



INTELLIGENT FIREARM LOCKING DEVICE

BACKGROUND TO THE INVENTION

Firearms security and management is a major concern especially for law enforcement agencies or similar as unsuitably protected the firearms can land in the wrong hands and with dire consequences. As such safe storage and management of firearms is of paramount importance in any armory. Often firearms are stored in a lock rooms with said firearms mounted onto racks or similar and with said firearms secured to the racks individually or in groups using chains and padlocks. Access to the firearms usually involves obtaining authorization from the person in charge of the system and the firearms are released by unlocking the padlocks and removing said firearms from the racks and recording needed for authorization and removing of said firearms is usually conducted manually. This system, though convenient, is subjected to human errors and open to abuses. The locks of the stores and the padlocks securing the firearms to the racks can be picked. Additionally recordings for the release of the firearms are subjected to human errors of worse still to frauds.

There are also systems wherein each firearm is secured onto a cradle with said cradle fixed to a stationary rack. The cradle is designed to accept a particular design of firearm only and the whole system need to be modified or replaced for a different design of firearm. Locking system uses the conventional key that can be picked. Additionally recording for control is manually conducted and real time centralized control of data is not incorporated into the system.

It is thus desirable to have a firearm-locking device and associated security and management system that can be protected against unauthorized access and networked for armory inventory and access control purposes. It is further desirable to have a firearm-locking device that is adaptable to accepted firearms of different designs. It is still further desirable to have a firearm-locking device that utilizes electronic key release mechanism that is protected from hot wiring techniques and also having electronic controller that can be interfaced to a computer system for access control and inventory system. It is still further desirable to have a firearm-locking device that has an internal and independent power source enabling said firearm-locking device to be operated in a standalone mode.



It is the objective of the present invention to provide an intelligent firearm-locking device that is modular in construction and adaptable to accept firearms of different designs.

5 It is still a further objective of the present invention to provide an intelligent firearm-locking device that utilizes to a digital key activating system for the locking assembly.

It is still a further objective of the present invention to provide an intelligent firearm-locking device that can be connected to a computer for centralized control and monitoring.

10 It is still a further objective of the present invention to provide an intelligent firearm-locking device having an internal and independent power source to enable said firearm-locking device to be operated in standalone mode.

SUMMARY OF THE INVENTION

15 The intelligent firearm-locking device of the present invention is designed to protect firearm locked by said device against theft and misuse with said firearm-locking device to be mounted to a stationary or a mobile rack. The firearm-locking device is protected from lock picking and can be network for armory inventory, control and access purposes or can be operated in a standalone mode.

20 The firearm-locking device comprises a cradle for positioning the firearm to be locked and a lock assembly to prevent said firearm from being removed from said cradle. The firearm-locking device is modular in construction with the cradle substitutable by a cradle of another design to fit the specific firearm to be locked. The lock assembly is fastened to the cradle but can be detached and fitted to another cradle
25 of a different design.

The cradle is of resilient materials and has a substantially 'U' shaped cross-section comprises an opening to receive or to withdraw the firearm and with said opening leading to a cavity to support a portion of said firearm. Transversely the cavity is sided by a front panel and a rear panel with said panels connected by a base
30 plate and longitudinally said cavity has a barrier at each end to prevent withdrawal of firearm from the cradle along the longitudinal direction. The lock assembly is

attached to the rear panel of the cradle using fasteners that can only be accessed from the cavity of said cradle side.

The lock assembly comprises a latch, a motorized latch activating mechanism, a power source, an electronic key system, a control module, all housed within a lock casing of resilient materials, and a cradle cover that is hinged to an outer edge of said lock casing. The lock casing has a top opening for access to components housed within and a casing cover for covering said opening and with said casing cover attached to said lock casing using fasteners. The casing cover is positioned next to rear panel of the cradle and cannot be removed once the lock assembly is fastened to said cradle and with a firearm positioned on to said cradle. The motorized latch activating mechanism, the power source, the control module and the electronic key system are connected up electrically and with said electronic key system having an externally exposed portion designated for contact activation. In the preferred embodiment the electronic key system is in the form of an iButton. The control module can be interfaced with a computer for remote monitoring and control and possible access.

