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(54) **Authorization control system**

(57) An authorization control system is presented in which any person who wants to use a device, amongst others particularly cars or fire arms can only use the device when the person has passed a successful authorization check. The check is performed with secret personal data, carried by the person and some data stored in digital form in the device. The data is transferred automatically from the person into the device's data processing device (23) when an authorized person wants to use the device, in case of a fire arm, wants to

shoot.

The data interface comprises capacitive coupling means (22) with the human body serving as carrier of the information stream or in an alternative embodiment, the data interface comprises a direct metal contact. The system can be extended to achieve a documentation of the use, too.

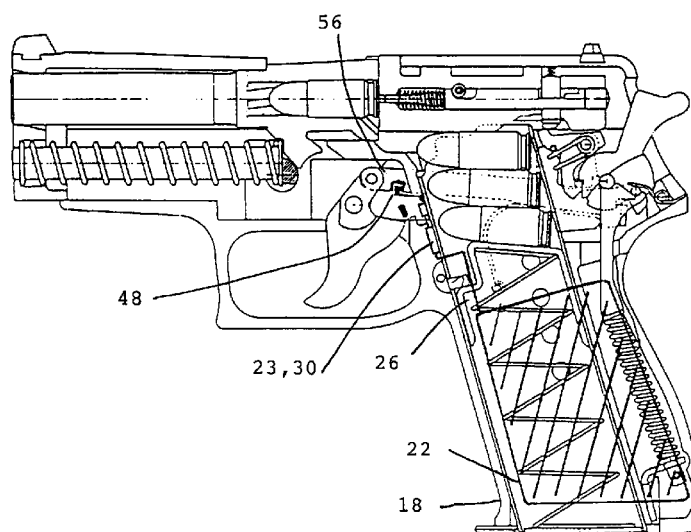


FIG. 2

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Description

BACKGROUND OF THE INVENTION

Technical Field:

[0001] The present invention relates in general to authorization control systems, and in particular to authorization control systems for preventing unauthorized using of devices. Even more particularly, the invention relates to authorization control systems for preventing unauthorized use of devices like fire arms, cars or other precious or dangerous devices.

Description of the Related Art

[0002] In the following description prior art control systems is discussed regarding fire arm use authorization systems.

[0003] Especially in the United States of America many people possess a fire arm for defending themselves against any attack performed by criminal persons. With increasing criminality the need for an effective protection with a personal fire arm is yet increasing. With the increasing number of sold fire arms the risk also increases that any unauthorized, e.g. criminal person can steal clandestinely a fire arm and thus possesses it even though he is not allowed to by law. Young kids, pupils, etc. who run amok are a threatening example for the unauthorized use of such fire arms.

[0004] The only possibility to master this problem is to lock in those fire arms in a secure place. This solution, however, is not satisfying at all because any hidden place can be detected.

[0005] Another problem arises in a scuffle between, say a policeman and a criminal person, when the latter one succeeds to take seize of the policeman's fire arm. In such a situation the criminal person could shoot the policeman.

[0006] In view of the discussion above, it should be apparent to those persons of ordinary skill in the art that a need exists for a system that permits an efficient authorization control for preventing unauthorized using of devices, especially fire arms or cars, too.

SUMMARY OF THE INVENTION

[0007] It is therefore one object of the present invention to provide an efficient authorization control system for preventing unauthorized using of devices, particularly devices like fire arms and cars.

[0008] It is another object of the present invention to provide such systems, the application of which is easy and secure.

[0009] It is yet another object of the present invention to provide such systems which can be produced with a minimum of production costs.

[0010] The foregoing objects are achieved as is now

described in conjunction with a fire arm use authorization control system.

