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(54) **MECHANICAL LOCKING DEVICE**

(57) The invention relates to a mechanical locking safety device that is electromechanically coupled to an authentication device (7.1). The invention provides a stable lock in an active safety position and this lock is only deactivated by means of a predetermined personalized code associated with a specific user.

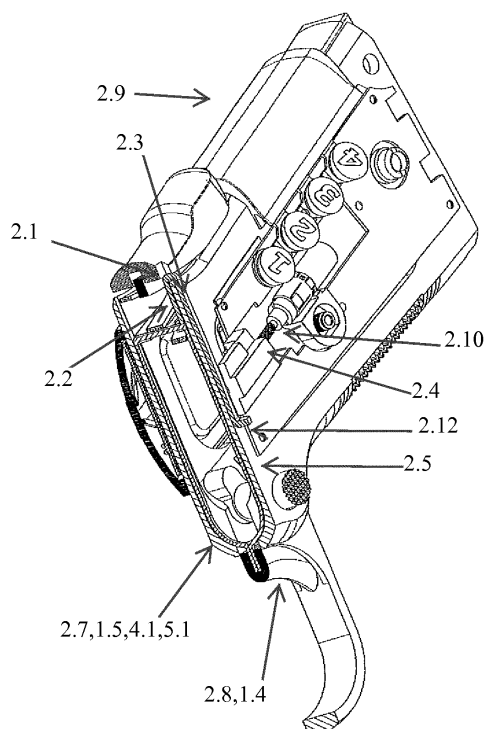


FIG. 2

Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a lightweight firearm equipped with a mechanical safety locking device which pertains to the field of grips of lightweight firearms.

STATE OF THE ART

[0002] A firearm is normally equipped with a manually actuated safety catch which has the function of preventing the firearm from discharging accidentally or involuntarily, preventing operation and/or activation of the firing mechanism thereof, directly or indirectly.

[0003] It is known that, in order to prevent the accidental discharge of a firearm, a certain component of the firing sequence must be actuated. The operation of the firing sequence is explained below based on figure 1, which shows an exploded view of a short lightweight firearm with a grip safety.

[0004] The internal firing mechanism of a pistol with a safety catch comprises at least a hammer (1.1), a hammer stirrup (1.2), a hammer spring (1.3), a trigger (1.4), a trigger bar or hammer bridge (1.5), a safety catch (1.6), a grip safety (1.7) and a firing pin (1.8).

[0005] When a user cocks the gun to subsequently fire it, the hammer (1.1) rotates around the hammer pin (1.9), moving from a rest position to a retarded position. At that moment, the hammer spring (1.3), through the hammer stirrup (1.2), exerts a force on the hammer (1.1).

[0006] After this movement by the components of the firing sequence, the hammer (1.1) remains in a fixed position due to the fact that the safety catch (1.6) prevents rotation thereof with respect to the pin (1.9).

[0007] When the gun is cocked and the shooter exerts pressure on the trigger (1.4), the trigger bar (1.5) moves in the direction of the barrel (1.10) towards the rear of the gun (1.11).

[0008] When the shooter grips the gun, the appendix (1.12) of the grip safety (1.7) allows the trigger bar (1.5) to move so that it comes into contact with the safety catch (1.6), causing it to rotate around the safety catch pin so that the hammer moves freely and the tension accumulated in the hammer spring is released, causing it to rotate suddenly and strike the firing pin (1.8), causing ignition of the gunpowder in the cartridge and subsequent discharge.

[0009] The function of the sear spring (1.13) is to return the trigger bar (1.5), safety catch (1.6) and grip safety (1.7) to the rest position. If the gun is not being gripped the appendix (1.12) of the grip safety (1.7) prevents the trigger bar (1.5) from moving in the event that pressure is exerted on the trigger (1.4), avoiding completion of the firing sequence.

[0010] At present there is demand for firearm equipment with safety devices that allow use thereof by previously authenticated and authorised persons, designed

to effectively prevent use of the firearm by unauthorised persons, wherein the safety device does not interfere with the manual mechanical safety mechanisms already incorporated in the firearm.

