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(54) FIRE WEAPON CONTROL SYSTEM INCLUDING SAFETY MEANS

BERECHTIGUNGSKONTROLLSYSTEM FÜR EINE FEUERWAFFE WELCHES EINE
SICHERUNGSVORRICHTUNG UMFASST

SYSTEME DE COMMANDE D'ARME A FEU COMPRENANT UN SYSTEME DE SECURITE

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Description

[0001] The invention concerns a fire weapon control system including safety means for preventing firing of the weapon by an unauthorized user.

[0002] Prior art fire weapon control systems of this kind are described in U.S. Patent Specifications Nos. 5,461,812 and 4,488,370.

[0003] The fire weapon control system described in U.S. Patent Specification No. 5,461,812 comprises a circuit contained within the grip of the weapon and a finger ring with a transponder. Arming the weapon for firing can only be accomplished upon receipt of a verifiable identification signal from the finger ring. One disadvantage is that the energy consumption is relatively high, so that e.g. the transponder needs batteries for operation.

[0004] There is a need for improving such prior art control systems in particular by reducing their energy consumption, their size, their cost, and by increasing their reliability.

[0005] The aim of the invention is therefore to provide an improved fire weapon control system of the above-mentioned kind which operates with reduced energy consumption, which is smaller and cheaper than prior art systems, and which in addition is more reliable.

[0006] According to the invention this aim is attained with a fire weapon control system defined by claim 1.

[0007] Preferred embodiments of the invention are defined by the subclaims.

[0008] The main advantages of a fire weapon control system according to the invention are that it has a lower energy consumption and can be made much smaller and cheaper than prior art systems, and that in addition it is more reliable, even under extreme climatic conditions.

[0009] Preferred embodiments of the invention are described hereinafter more in detail with reference to the accompanying drawings.

Fig. 1 shows an exploded view of handgun control system according to the invention.

Fig. 2 is a perspective view illustrating a typical use of a handgun control system shown by Fig. 1.

Fig. 3 is a schematic diagram of a prior art receiver circuit used for PSK or FSK demodulation.

Fig. 4 is a schematic diagram of a receiver circuit used for ASK demodulation used in a weapon control system according to the invention.

Fig. 5 is a schematic diagram of a prior art demodulator used for PSK or FSK demodulation in a receiver circuit of the type shown by Fig. 3.

Fig. 6 is a schematic diagram of demodulator used

for ASK demodulation used in a receiver circuit of the type shown by Fig. 4.

[0010] In the embodiments described hereinafter the weapon is a handgun. Within the scope of the invention the weapon can be also any similar firearm, e.g. a rifle or a rapid firing assault weapon.

[0011] As shown by Fig. 1 a handgun control system according to the invention basically comprises handgun control means lodged in a hollow part of the handgun handle (as described in detail hereinafter) and a user identification element 15, which is an element external to the handgun.

[0012] The handgun control means include safety means 27 for preventing firing of the handgun and further comprises a reader 23 lodged in a hollow part of the handgun handle 24, e.g. behind a hand grip wall 25 of handle 24. Reader 23 comprises a transceiver composed of a signal transmitter and a signal receiver. The output signal of this receiver is used to control the position of said safety means 27. Reader 23 also comprises a microprocessor which coordinates the operation of the transceiver, the receiver and the safety means. This microprocessor controls the position of the safety means in response to signals provided by the receiver part of the transceiver.

[0013] In a preferred embodiment the microprocessor manages a plurality of data related to use of the handgun, e.g. the point of time at which the control system of the handgun is put into operation, the points of time at which the handgun is used, the number of projectiles present in the cartridge of the handgun, etc. This plurality of data is stored in memory means included in the microprocessor.

[0014] The transceiver of reader 23 comprises an antenna 21 which is lodged in a side wall of the handle 24 of the handgun and on the side of the handle which is located at the shortest distance from the trigger of the handgun. Antenna 21 is distanced from metallic parts of the handgun in order to protect the operation of the control system against noise signals and in order to improve the signal-to-noise ratio of the useful signals.