[0011] The person who is authorized to use his fire arm wears near of his body a small transmitter embedded with a microchip in which secret, personal code data relating strictly only to this person or in case of a policeman relating to a group of policemen or eventually relating to any policeman is stored. In the fire arm, the same personal code data is stored. When a person wants to shoot the data is automatically transferred from the person to the fire arm and is checked there to be identical or not. The transfer is achieved via a pair of electrical coupling devices which can be an ordinary metal contact, or, advantageously via a pair of electrodes, one coupling the stored data from the person's data carrier into his own body, and the second electrode receiving a signal, representing the personal code data from the body and conducting them into an evaluation circuit arranged in the fire arm. In this circuit the authorization data are compared. When they are identical, a special purpose lock/unlock mechanism, e.g. engaging a part of the trigger bar or a different part of the mechanic effectuation chain - beginning with the trigger and ending with the firing pin - inside the fire arm is enabled. As a result, the such authorized person is able to shoot with the fire arm as usual. When, however, the receiver in the fire arm does not receive any data or it receives data which is not identical to that one stored in the fire arm the lock/unlock mechanism will not be enabled, so the trigger of the fire arm remains locked and the person cannot shoot. As a matter of fact the default position of the lock/unlock-mechanism can be an already unlocked position of e.g. the trigger or the like, which will be locked, when the data compare yields that the person who wants to shoot with the fire arm is not authorized to do it.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts a schematic block diagram of the system in accordance with a preferred embodiment of the present invention,

Figure 2 depicts a schematic representation of a prior art fire arm, a SIG-Sauer pistol p 225 (P6), which parts of German police is equipped with, provided with an exemplary embodiment of the control system of the present invention, a trigger lock/unlock mechanism engaged before authorization

control,

Figure 3 depicts a schematic representation of the fire arm shown in fig. 2, the trigger lock/unlock mechanism disengaged after successful authorization control,

Figure 4 is a schematic detail of the pistol shown in fig. 2 and fig. 3 in which the operation of an exemplary lock/unlock mechanism working with the system of the present invention is shown.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] With general reference now to the figures and especially to figure 1 the system comprises a data storage 10, the data of which can be accessed by a controller 12.

[0014] The data storage is a PROM non volatile memory which stores the personal code data of the authorized person in form of a bit sequence of a predetermined length, e.g. 256 bit.

[0015] Controller 12 comprises a transmitter which couples signals, representing the personal code data through a transmitter electrode 14 into the body 16 of the authorized person. The transmitter is an LC-tank, e.g. with a current ratio Q (current in the tank circuit over current in the feed line of the tank circuit) $Q = 6$, made from a surface-mount inductor and the inherent electrode capacitance. All electrical and electronical devices are supplied by a DC voltage source. The resonant tank circuit produces a clean sine wave output from a square wave input minimizing RF harmonics, and boosts the output voltage in proportion to the Q of the tank. The transmit voltage can also be digitally programmed by varying the pulse width of the driving square wave. The transmit electrode couples the modulated voltage capacitively into the authorized person's body. This so called PAN-technology (Personal Area Network) was described in more detail relating to data exchange between persons in 'IBM Systems Journal, Vol. 35, No 3&4, 1996' the contents of which is incorporated by reference into the present patent application.

[0016] This so called near-field communication can operate at very low frequencies such as 0.1 to 1 megahertz. This frequency is directly generated from inexpensive microcontroller devices which are easy to wear, e.g. in a watch-like form at the wrist of the hand.

[0017] Thus, an electrical current which is small in intensity and not damaging the health of the person is fed into the human body 16 which in turn acts as 'wet wire'.

[0018] When this person wants to shoot with the fire arm, the arrangement depicted in the lower part of fig. 1 will be enabled, again by capacitive coupling, which will be described next below.

[0019] The person seizes the grip 18 (see fig. 2, too) of the fire arm 20 when he wants to shoot. Advantageously, the fire arm 20 is adapted to both right and left handed persons. So, in both grip plates one of which would then be touched with a larger area of the inner side of the person's hand a receiving electrode 22 is embedded the impedance of which is such that the current fed into the body 16 can be received by this antenna-like device.

[0020] The signal received by the receiver electrode 22 incorporated in the fire arm 20 is amplified by an amplifier comprised of a controller 24 arranged e.g. as a chip 23 - see the broken lines in fig. 1 - inside of the fire arm. Controller 24 is connected to the receiver electrode 22 by a wire connection 26. In said controller, the signal is demodulated, A-D-conversion takes place, and the resulting data is compared to that one stored in a storage area 25, incorporated in the controller chip 23, too. The controller 24 generates an output signal 28 which reflects the data compare result, i.e. 0 = 'identical', and 1 = 'not identical' for a controlling device 30 which controls an actuator device 32 for locking the motion of the trigger of the fire arm and for unlocking the trigger in response to an evaluation result which is represented by the output signal of the controller. Prior art techniques can be taken in consideration to how the controlling device 30 controls the actuator device 32 which in turn is locking and unlocking the trigger, respectively. The receiving, evaluating and actuating circuit shown in the bottom part of the figure is powered by batteries not shown in fig. 1.

