shooting, i.e. facing towards the operator 15.

[0055] The indication of the blocking or unblocking state of firearm 11 can be transmitted through electrical connections or through any means of transmitting information by an air interface to a receiving and information processing system and/or to a third viewing screen, not shown in the drawings, which forms part of the operator's equipment or is far from him.

[0056] Both the emitter 20 and the receiver 21 comprise an electrical power source 20p, 21 p, such as a battery, cell or similar device that is smaller in size and long-lasting, which supplies electrical power to the corresponding electronic circuitry, and may also be rechargeable batteries.

[0057] To extend the life of the batteries 20p, 21 p, the first and second viewing screens 20d, 21 d show their information for a predetermined period of time in order to not distract the attention of the operator 15 longer than necessary and prevent him from being located in the darkness. The rest of the time they remain turned off, except when they must show new relevant information to the user 15, i.e. that the battery 20p, 21p is close to running out or that blocking of the firearm has taken place due to a malfunction in the electronic circuit.

[0058] The information from both screens 20d, 21d will be shown with different degrees of light intensity according to the existing ambient light at any given time to facilitate their viewing. In this manner, it will be noticeably reduced when the ambient light is low or there is darkness, and it will increase in the opposite case.

[0059] Authentication and authorisation device 10 of firearm 11 can also include buttons to perform additional functions such as, for example, that the viewing screens 20d, 21 d not show information, blocking or unblocking the use of firearm 11 indefinitely.

[0060] The viewing screens 20, 21d can be liquid crystal display type (LCD), electroluminescent, plasma, coherent light or similar, due to the fact that these technologies involve low electrical power consumption.

[0061] Likewise, the described authentication and authorisation device 10 can be used to show on 20d, 21 d viewing screens information relevant to firearm 11, its conditions of use or its status. For example, the number of shots fired with the charger that firearm 11 carries, the total number of shots fired throughout the life of firearm 11, the number of cartridges that remain in the same, or the barrel temperature, measured with appropriate probes.

[0062] The embodiments and examples stated in this report are presented as the best explanation of this invention and its practical application, and thus allow the experts in the technique to put into practice and utilise the invention. However, the experts in the art will recognise that the description and the above examples have been presented for the purpose of illustration and as an example only. The description as explained is not intended to be exhaustive or to limit the invention to the exact described form. Many modifications and variations are possible in light of the above instruction without going beyond the intent and scope of the following claims.

Claims

1. Authentication and authorisation device of firearms (11) to restrict the use of the same to at least one authorised operator (15); **characterised in that** the authentication and authorisation device (10) comprises an emitting device (20) carried by the operator (15) that is verified and authorised to use the firearm (11), which generates and emits through some first electrical input/output terminals (20e) an authentication and authorisation signal to a receiving device (21) included in firearm (11).

2. Device as per claim 1; **characterised in that** the authentication and authorisation signal is a selectable electrical characteristic associated with the encoded electric field.

3. Device as per claim 2; **characterised in that** the selectable electrical characteristic associated with the electric field is encoded through frequency, amplitude and phase modulation.

4. Device as per claim 3; **characterised in that** the receiving device (21) receives through some second electrical input/output terminals (21e) an electric signal related to the authentication and authorisation

signal emitted by the emitting device (20), in turn generating and transmitting an unblocking signal through some third electrical terminals (21t) so that the firearm (11) is operational for firing.

5. Device as per claim 4; **characterised in that** the authentication and authorisation signal generated by the first generator (20g) flows through the body of the authorised operator (15) to the receiving device (21) without there being electrical contact between the first electrical input/output terminals (20e) and the operator (15), or between the operator (15) and the second electrical input/output terminals (21 e) of receiver (21).

6. Device as per claim 5; **characterised in that** the transmission of the authentication signal is performed only when the separation between the operator (15) and the second electrical input/output terminals (21e) is less than or equal to a predetermined distance.

7. Device as per claim 6; **characterised in that** the transmission of signals between the emitting device (20) and the receiving device (21) is two-way.

8. **Emitting device** connectable to a receiving device (21); **characterised in that** the emitting device (20) generates and emits to the receiving device (21) an authentication and authorisation signal related to a selectable electrical characteristic of an electrical field, encoded by frequency, amplitude and/or phase modulation.

9. **Device** as per claim 8; **characterised in that** the authentication and authorisation signal is programmable through a first programmable logic means of control (20m).