SUMMARY

[0011] The present invention seeks to resolve one or more of the previously expounded drawbacks by means of a mechanical safety lock device such as that claimed in the claims.

[0012] An object of the invention is to provide a mechanical safety locking device electromechanically coupled to an authenticator device that provides stable interlocking in an active safety position, where the interlocking can only be deactivated by means of a person-alised predefined password associated with a specific user.

[0013] Another object of the invention is to supply a mechanical safety locking device positioned in the grip behind the trigger of the lightweight firearm, maintaining the structural characteristics of the grip and preventing or allowing use of the firearm by a previously authorised person through the authentication device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] A more detailed explanation of the invention is provided in the following description based on the attached drawings:

Figure 1 shows an isometric perspective view of a lightweight firearm according to the state of the art; Figure 2 shows a perspective view of a firearm that includes a mechanical safety locking device; Figure 3 shows an elevational view of the lightweight firearm that includes the mechanical safety locking device; and Figure 4 shows a block diagram of the mechanical safety locking device.

DESCRIPTION OF AN EMBODIMENT

[0015] Reference is now made to figures 2 and 3, which show a mechanical safety locking device disposed between the outer face of the grip of the lightweight firearm frame and the inner face of a side of the handgrip; and which has an active position and an inactive position combined with a disinterlocked and interlocked position, respectively, electromechanically supplied by an authenticator device (7.1).

[0016] The mechanical blocking device comprises a trigger lever (2.1) that cooperates with a trigger bar (1.5) or firearm hammer bridge; an interlocking element (2.4) or interlock bolt for interlocking the trigger lever (2.1); a displacer element (2.6) for moving the interlock bolt (2.4) between the interlocked position, defined by the physical contact between an appendix (2.12) and the interlock

bolt (2.4), and the interlocked position, defined by the absence of physical contact between the appendix (2.12) and the interlock bolt (2.4).

[0017] The trigger lever (2.1) has a broken zig-zag line shape, comprising a first section (2.2) which is in physical contact with one of the parallel sides of the trigger bar (1.5), which extends in a substantially straight line from the trigger (1.4) area towards the firing pin of the firearm, folding upon itself, i.e. folding 180° along the exterior of the first section (2.2); this second section (2.3) extends up to the central body of the trigger bar (1.5) next to the trigger (1.4) area; and a third section (2.12) or appendix perpendicular to the second section (2.3).

[0018] In the interlocked position, the interlock bolt (2.4) interrupts the axial movement of the appendix (2.12) and, therefore, of the trigger lever (2.1). In this situation, the trigger lever (2.1) cannot move or slide, thereby preventing completion of the firing sequence, even if an authorised user actuates the trigger (2.8). However, in the interlocked position, the trigger lever (2.1) can move freely.

[0019] The grip safety (1.7) is in physical contact with the end of the first section (2.2) of the trigger lever (2.1). The first section (2.2) is disposed in the interior of the firearm body and is in contact with an element of the firearm firing sequence. The other sections (2.3, 2.12) of the trigger lever (2.1) are disposed on the exterior of the firearm in such a manner that a side wall (2.5) of the grip area of the firearm frame is disposed between the first section (2.2) and the second section (2.3) of the trigger lever (2.1).

[0020] The trigger lever (2.1) has a broken zig-zag line shape which allows part of the components of the mechanical safety locking device to be disposed in the exterior of the firearm frame, such as the interlock bolt (2.4) and the displacer element (2.6), which are hidden from sight and fixed to the sides (3.1) of the grip, in such a manner that the mechanical locking device is invisible, providing greater safety to authorised users.

[0021] The locking device elements are distributed in the firearm frame.

[0022] The location of the various mechanical locking device elements in the firearm allows adaptation of the physical design and dimensions of each element of the device to prevent deformation thereof due to the pressure exerted on the trigger (2.8) on firing.

[0023] In the disinterlocked position, when an authorised user exerts pressure on the trigger (2.8), the trigger lever (2.1) moves axially towards the firing pin area of the firearm. Previously, the interlock bolt (2.4) has been vertically moved away from the gun barrel and disposed in the disinterlocked position, in which the trigger lever (2.1) can move freely.