[0015] Antenna 21 is so oriented that the main lobe of the transmitting field is directed towards the trigger of the handgun. Therefore, the main lobe of the transmitting field is directed towards the normal position of the user identification element 15, e.g. a finger ring carried by the user, when the handgun is properly hold by the user.

[0016] Safety means 27 have a normally disarmed position and an armed position and are adapted for being moved from the normally disarmed position to said armed position in response to a signal from the signal receiver.

[0017] If the weapon is a handgun the user identification element 15 is preferably a finger ring adapted to be worn by an authorized user of the handgun as shown by Fig. 2. Element 15 includes a transponder 14 mount-

ed on ring 15 and adapted for receiving a signal from said transmitter in the handgun.

[0018] If the weapon is a rifle the user identification element 15 is preferably a bracelet.

[0019] The transmitter in the handgun is adapted to elicit a response from the transponder 14 of the user identification element 15.

[0020] Transponder 14 of the user identification element 15 is adapted to receive a signal from the transmitter in the handgun and to generate a transponder signal back to the handgun.

[0021] The receiver in the handgun comprises recognition means responsive to at least one coded identification carried by the transponder signal, and a means for generating an output signal to operate safety means 27 for release of the safety means to their armed position.

[0022] In a preferred embodiment the coded identification carried by the transponder signal has a hierarchical structure which allows identification of a plurality of authorized users of the handgun.

[0023] The receiver in the handgun further comprises an amplitude shift keying demodulator for demodulating the transponder signal sent to the handgun.

[0024] A preferred embodiment of a handgun control system according to the invention further comprises programming means for coding said at least one identification in the transponder and in the recognition means of the receiver means in the handgun.

[0025] In a preferred embodiment, the handgun control system further comprises a switch 33 for connecting a power supply 29 to electric circuits of said control means of the handgun.

[0026] In a preferred embodiment, power supply 29 is normally disconnected from those electric circuits, and is adapted to be connected to those electric circuits by means of switch 33 when the user holds the handle of the handgun, or when pressure is applied to the trigger. Instead of switch 33 any other activation means having the function of a switch can be used.

[0027] In a preferred embodiment the handgun control system further comprises a LED display 26 which shows the user the status of the batteries and preferably also the status of the handgun control system as a whole.

[0028] In a further preferred embodiment the handgun control system further comprises a device 36 or 37 for manually putting the handgun control system out of operation. Both devices 36, 37 requires the presence of an authorized transponder to operate. Device 36 requires also the presence of an authorized transponder to return to the safety condition. Device 37 is adapted to return to the safety condition without the presence of an authorized transponder.

[0029] Batteries 29 are used as power supply. This batteries are preferably placed in a space or container located under the cartridge of the handgun. The battery container may be also connected to the cartridge.

[0030] In a preferred embodiment, the shape of the cartridge holder is used as part of a mechanism for putting the handgun control system out of operation. This is achieved for example by configuring the control system in such a way that removal of the cartridge puts the control system out of operation. It is thereby prevented that any projectile remaining in the handgun may be fired.

[0031] The simplification of the electric circuits of the control means of the handgun can be appreciated by comparing the receiver circuit for Amplitude Shift Keying (ASK) used in a handgun control system according to the invention represented by Fig. 4 with a receiver circuit for PSK (Phase Shift Keying) or FSK (Frequency Shift Keying) represented by Fig. 3. As shown by the latter Figure such a receiver circuit comprises the following elements/blocks connected in series: antenna 51, duplex filter 52, amplifier 53, filter 54, demodulator 55, filter 56, amplifier 57, A/D-converter 58 and output lead 59, whereas the receiver circuit represented by Fig. 4 only comprises the following elements/blocks connected in series: antenna 61, demodulator 62, filter 63, amplifier 64, A/D-converter 65 and output lead 66.