[0021] Persons could wear the devices depicted in the upper part of fig. 1 in a watch-like form at the wrist of his hand. The contact area with the body at his wrist is large enough to communicate the data into the body.

[0022] Alternatively, such PAN devices can take the shape of commonly worn objects: watches, credit cards, eyeglasses, identification badges, belts, waist packs and shoe inserts, etc. The capacitive coupling area must be large enough to communicate the signals into the body. Such a near-field communication advantageously does not need a large amount of energy because it works at very low frequencies compared to far-field communication techniques e.g. GSA mobile radio communication. For example the transmitter, depicted in fig. 2 and fig. 1 can operate at 330 kilohertz at 30 volts with a 10-picofarad electrode capacitance, consuming 1.5 milliwatts discharging the electrode capacitance. Optionally, by energy-recycling a majority of this power is conserved by using a resonant inductance-capacitance (LC) tank circuit.

[0023] With reference now to fig. 2, and fig. 3, respectively a schematic representation of a prior art fire arm, a SIG-Sauer pistol P 225 (P6) is shown, which parts of German police are used to be equipped with. Said pistol is provided with an exemplary embodiment of the control system of the present invention.

[0024] SIG-Sauer pistol P 225 (P6) is a prior art auto-

matic pistol equipped with a double action trigger. Thus, motion of the trigger is biasing the hammer and unlocks the firing pin.

[0025] The receiver electrode 22 is embedded in each of the grip plates of grip 18. A shielded wire line 26 connects the receiver electrode with the receiving side controller chip 23 which comprises a circuit 24 including current amplifier (gain = 106) followed by an analog bipolar chopper controlled by a digital microcontroller. The detector synchronously integrates the tiny received displacement current, e.g. 50 picoamperes, 330 KHz, into a voltage that can be measured by a slow low-resolution analog-to-digital converter operating at e.g. 50 KHz, 8 bits. Said analog components and the microcontroller are combined into a single CMOS integrated circuit in chip form to produce a low-cost integrated PAN receiver.

[0026] Furthermore, circuit 24 comprises a logic circuit with the storage area 25 in which the same code is stored as is stored in the authorized person's data carrier. Said logic circuit evaluates the digital data extracted from the received signal and compares it to the data stored in the fire arm. If the data compare yields 'identical' the lock mechanism will be unlocked, see fig. 3 - otherwise not. This will be described next below.

[0027] The lock mechanism, see in further detail fig. 4, comprises a locking member 48 having a rod 50 fixedly mounted with a small end portion 51 perpendicular to the length extension of the rod at a base portion 53 fixedly connected to an inner frame portion of the grip. The other end portion of the rod 50 is a protruding member 52 which engages an opening 54 formed in the trigger bar 56. With member 52 engaging the opening 54 a motion of the trigger for firing the arm is prevented. The rod is slightly biased to securely engage the opening 54.

[0028] With member 52 disengaged from the opening 54 - see the position of the locking member in broken lines - the motion of the trigger for firing the arm is possible as usual.

[0029] For unlocking the lock mechanism in case of a 'successful' data compare a simple, a relay-like circuit provided with a fixedly mounted coil 44 is energized which in turn attracts - by magnetic force - the back side of the end portion of the metal locking member 48. Thus, the member 48 is attracted against the elastic force of the metal rod 50 and disengages the opening 54 in the trigger bar 56. Thus, the rod is bent backward and is moved to the attracting coil until it's backside 46 touches the coil 44.

[0030] Now, trigger 58 can be pressed as usual and the person holding the fire arm is able to shoot, see back to fig. 3.

[0031] Advantageously, chip 23 is provided with a timer which sets up again the full authorization control procedure after a certain delay of time, e.g. some few seconds in order to allow to fire a plurality of shots in relatively short time sequence without being influenced by the control system according to the invention. Thus, the

coil remains energized during this preselected delay time.