10. **Device** as per claim 9; **characterised in that** the emitting device (20) comprises the first programmable logic means of control (20m) connected electrically to a first generator (20g) of authentication and authorisation signals, in turn connected electrically to a first source (20p) of electrical power, some first electrical input/output terminals (20e) without electrical contact with the body of the operator (15) so that the authentication and authorisation signal generated flows through the body of the operator (15) to the receiving device (21).

11. **Device** as per claim 10; **characterised in that** the emitting device (20) is carried by the authorised operator (15).

12. **Device** as per claim 11; **characterised in that** the emitting device (20) is programmable through the first programmable logic means of control (20m).

13. **Receiving device** connectable to an emitting device (20); **characterised in that** the receiving device (21) receives a selectable electrical characteristic related to an authentication and authorisation signal generated by the emitting device (20), in turn generating and transmitting an unblocking signal through some third electrical terminals (21t) so that the firearm (11) is operational for firing

14. **Device** as per claim 13; **characterised in that** the receiving device (21) comprises a second programmable logic means of control (21 m) connected electrically to a second generator (21 g), in turn connected electrically to a second source (21 p) of electrical power, some second electrical input/output terminals (21 e) by which the selectable electrical characteristics is received, and some third electrical input/output terminals (21t) by which the unblocking signal is transmitted for use of the firearm (11).

15. **Device** as per claim 14; **characterised in that** the receiving device (21) comprises a second microprocessor (21m) that generates and transmits the corresponding unblocking signal through the third terminals (21t) to an electromagnetic device that releases the firearm (11) firing mechanism.

16. **Device** as per claim 15; **characterised in that** the magnetic core of the electromagnetic device is a part different from those that make up the kinematic firing chain of firearm or one of the mechanical safeties of firearm (11).

17. **Device** as per claim 15; **characterised in that** the magnetic core of the electromagnetic device is at least one of the parts of the same kinematic firing chain of firearm (11) or one of the mechanical safeties of firearm (11).

18. **Device** as per claim 15; **characterised in that** the electromagnetic device (21) is replaceable by an electric circuit that electrically transmits and/or cuts the transmission of a firing signal of an electrically or electronically activated firearm (11).

19. **Device** as per claim 15; **characterised in that** the receiving device (21) is configured to be inserted in the body of the firearm (11).

20. **Device** as per claim 19; **characterised in that** the receiving device (21) is programmable through the second programmable logic means of control (21 m).