[0032] A further simplification provided by the use of ASK according to the invention can be by comparing the structure of the demodulator 62 for Amplitude Shift Keying (ASK) shown by Fig. 6 with the structure of an FM demodulator shown by Fig. 5. As shown by the latter Figure such an FM demodulator comprises the following elements/blocks (some of them are complex circuits): an input lead 71; a PLL circuit comprising a phase detector 73, a low-pass filter 74 and a voltage controlled oscillator 75; a resistor 76, a capacitor 77 and an output lead 78, whereas the ASK demodulator 62 represented by Fig. 6 only comprises the following elements/blocks (all of which are passive components): an input lead 81, a diode 82, a capacitor 83, resistors 84, 85, a capacitor 86 and an output lead 87.

[0033] From the foregoing it is clear that use of ASK according to the invention provides a considerable reduction of the number of components and therefore also of the size of the electric circuits of the handgun control system. A higher degree of miniaturization is therefore possible. Moreover manufacturing and maintenance costs are also much lower than those of prior art systems.

[0034] Moreover use of ASK according to the invention provides a considerable reduction of the energy consumption of the transceiver of reader 23 of the handgun control system. The energy consumption of such a transceiver is about nine times lower than the one of prior art transceivers for a similar purpose.

[0035] In addition use of ASK according to the invention provides a stronger signal to the input of the receiver part of the transceiver of reader 23. Therefore, operation of the handgun control system according to the invention is more reliable, even under noise conditions that would seriously affect the reliability of prior art systems.

[0036] In a preferred embodiment the handgun control system, special screws 42, 43, 44, 45 which can only be removed with special tools are used for mounting the various parts of the control system in the handle of the handgun, in order to protect it against misuse. As a further protection against misuse, screws 42, which fix the control system to the handgun, are positioned internally.

Claims

1. A fire weapon control system including safety means for preventing firing of the weapon by an unauthorized user, comprising:

a weapon having a weapon control means including

a reader (23) lodged in a hollow part of the weapon handle (24), said reader comprising a transceiver composed of signal transmitter means and signal receiver means, the output of the receiver means being used to control the position of said safety means (27),

said safety means (27) having a normally disarmed position and an armed position, and being adapted for being moved from the normally disarmed position to said armed position in response to a signal from the signal receiver means;

a user identification element (15) adapted to be worn by a user of the weapon, said element having a transponder (14) adapted to receive a signal from said transmitter means;

said transmitter means in the weapon being adapted to elicit a response from the transponder (14) of the user identification element (15);

said transponder (14) of the user identification element (15) being adapted to receive a signal from said transmitter means in the weapon and to generate a transponder signal back to the weapon;

said receiver means in the weapon having a recognition means responsive to at least one coded identification carried by the transponder signal, and a means for generating an output signal to operate said safety means (27) for release of the safety means to the armed position, **characterized in that** said receiver means in the weapon have an amplitude shift keying demodulator (62) for demodulating the transponder signal sent to the weapon.

2. A fire weapon control system according to claim 1 and further comprising programming means for coding said at least one identification in the transponder and in the recognition means of the receiver means in the weapon.

3. A fire weapon control system according to claim 1, wherein said transceiver of reader (23) comprises an antenna (21) which is lodged in a side wall of the handle of the weapon and on the side of the handle which is located at the shortest distance from the trigger of the weapon, said antenna being distanced from metallic parts of the weapon, and being so oriented that the main lobe of the transmitting field is directed towards the trigger of the weapon.

4. A fire weapon control system according to claim 1, wherein said weapon is a handgun and said user identification element (15) is a finger ring which is adapted to be worn by a user of the weapon and which carries said transponder (14).

5. A fire weapon control system according to claim 1, wherein said weapon is a rifle and said user identification element (15) is a bracelet which is adapted to be worn by a user of the weapon and which carries said transponder (14).