[0024] As of that moment, the rest of the components of the firing sequence intervene independently from the mechanical locking mechanism.

[0025] Once the firearm has been fired, the trigger lever (2.1) returns to its rest position aided by a compressed

recoil spring (5.6).

[0026] One end of the recoil spring (5.6) is fixed mechanically to the trigger lever (2.1) and the other end of the recoil spring (5.6) is fixed mechanically to the firearm frame or firearm grip.

[0027] However, in the interlocked position, the trigger lever (2.1) is not axially displaced towards the firearm firing pin area, as the interlock bolt (2.4) comes into physical contact with the appendix (2.2), thereby preventing completion of the firing sequence.

[0028] The displacer element (2.6) is adapted to move the interlock bolt (2.4) between the interlocked and disinterlocked position, said displacer element (2.6) being of the bushing (2.10) type, which is adapted to mechanically engage with the interlock bolt (2.4).

[0029] The bushing (2.6) is adapted to transform the rotational movement of a reducer motor (2.11), along a straight line, in this case, a substantially vertical movement whereby the position of the interlock bolt (2.4) is controlled.

[0030] The interlock bolt (2.4) may move in a direction perpendicular to the gun barrel or in another direction that prevents the free movement of the trigger lever (2.1) when it is in the interlocked position and releases the lever (2.1) when it is in the disinterlocked position.

[0031] The reducer motor (2.11) is disposed in a fixed predefined position that secures it to the grip (6.9) or firearm frame (2.5) by means of a mechanical fixing element (6.8), such as for example, a double bolt and screw assembly. The reducer motor (2.11) is thus disposed in a fixed position with respect to the firearm body and there is a controlled displacement of the interlock bolt (2.4) with respect to that fixed point of the firearm body.

[0032] In the event that the fixer (6.8) is mechanically secured to the firearm grip (6.9), the grip (6.9) is fixed to the firearm frame (2.5) by means of a standard mechanical fixing subassembly, such as for example a set of screws (3.5).

[0033] Rails are disposed along the inner surface (6.7) of the grip that serve as a guide for the linear movement of the interlock bolt (6.4). In order to facilitate the guiding action, the inverted pattern of that made on the inner side of the grip (6.7) may be engraved on the surface of the interlock bolt (2.4) that comes into contact with the grip (6.7), further facilitating the linear movement of said interlock bolt (2.4).

[0034] In relation to figure 4, the mechanical locking device also comprises an authenticator device (7.1) for generating electrical control signals that are sent to the reducer motor (2.11) to allow the interlock bolt (2.4) to move between the interlocked and disinterlocked position.

[0035] The authenticator device (7.1) is adapted to evaluate whether a user of the firearm is or is not authorised to use said firearm in accordance with a personalised password provided by a potential user of the firearm.

[0036] If the personalised password provided is positively verified, the authenticator device (7.1) sends an

electrical signal to the reducer motor (7.11), which moves the interlock bolt (2.4) from an interlocked position to a disinterlocked position. Otherwise, if it is negatively verified, no electrical signal is sent from the authenticator device (7.1). By default, the locking device is in a permanently locked position and only allows use of the firearm upon identification of an authorised user.

[0037] In order to compact the mechanical locking device, the authenticator device (7.1) is assembled on the inner face of a side (6.7) of the firearm grip.

[0038] The authenticator device (7.1) comprises a power source (7.2), a status indicator button (7.9), a light signal (7.4), a central control unit (7.5) comprising a microprocessor (7.6) and a memory-type mass storage unit (7.7).

[0039] Additionally, the authenticator device (7.1) includes a grip detection unit (7.8) and a grip transmitter-receiver, namely, a grip transceiver (7.3).

[0040] The power source (7.2) supplies electricity to all the components of the mechanical locking device and, in particular, to the displacer (2.6) where through the position of the interlock bolt (2.4) is controlled. The power source (7.2) is of the disposable battery type, rechargeable battery type, etc. If a rechargeable battery is used, a USB port shall be disposed to charge the rechargeable battery, for example.

[0041] On actuating the indicator button (7.9), the light signal (7.4) visually indicates whether the locking device is in the interlocked or disinterlocked position.