[0032] After the shot(s) the trigger bar 53 takes back again the position shown in fig. 2. When the coil is not energized anymore the fire arm is locked again and a new authorization control has to be passed before firing the next shot.

[0033] The orientation of the edges pressing to each other at the attempt to shoot without authorization is such that the engaging edges cannot slide away without help of magnetic attraction of the coil 44.

[0034] Advantageously, the lock/unlock mechanism is encapsulated in a case to prevent unauthorized manipulation of the mechanism.

[0035] In a further embodiment not depicted in the figures the transfer of data is achieved by a direct electrical contact between one contact surface being embedded in and protruding slightly from the finger facing portion of the trigger, the other contact being provided by a ring like device, worn by the authorized person. Said ring serves as carrier for the chip holding the personal data.

[0036] For regarding further variations, the lock/unlock mechanism can be placed elsewhere, too. For example, the hammer's motion to hit the firing pin's back end can be locked by blocking the main spring guide rod in a similar manner. Or, the lock/unlock mechanism can be combined to an already existing safety system, e.g. that one of the firing pin. It should be noted that the arrangement, the location, and the structure of the lock/unlock mechanism should reflect the influence of magnetic fields set up by any unauthorized person and - and of course the particular type of construction and application of each fire arm which is object to the present invention.

[0037] In a further preferred embodiment of the present invention, the device the use of which is to be controlled is provided with an using time registration and storing device with the help of which at least the shooting or more generally, the using time is stored. The time registration and storing device can advantageously be incorporated in the signal processing device 23. Thus, a pair of data, e.g. shooting time and personal code data can be stored which is useful when the fire arm is dedicated to a limited plurality of persons. Later investigations regarding questions like 'which person did shoot, to which time, and how often' after the use of the fire arm become more easy to evaluate.

[0038] A further application of the present invention is to prevent larceny of cars. The signal receive interface means can advantageously be incorporated into the driver's seat or into the steering wheel in order to provide a sufficiently large capacitive coupling area. With the time registration device it is possible for example to control exactly the period of time during which a driver of a truck is driving on the road. Thus, exceeding the time limit given by law can easily be controlled and punished.

[0039] In the foregoing specification the invention has

been described with reference to a specific exemplary embodiment thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention as set forth in the appended claims. The specification and drawings are accordingly to be regarded as illustrative rather than in a restrictive sense.

LIST OF REFERENCE SIGNS	
10	data storage
12	controller
13	transmitter side chip
14	transmitter electrode
16	human body
18	grip
20	device, fire arm
22	receiver electrode
23	receiver side chip
24	controller circuit
25	data storage
26	wire connection
28	output signal
30	controlling device
32	actuator device
44	coil
48	locking member
50	rod
52	protruding member
54	opening
56	trigger bar
58	trigger
62	battery

Claims

1. An authorization control system for personal use of devices comprising

storage means (10) for storing at least personal code data,

signal provider means (12) arranged for providing signals representing said code data to

signal delivery interface means (14),

said means being able to be worn by a person close to his body,

said authorization control system further comprising

signal receive interface means (22) connected to said device (20) and arranged for signal reception via said signal delivery interface means (14) at least when any person tends to use the device,

a signal processing device (23) connected to said signal receive interface means (22) arranged for determining the person's authorization for using the device by evaluating the signals and for delivering an output signal (28) reflecting the evaluation result,

a controlling device (30, 44) connected to said signal processing device (23) and to

an actuator device (32, 48) which is in turn arranged for inhibiting the use of the device in response to said signal evaluation result.

2. The system according to claim 1, characterized by

said signal delivery interface means (14) being capacitively coupled to said signal receive interface means (22).

3. The system according to claim 2, characterized by the device (20) being a fire arm.

4. The system according to claim 3, characterized by said signal delivery interface means (14) being a transmitter device comprising a transmitter electrode (14) capacitively coupling a displacement current modulated by the signals representing said code data into the person's body (16),

said signal receive interface means (22) being a receiver device comprising a receiver electrode (22) capacitively receiving said signals from the person's hand when the person tends to use the fire arm.