6. A fire weapon control system according to claim 1 and further comprising a switch (33) for connecting a power supply (29) to electric circuits of said control means of the weapon, said power supply being normally disconnected from said electric circuits, and said power supply being adapted to be connected to said electric circuits by means of switch (33) when the user holds the handle of the weapon.

7. A fire weapon control system according to claim 1 wherein said coded identification carried by the transponder signal has a hierarchical structure allowing identification of a plurality of authorized users of the weapon.

8. A fire weapon control system according to claim 1 wherein said reader 23 also comprises a microprocessor which coordinates the operation of the transceiver, the receiver and the safety means and which preferably manages a plurality of data related to use of the weapon.

Patentansprüche

1. Kontrollsystem für Feuerwaffen mit Sicherungsmitteln, welche das Abfeuern der Waffe durch unbefugte Benutzer verhindern, enthaltend:

eine Waffe mit Waffenkontrollmitteln mit einem in einem hohlen Teil des Griiffs (24) der Waffe untergebrachten Leser (23), der einen Transceiver bestehend aus Signalsendermitteln und Signalempfängermitteln enthält,

wobei der Ausgang der Empfängermitel zur Steue-

rung der Stellung der genannten Sicherungsmittel (27) dient,

wobei die Sicherungsmittel (27) eine normale gesicherte Stellung und eine entsicherte Stellung aufweisen und durch ein Signal vom Signalempfänger von der normalen gesicherten Stellung in die entsicherte Stellung bewegbar sind;

einem Benutzeridentifikationselement (15), welches von einem Benutzer der Waffe getragen werden kann und einen Transponder (14) aufweist, mit dem ein Signal von den genannten Sendemitteln empfangbar ist;

wobei mit den genannten Sendemitteln in der Waffe eine Antwort des Transponders (14) des Benutzeridentifikationselements (15) auslösbar ist;

wobei mit dem Transponder (14) des Benutzeridentifikationselements (15) ein Signal von den genannten Sendemitteln in der Waffe empfangbar und ein zur Waffe zurückgesendetes Transpondersignal erzeugbar ist;

wobei die genannten Empfängermitel in der Waffe ein Erkennungsmittel für mindestens eine im Transpondersignal enthaltene codierte Identifikation aufweisen sowie ein Mittel zur Erzeugung eines Ausgangssignals zur Betätigung der Sicherungsmittel (27), um die Sicherungsmittel in die entsicherte Stellung zu bringen;

dadurch gekennzeichnet, dass die Empfängermitel in der Waffe einen Amplitudenumtastungsmodulator (62) zur Demodulation des zur Waffe gesendeten Transpondersignals aufweisen.

2. Feuerwaffen-Kontrollsystem nach Anspruch 1, zusätzlich mit Programmiermitteln zum Codieren der genannten mindestens einen Identifikation im Transponder und in den Erkennungsmitteln der Empfängermitel der Waffe.

3. Feuerwaffen-Kontrollsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** der Transceiver des Lesers (23) eine Antenne (21) aufweist, die in einer Seitenwand des Handgriffs der Waffe untergebracht ist, und zwar auf der Seite des Handgriffs, welche am nächsten beim Abzug der Waffe liegt, wobei die Antenne von metallischen Teilen der Waffe beabstandet und so ausgerichtet ist, dass die Hauptkeule des Übertragungsfelds zum Abzug der Waffe gerichtet ist.

4. Feuerwaffen-Kontrollsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die Waffe eine Handfeuerwaffe ist und das Benutzeridentifikationselement (15) ein Fingerring, der von einem Benutzer der Waffe getragen werden kann und den genannten Transponder (14) enthält.

5. Feuerwaffen-Kontrollsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die Waffe ein Ge-

wehr ist und das Benutzeridentifikationselement (15) ein Armband, das von einem Benutzer der Waffe getragen werden kann und den genannten Transponder (14) enthält.