[0042] The personalised password can be introduced using a keyboard (8.1) disposed on firearm grip or using a portable alphanumeric keyboard (8.2) that allows remote connection through the transceiver (7.3) of the mechanical locking device.

[0043] Once the personalised password has been introduced in the authenticator device (7.1), said device compares it with a stored password. If the access code supplied and that stored coincide, the interlock bolt (2.4) is moved to the disinterlocked position, allowing the firearm to be used.

[0044] When an authorised user grips the firearm, the grip detector (7.8) is adapted to allow the power source (7.2) to supply electricity to the different components of the authenticator device (7.1).

[0045] Further, the personalised password may also be supplied by a transmitter device to the authenticator device (7.1) via the grip transceiver (7.3). Communication between the transmitter device and the grip transceiver is via a BLUETOOTH-type radio interface. Consequently, the user of the firearm does not have to introduce the personalised password, as when the two devices are within range of the radio interface, i.e. the two devices detect each other, the transmitter device emits a signal containing the personalised password to the grip transceiver (7.3), which retransmits said signal to the authenticator device (7.1).

Claims

1. A **mechanical safety locking device** of a light-weight firearm, **characterised in that** the mechanical locking device comprises a trigger lever (2.1) that cooperates with a trigger bar (1.5); an interlocking element (2.4) is configured to interlock the trigger lever (2.1); a displacer element (2.6) is adapted to move an interlock bolt (2.4) between an interlocked position, defined by the physical contact between an appendix (2.12) and the interlock bolt (2.4), and the disinterlocked position, defined by the absence of physical contact between the appendix (2.12) and the interlock bolt (2.4).
2. A **device**, according to claim 1, **characterised in that** the trigger lever (2.1) has a broken zig-zag line shape comprising a first section (2.2) which is in physical contact with the trigger bar (1.5), which extends substantially in a straight line from the trigger area to the firing pin area thereof, folding upon itself on the outer side of the first section (2.2); and a third section (2.12) perpendicular to the second section (2.3).
3. A **device**, according to claim 2, **characterised in that** the interlock bolt (2.4) is configured to be moved by the displacer device (2.6) between the interlocked and disinterlocked position.
4. A **device**, according to claim 3, **characterised in that** the displacer element (2.6) is of the bushing type (2.10), which is adapted to mechanically engage the interlock bolt (2.4).
5. A **device**, according to claim 1, **characterised in that** the mechanical locking device also comprises an authenticator device (7.1) for generating electrical control signals which are sent to the displacer element (2.6) and allow the interlock bolt (2.4) to move between the interlocked and disinterlocked position.
6. A **device**, according to claim 5, **characterised in that** the authenticator device (7.1) is adapted to evaluate a predefined password received via a grip transmitter-receiver (7.1) supplied by a potential user of the firearm; if the verification of the personalised password is positive, the displacer element (2.6) moves the interlock bolt (2.4) to its disinterlocked position.
7. A **device**, according to claim 6, **characterised in that** the predefined password is supplied to the authenticator device (7.1) by means of an alphanumeric keyboard (8.1) disposed on the firearm or by means of a portable alphanumeric keyboard (8.2) which allows remote connection via a transceiver (7.3) included in the mechanical locking device.