The motorized latch activating mechanism comprises a motor, a DC motor in this case, a latch activating means driven by said motor to activate the latch, a base that is positioned fixed on to the lock casing and a mounting plate and associated fasteners with for mounting and supporting said motor, said latch activating means and the latch. The latch activating means comprises a gear wheel supported onto a gear wheel support, a lever positioned on top of said gear wheel and a ring positioned on top of said lever and with said lever further comprises a lever body, an extended arm and a pin attached upright onto the upper face of said extended arm and with said lever mounted at its body onto the gear wheel and coupled co-axially to said gear wheel. The gear wheel support, the gear wheel, the lever and the ring are positioned upright and substantially co-axially one on top of the other in this sequence and collectively acts substantially as an integral unit. The lower end of the gear wheel support fits into a receiving cavity of the base while the upper end of said ring locates beneath a flange of the mounting plate and secured in position with a fastener. An inner limiter and an outer limiter on the flange limit the extend of movements of the extended arm of the lever. The gear wheel is coupled to and driven by the output gear

attached to the output shaft of the motor. The extended arm of the lever functions to induce linear displacements of the latch.

A sensor is mounted onto the mounting plate to detect and to monitor the position of the latch and with circuitry linked to said sensor able to provide a positive
5 signal to the user should the latch not at its intended position when the firearm-locking device is set to lock.

The latch comprises a body with an extended bar, a slot guide, a receiving slot, an upright first face, an upright second face and a pin that extends from the lower face of said body. The upright first face acts in conjunction with the extended arm of the
10 lever to prevent manipulation of the latch to unlock the lock assembly. The latch rests onto the level platform of the base and is able to translate linearly along the guide rail of said level platform guided by the pin that fits into said guide rail. Additionally a stationary upright post mounted to the level platform extends through the slot guide of the body of the latch with said upright post acting as an additional guide to linear
15 translation of said latch. A fastener attached on top of the upright post prevents the latch from being displaced from level platform.

The cradle cover comprises a top plate with a hinge member attached onto one edge of said top plate and a side plate at the opposed edge. The hinge member has a passageway and a through slot of size enabling it to receive the extended bar of the
20 latch when the lock assembly is in the locked position. At an edge of the top plate and opposed to that of the hinge member is a side plate and an intermediate groove at the junction between said top plate and said side plate and when the top plate covers the opening of the cavity the intermediate groove locating over the top edge of the front panel of the cradle. A hinge pin that is used in the hinge to connect the cradle
25 cover to the lock casing is set at a fixed position in the hinge. At the mid-section of the hinge pin is a milled flat. The milled flat is to accommodate part of the extended bar of the latch when the firearm-locking device is in the locked position.

When the firearm-locking device is in the open position the cradle cover is flipped away from the opening of the cavity of the cradle with access to said cavity
30 unrestrained. The firearm, if present, can be removed from the cradle or if there is none initially the firearm can be positioned on to said cradle. When the firearm-locking device is in the closed position the cradle cover closes up the opening of the

cavity of the cradle and access to said cavity is denied and the firearm, if present, that is positioned on to said cavity cannot be taken out.

These and other features, advantages and objectives of the present invention will be further understood and appreciated by those skilled in the art by the following specification, appended drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows the lock assembly (4) and the cradle (3) of the intelligent firearm-locking device (1) of the present invention.

Fig. 2 shows the main components of the lock assembly (4) without the lock casing cover (42) of the intelligent firearm-locking device (1).

Fig. 3 shows the main components of the lock assembly (4) and with the cradle cover (5) attached to the lock casing (40).