6. Feuerwaffen-Kontrollsystem nach Anspruch 1, zusätzlich mit einem Schalter (33) zur Verbindung einer Stromversorgung (29) mit elektrischen Schaltungen der Kontrollmittel der Waffe, wobei die Stromversorgung normalerweise von den elektrischen Schaltungen getrennt ist und über den Schalter (33) mit den elektrischen Schaltungen verbindbar ist, wenn der Benutzer den Handgriff der Waffe in der Hand hält.

7. Feuerwaffen-Kontrollsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die im Transpondersignal enthaltene codierte Identifikation eine hierarchische Struktur aufweist, die die Identifikation mehrerer berechtigter Benutzer der Waffe gestattet.

8. Feuerwaffen-Kontrollsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** der Leser 23 ausserdem einen Mikroprozessor aufweist, der den Betrieb des Transceivers, des Empfängers und der Sicherungsmittel koordiniert, und der vorzugsweise mehrere Arten von Daten im Zusammenhang mit der Benützung der Waffe verwaltet.

Revendications

1. Système de contrôle d'armes à feu comprenant des moyens de sûreté pour éviter la décharge de l'arme par un utilisateur non autorisé, comprenant:

une arme munie d'un moyen de contrôle de l'arme comprenant

un lecteur (23) logé dans une partie creuse de la poignée (24) de l'arme, ledit lecteur comprenant un récepteur-émetteur composé de moyens émetteurs de signaux et de moyens récepteurs de signaux, la sortie des moyens récepteurs étant utilisée pour commander la position desdits moyens de sûreté (27),

lesdits moyens de sûreté (27) présentant une position normale désarmée et une position armée et étant déplaçables de la position normale désarmée à ladite position armée en réponse à un signal des moyens récepteurs de signaux; un élément d'identification utilisateur (15) portable par un utilisateur de l'arme, ledit élément comprenant un transpondeur (14) apte à recevoir un signal desdits moyens émetteurs; lesdits moyens émetteurs dans l'arme étant aptes à engendrer une réponse du transpondeur (14) de l'élément d'identification utilisateur (15);

ledit transpondeur (14) de l'élément d'identification utilisateur (15) étant apte à recevoir un signal desdits moyens émetteurs dans l'arme et à générer un signal transpondeur retransmis à l'arme;

lesdits moyens récepteurs dans l'arme de poing comprenant des moyens de reconnaissance répondant à au moins une identification codée, portée par le signal du transpondeur, ainsi qu'un moyen permettant de générer un signal de sortie pour la commande desdits moyens de sûreté (27) afin de débloquent les moyens sûreté pour les mettre en position armée;

caractérisé en ce que lesdits moyens récepteurs dans l'arme comprennent un démodulateur de modulation par déplacement d'amplitude (62) pour la démodulation du signal du transpondeur transmis à l'arme.

2. Système de contrôle d'une arme à feu selon la revendication 1, comprenant en outre des moyens de programmation permettant le codage de ladite au moins une identification dans le transpondeur et dans les moyens de reconnaissance dans l'arme.
3. Système de contrôle d'une arme à feu selon la revendication 1, **caractérisé en ce que** ledit récepteur-émetteur du lecteur (23) comporte une antenne (21) logée dans une paroi latérale de la poignée de l'arme et située du côté le moins éloigné de la détente de l'arme de poing, ladite antenne étant à l'écart de parties métalliques de l'arme et orientée de telle manière que le lobe principal du champ de transmission est dirigé vers la détente de l'arme.
4. Système de contrôle d'une arme à feu selon la revendication 1, **caractérisé en ce que** ladite arme est une arme de poing et ledit élément d'identification utilisateur (15) est une bague portable par un utilisateur de l'arme et munie dudit transpondeur (14).
5. Système de contrôle d'une arme à feu selon la revendication 1, **caractérisé en ce que** ladite arme est un fusil et ledit élément d'identification utilisateur (15) est un bracelet portable par un utilisateur de l'arme et muni dudit transpondeur (14).
6. Système de contrôle d'une arme à feu selon la revendication 1, comprenant en outre un interrupteur (33) permettant de connecter une alimentation (29) aux circuits électriques desdits moyens de contrôle de l'arme, ladite alimentation étant normalement déconnectée desdits circuits électriques et apte à être connectée auxdits circuits électriques au moyen de l'interrupteur (33) lorsque l'utilisateur

tient la poignée de l'arme.