5. The system according to claim 1, characterized by

said device (20) being a fire arm,

said signal delivery interface means (14) being

an electrically conducting portion of a finger ring worn by said person,

said signal receive interface means (22) being an electrically conducting portion of the trigger of the fire arm
whereby an electrical circuit is closed when said person touches the trigger of the fire arm with the conducting portion of his finger ring and the personal code data relating signals being enabled to pass the interface means (14, 22).

6. A firearm comprising

signal receive interface means (22) between a signal source (16) external to said fire arm and a signal processing device (23) included in said fire arm for gathering signals when any person tends to use the fire arm, the signals relating to personal code data associated to a person or a group of persons authorized to use said fire arm,

said signal processing device (23) being connected to said signal receive interface means (22) arranged for evaluating the signals and for delivering an output signal (28) reflecting the evaluation result,

a controlling device (30) being connected to said signal processing device (23) and to

an actuator device (32) which is in turn arranged for inhibiting the firing of the fire arm (20) if the signal evaluation yields that said person tending to use the fire arm is not authorized for use.

7. The firearm according to claim 6, characterized by said signal receive interface means (22) comprising capacitive coupling means.

8. The firearm according to claim 7, characterized by said signal receive interface means (22) comprising a capacitively coupling receiving device embedded in at least one plate of grip (18) of the fire arm (20) and, the fire arm comprising an integrated circuit implementing said signal processing device (23) and said controlling device (30).

9. The firearm according to claim 6, characterized by that the signal receive interface means (22) comprises an electrically conducting portion of the trigger of the fire arm.

10. A finger ring for use with the fire arm use authorization control system according to claim 3, comprising

ing

storage means (10) for storing at least personal code data,

signal provider means (12, 13) arranged for providing signals representing said code data to

signal delivery interface means (14).

11. The finger ring according to claim 10, the ring comprising

an integrated circuit implementing said storage means (10) and said signal provider means (12),

and an electrically conducting portion serving as said signal delivery interface means (14).

12. The system according to claim 1, characterized by the signal processing device (23) being provided with an using time registration and storing device.