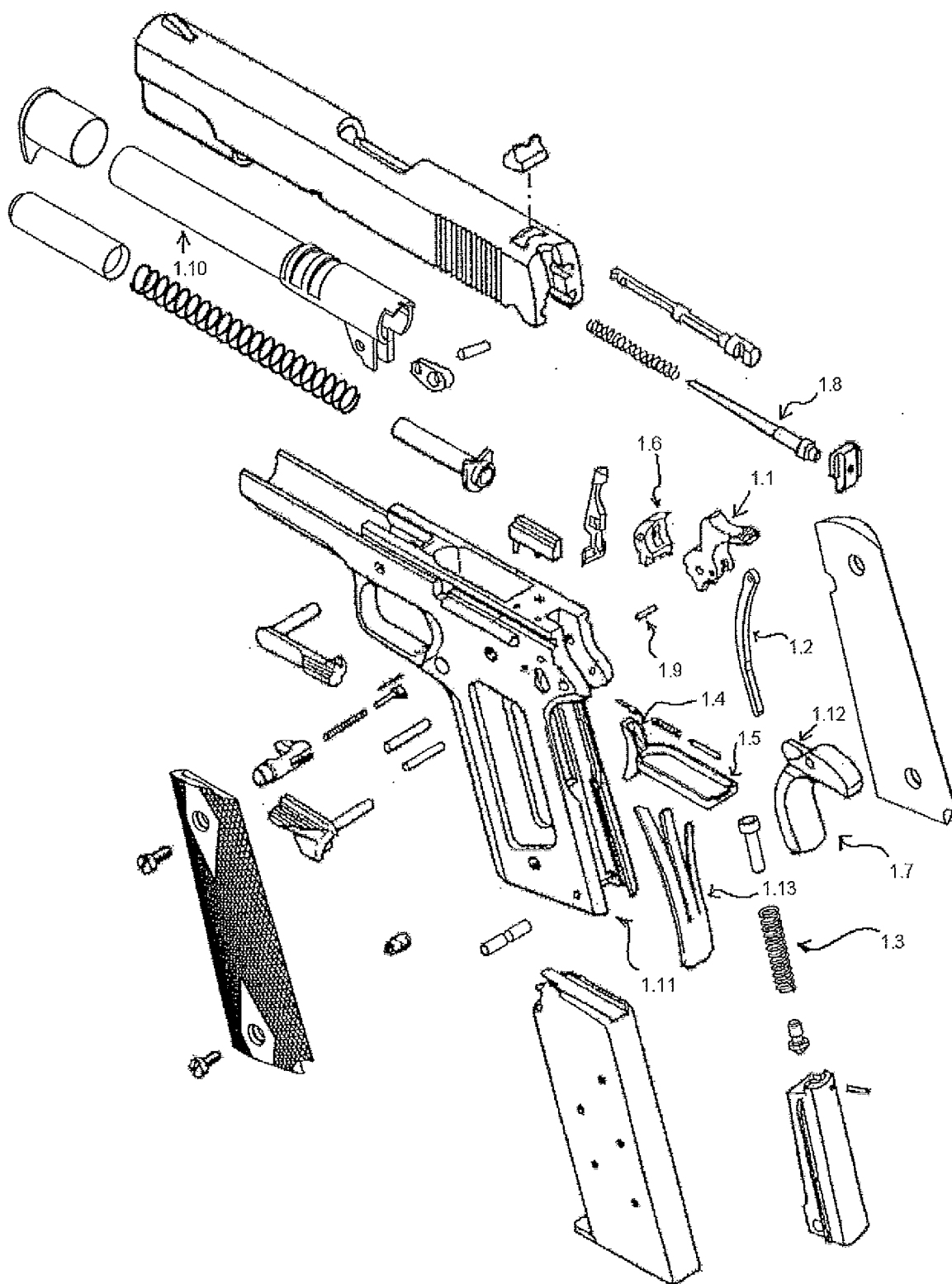


FIG. 1

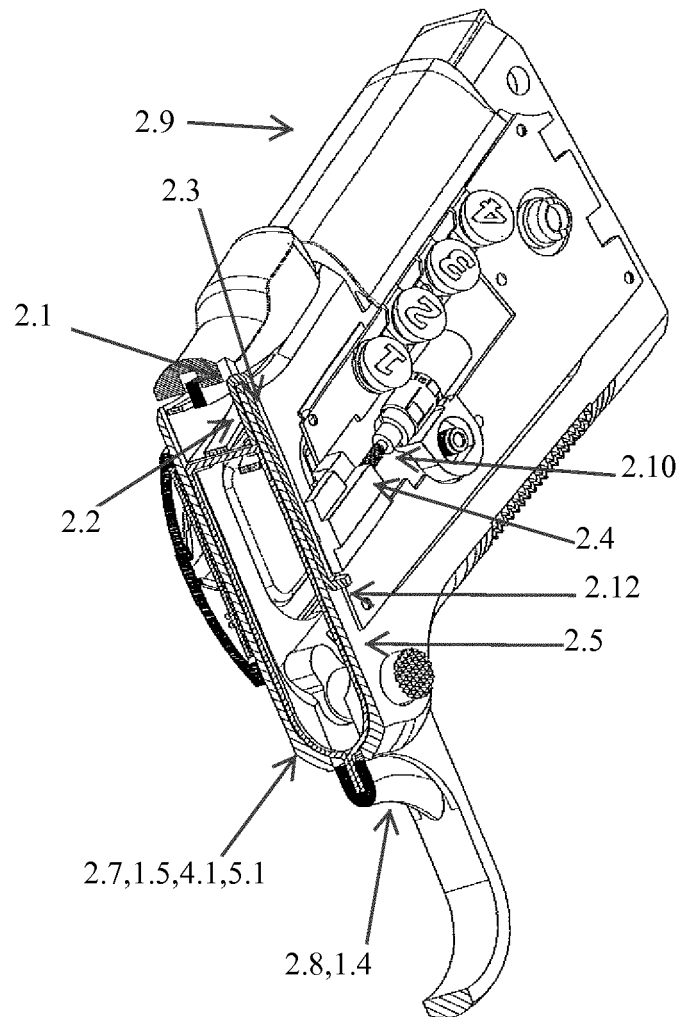


FIG. 2

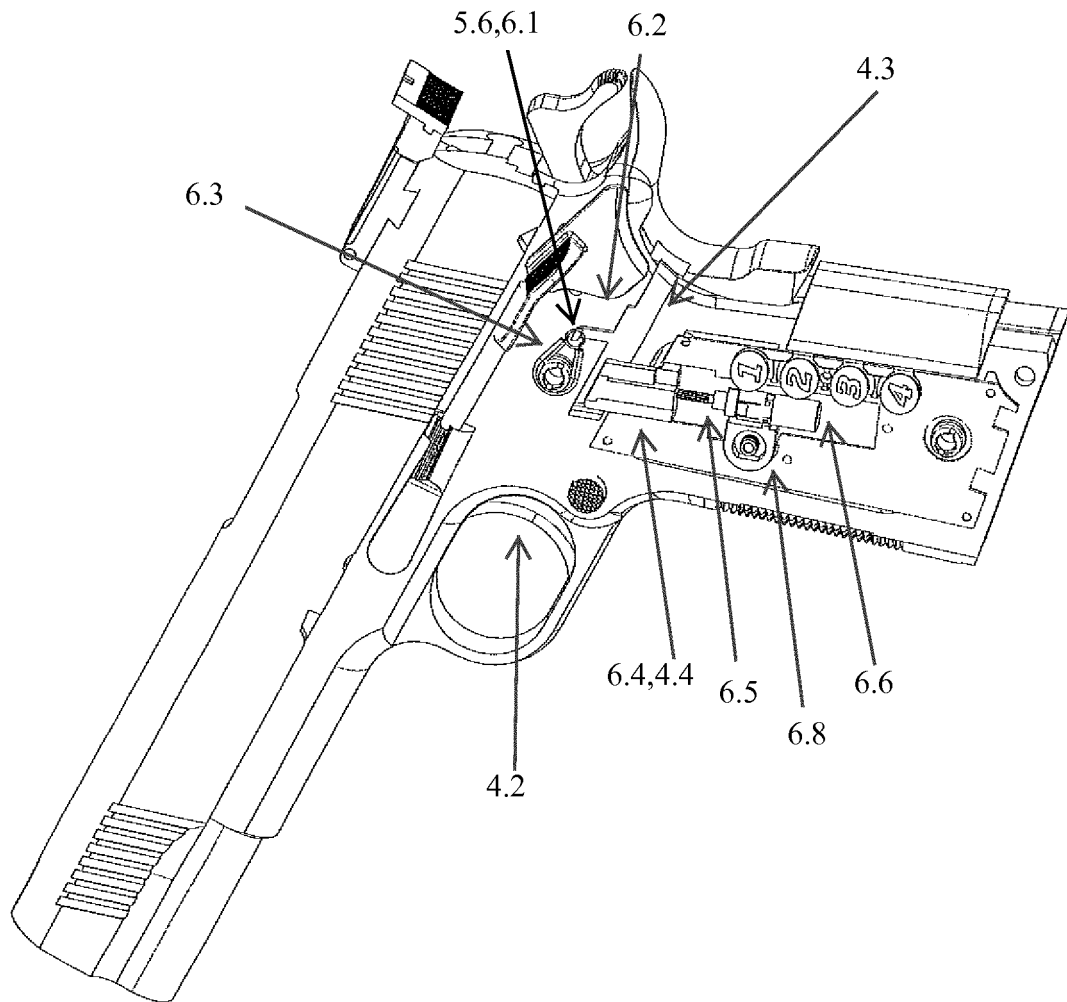


FIG. 3

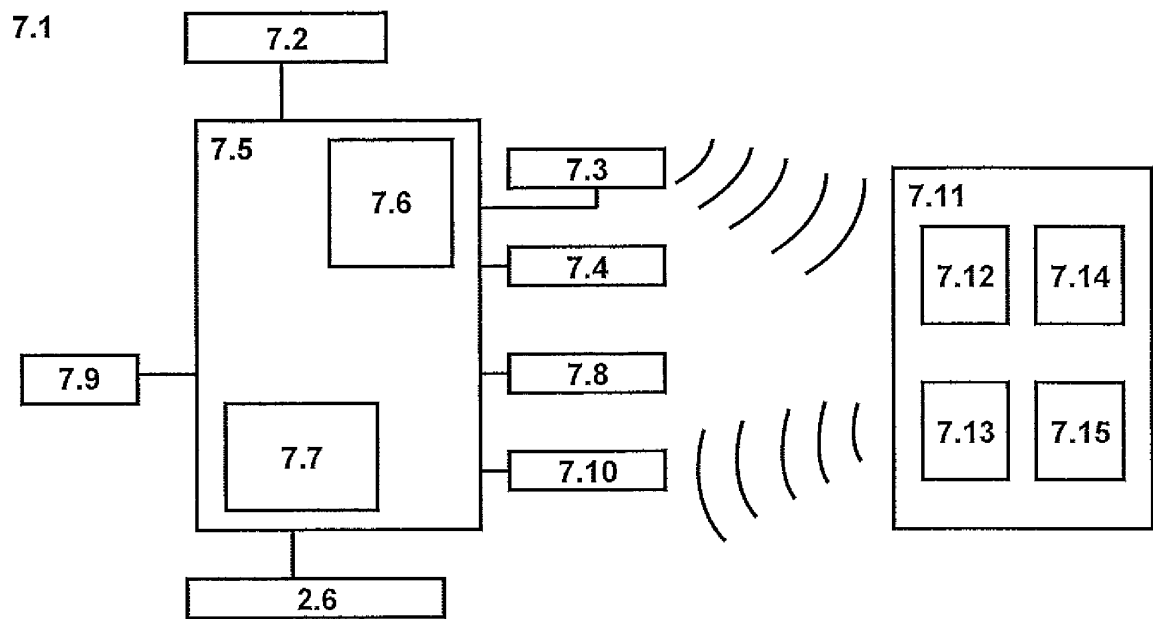


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/070253

A. CLASSIFICATION OF SUBJECT MATTER

F41A17/06 (2006.01)

F41A17/30 (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

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)

EPODOC, INVENES. 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 5896691 A (KAMINSKI KEVIN A ET AL.) 27/04/1999, column 2, line 64 - column 3, line 39; figures.	1-7
X	US 2009007476 A1 (MAUCH ERNST ET AL.) 08/01/2009, paragraphs[48 - 51]; figure 6.	1
A	US 2007074438 A1 (PARHOFER STEFAN ET AL.) 05/04/2007, abstract; figure 2.	1,2,7,8
A	US 5758524 A (YU SANDY TAI SHEUNG) 02/06/1998, abstract; figures.	1,2,7
A	GB 191406956 A (WHITING WILLIAM JOHN) 18/02/1915, figures.	1

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

* Special categories of cited documents:

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Date of the actual completion of the international search
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2011/070253

Information on patent family members

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