7. Système de contrôle d'une arme à feu selon la revendication 1, **caractérisé en ce que** ladite identification codée portée par le signal du transpondeur présente une structure hiérarchique permettant l'identification d'une pluralité d'utilisateurs autorisés de l'arme.
8. Système de contrôle d'une arme à feu selon la revendication 1, **caractérisé en ce que** ledit lecteur (23) comprend également un microprocesseur qui coordonne le fonctionnement du récepteur-émetteur, de l'émetteur et des moyens de sûreté, et qui traite de préférence une pluralité de données relatives à l'utilisation de l'arme.

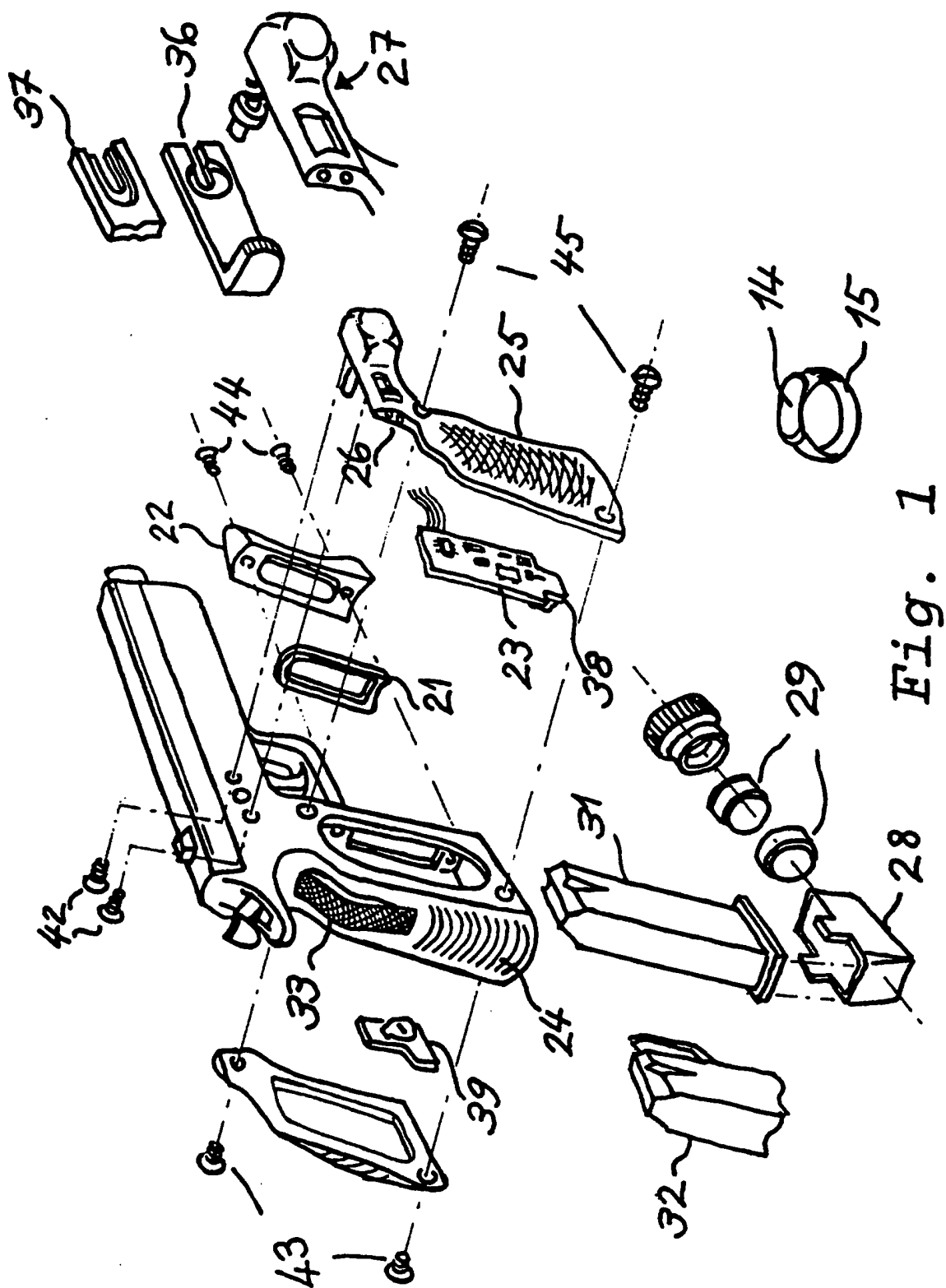


Fig. 1

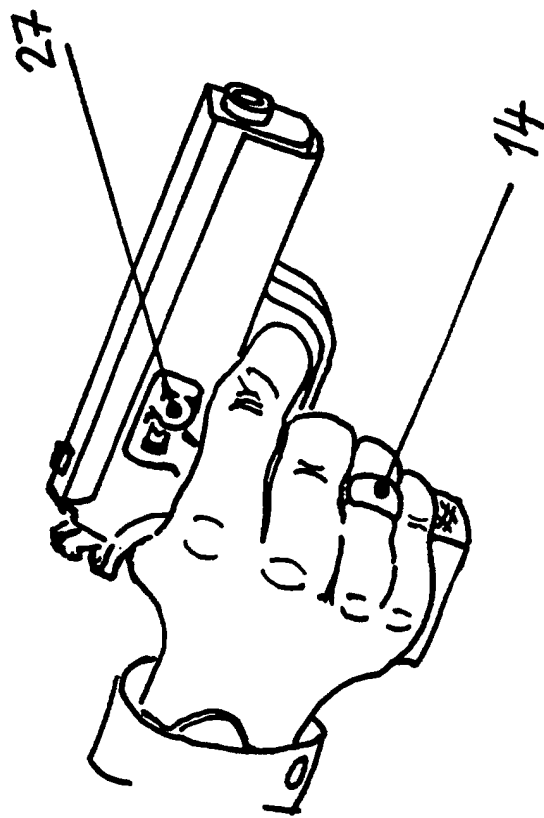


Fig. 2

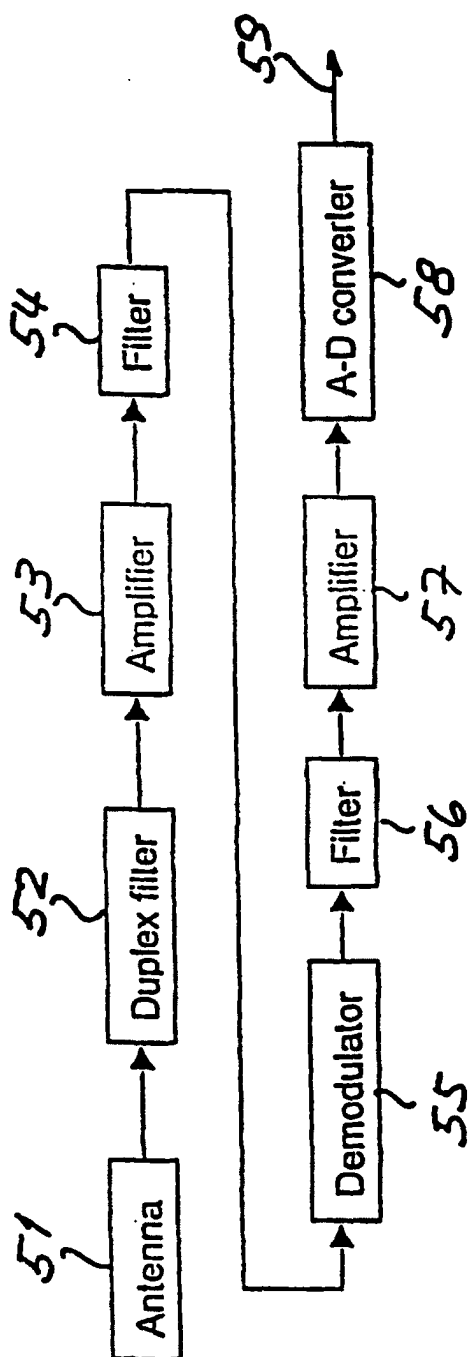


Fig. 3

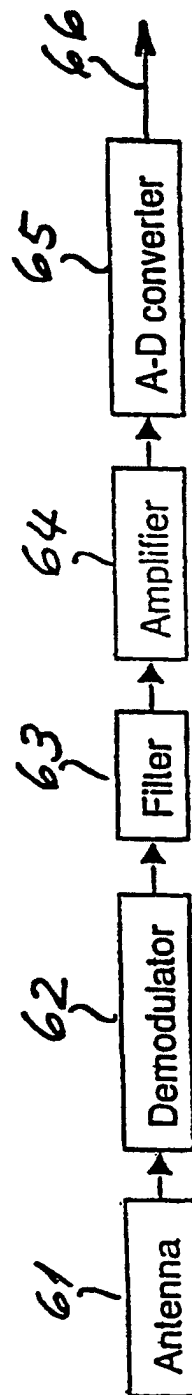


Fig. 4

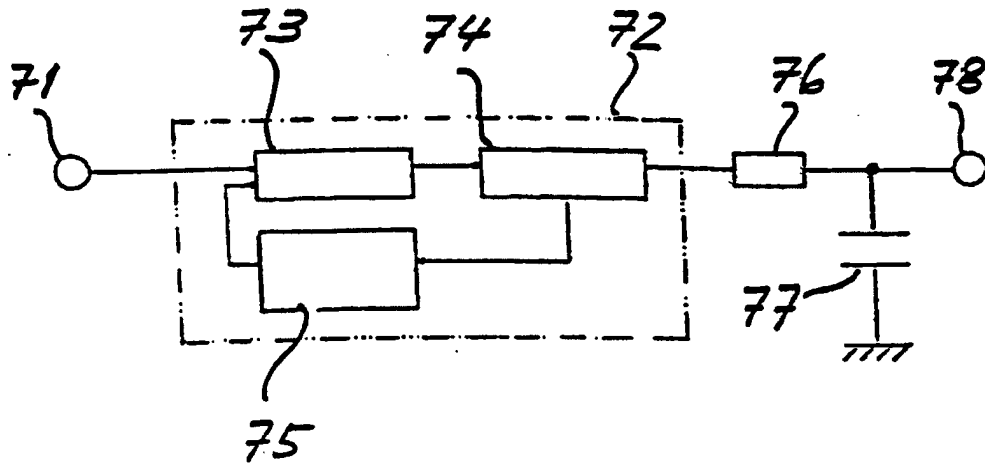


Fig. 5

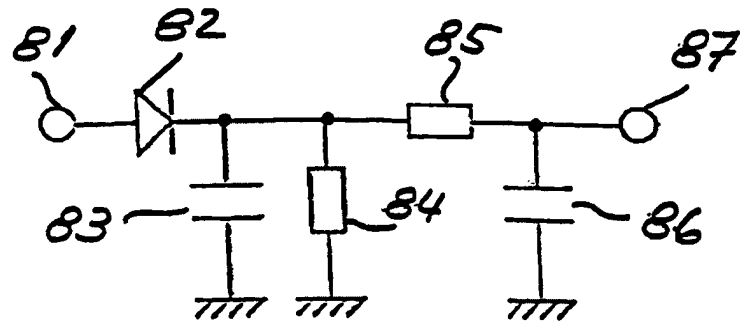


Fig. 6