13. The system according to claim 1, characterized by the device (20) being a car.

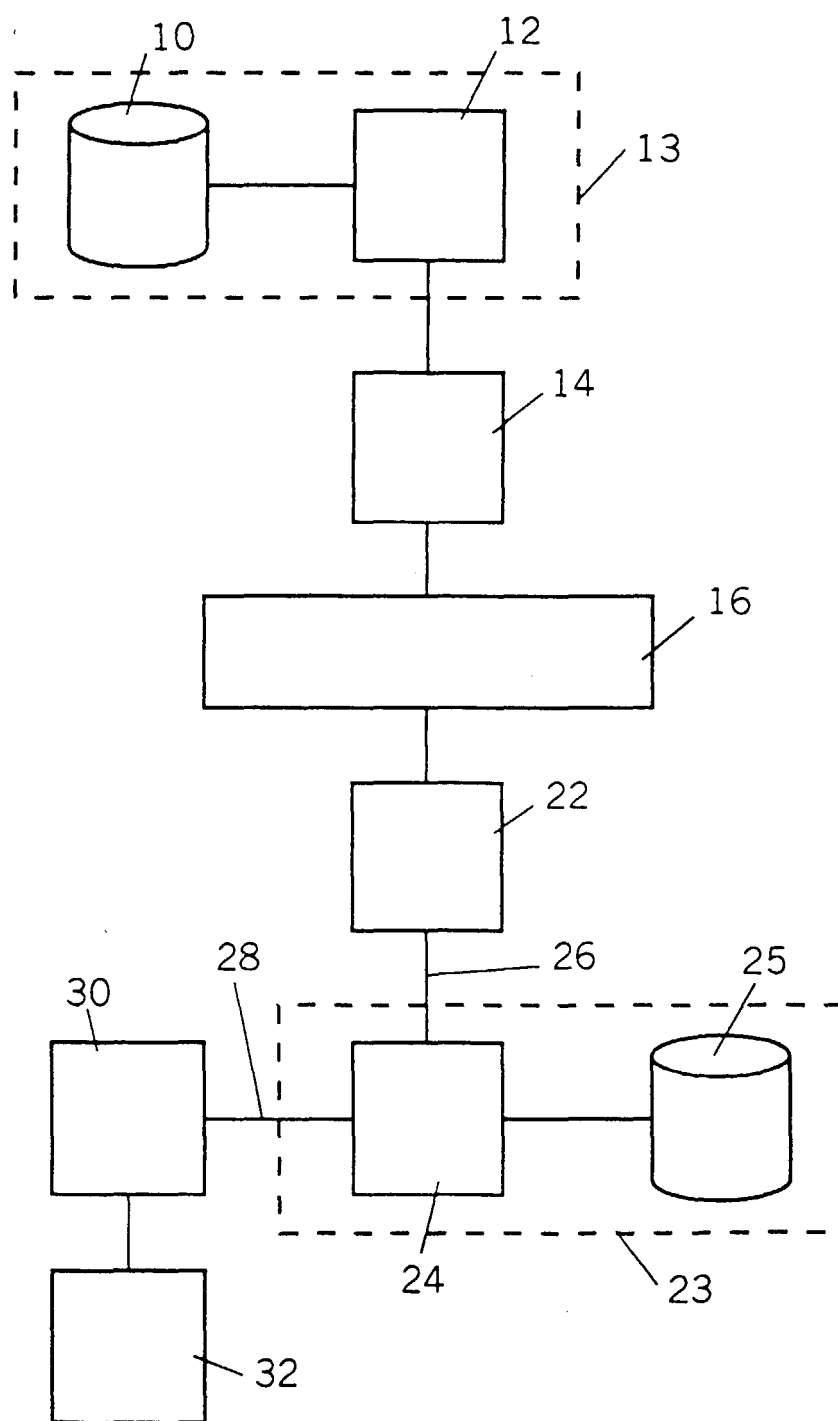


FIG. 1