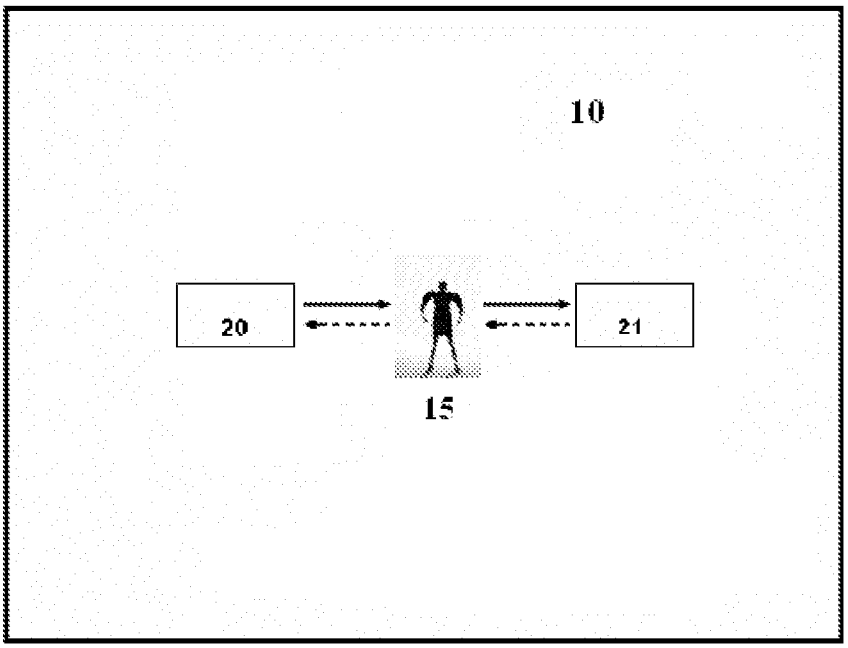

FIG. 1

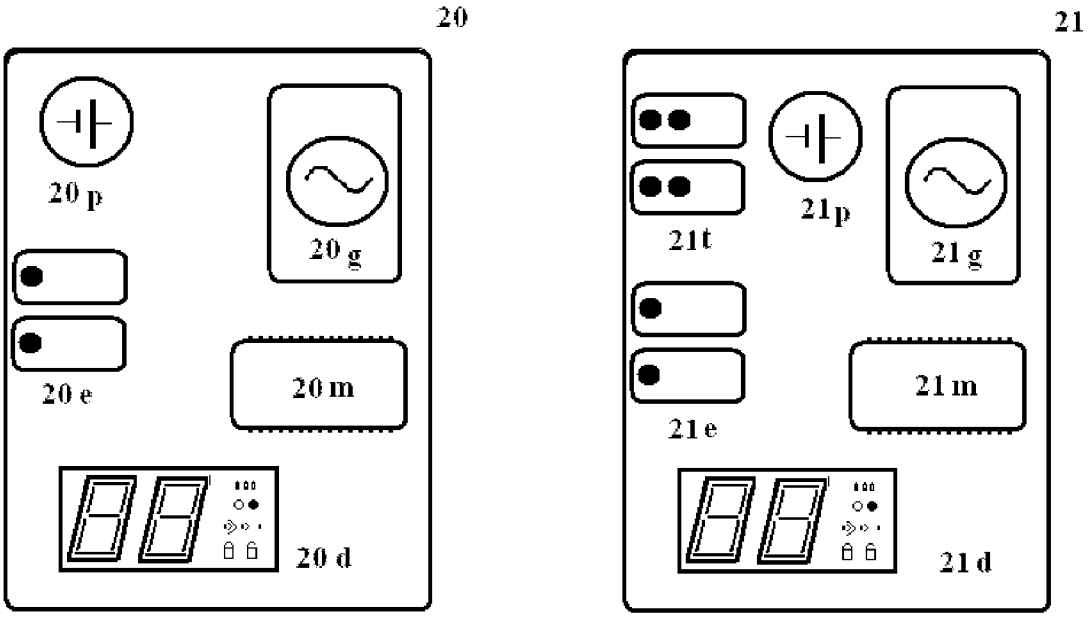

FIG. 2

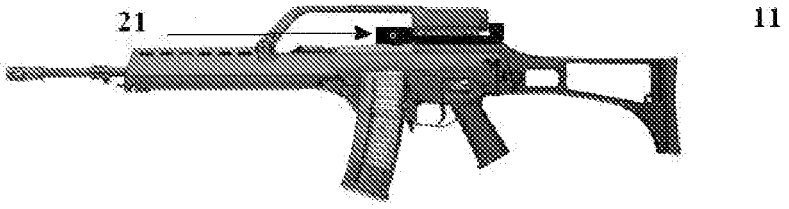

FIG. 3a

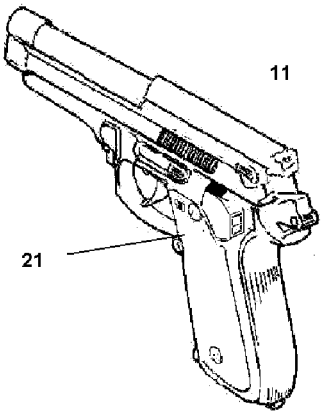

FIG. 3b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 2007/070150

A. CLASSIFICATION OF SUBJECT MATTER

F41A 17/06 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F41A 17+, G07C9+

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CIBEPAT, EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6861944 B1 (HOEPELMAN et al.) 01.03.2005, column 1, line 58 - column 2, line 34; column 2, line 66 - column 4, line 53; figures 1-5A.	1-20
X	WO 0113217 A1 (FREDKIN RICHARD) 22.02.2001, page 2, line 29 - page 4, line 14; page 5, line 1 - page 8, line 1; figures.	1-20
X	US 5461812 A (BENNETT et al.) 31.10.1995, column 1, line 53 - column 4, line 53; figures.	1-8,13-20
A	US 2002021206 A1 (WOOTTON et al.) 21.02.2002, paragraphs [31-33], [37-39], [42], [43] and [45].	1-4,7-16, 19,20
A	WO 0065291 A1 (LAQUILA SA; HEFTI ALDO) 02.11.2000, the whole document.	1-4,7-12, 19,20

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 April 2008 (30.04.2008)	(06/05/2008)
Name and mailing address of the ISA/ O.E.P.M. Paseo de la Castellana, 75 28071 Madrid, España. Facsimile No. 34 91 3495304	Authorized officer E. Martín Malagón Telephone No. +34 91 349 6867

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ ES 2007/070150

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REFERENCES CITED IN THE DESCRIPTION

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