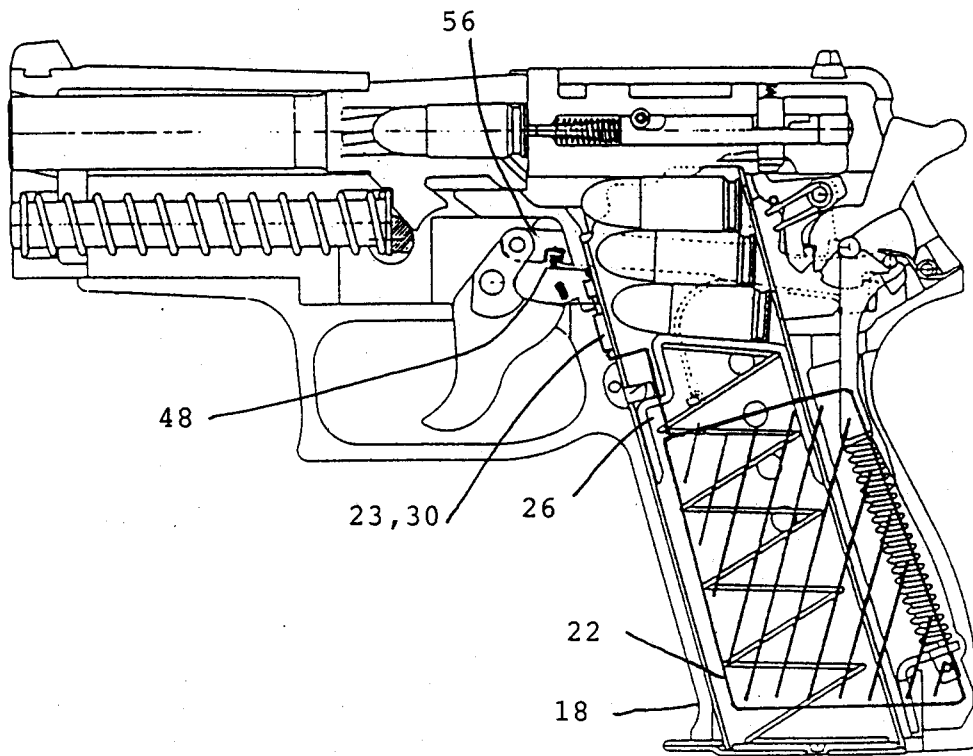


FIG. 2

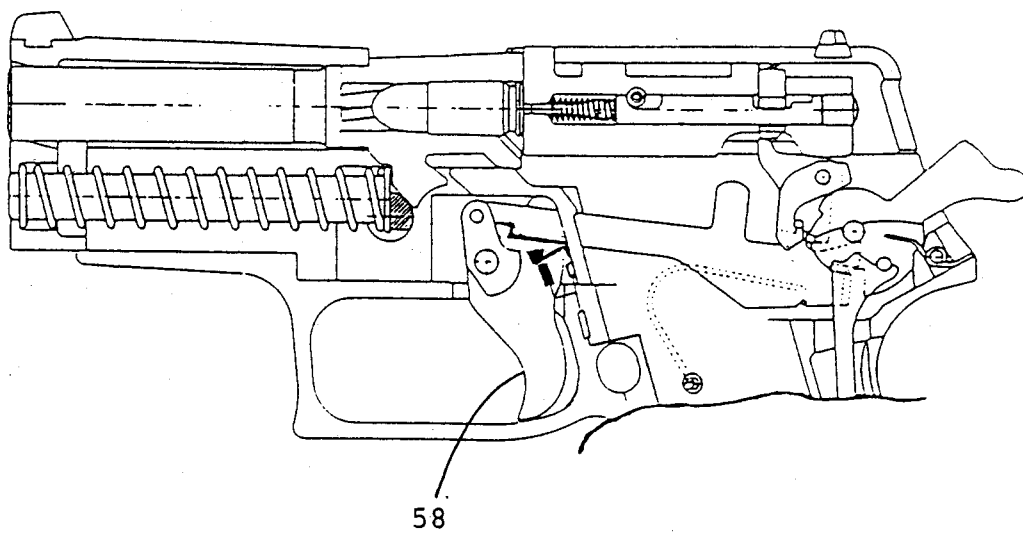


FIG. 3

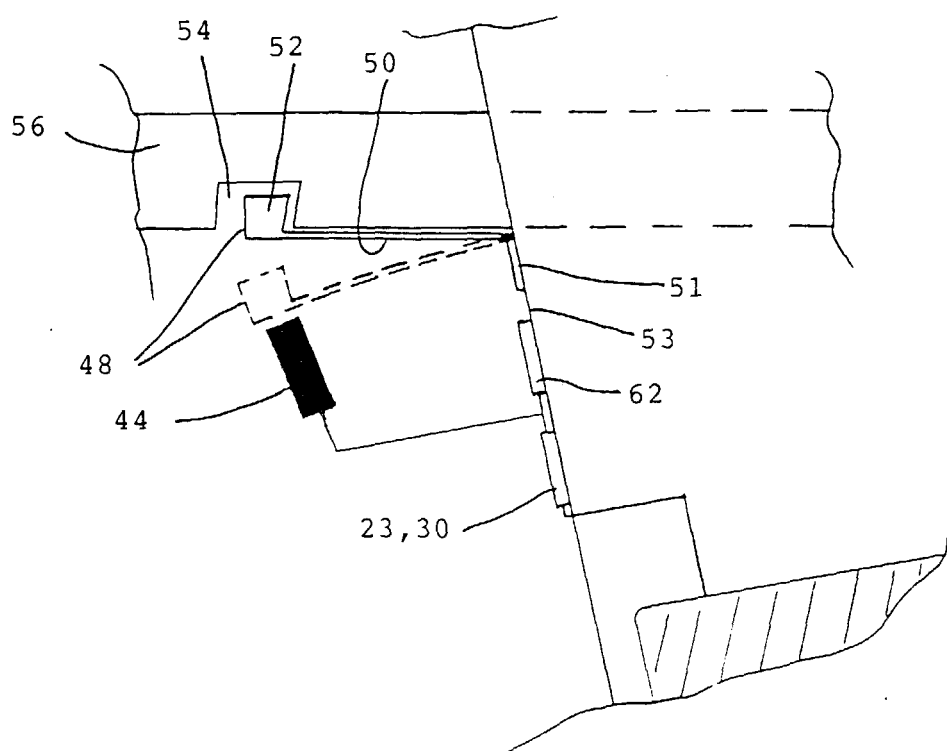


FIG. 4