Fig. 3A shows the opening (41) on a side wall of the lock casing (40).

Fig. 4 shows detail components of the latch activating mechanism (15) and the latch (8).

Fig. 5 shows the assembled latch activating mechanism (15) in the 'open' position.

Fig. 6 shows the assembled latch activating mechanism (15) in the 'closed' position.

Fig. 7 shows the intelligent firearm-locking device (1) in the 'open' position.

Fig. 8 shows the intelligent firearm-locking device (1) in the 'closed' position.

Fig. 9 shows the intelligent firearm-locking device (1) with a firearm (100) locked in position.

Fig. 10 shows an example whereby a series of systems comprising a plurality of firearm-locking device (1) connected up for remote monitoring.

DETAIL DESCRIPTION OF THE INVENTION

The intelligent firearm-locking device (1) of the present invention is designed to protect firearm locked by said device against theft and misuse with said firearm-locking device (1) to be mounted to a stationary or a mobile rack. The firearm-

locking device (1) is protected from lock picking and can be network for armory inventory, control and access purposes.

It should be noted that for the sake of clarity all the components and parts of the firearm-locking device (1) may not be shown and marked in the drawings. Additionally the terms as used in this description refer to the items as orientated in the drawings and they may be in any various orientations when in use and as such the orientations as illustrated in the drawings are not necessary for operability. The firearm-locking device (1), as shown in Fig. 1, Fig. 7 and Fig. 8, comprises a cradle (3) for positioning the firearm to be locked and a lock assembly (4) to prevent said firearm from being removed from said cradle (3). The firearm-locking device (1) is modular in construction with the cradle (3) replaceable by a cradle of another design to fit the specific firearm to be locked. Likewise the lock assembly (4) is attachable to the cradle (3) but can be detached and fitted to another cradle of a different design. A cradle cover (5), forming part of the lock assembly (4), is hinged to an edge of the lock casing (40) of said lock assembly (4) and with said cradle cover (5) acting directly, by its suitable positioning, to preventing the firearm from being removed from the cradle (3). A feature in the design of the firearm-locking device (1) is that the lock mechanism is built at the hinge (17) between the cradle cover (5) and the lock casing (40) as shall be described later.

The cradle (3) of the firearm-locking device (1), as shown in Fig. 1, is made from resilient materials and can be detached from the lock assembly (4) and replaced by another cradle of a different design to suit a particular firearm to be locked. The cradle (3) has a substantially 'U' shaped cross-section and comprises an opening (35) to receive or to withdraw the firearm and with said opening (35) leading to a cavity (31) to support a portion of said firearm. The cavity (31) is shaped to support the firearm that it is intended for. Transversely the cavity (31) is sided by panels, the front panel (30) and the rear panel (32) with said front panel (30) and said rear panel (32) connected by a base plate (33). In the embodiment shown part of the rear panel (32) is cut out leaving an upright plate (36) at each end. A cradle (3) having a rear panel (32) without any cut out is possible and it falls within the scope of the present invention. Longitudinally and at each end of the cradle (3) is a barrier (34) to prevent withdrawal of firearm from said cradle (3) along the longitudinal direction. A firearm

that is supported by in the cavity (31) of the cradle (3) can only be withdrawn through the opening (35).

The lock assembly (4) is attachable to the rear panel (32) of the cradle (3) using fasteners (47) that can only be accessed from the cavity (31) of said cradle (3) side as indicated in Fig. 1. In this manner the fasteners (47) cannot be accessed once the firearm is positioned onto the cradle (3). In the present embodiment, as shown in Fig. 1, the lock assembly (4) is fitted to the cradle (3) by first sliding the lock casing (40), at the side grooves (44), down along the opposing inner edges of the upright plates (36) of the rear panel (32) and when said lock assembly (4) has settled in position it is then fastened onto said cradle (3) with fasteners (47). For the design whereby there is no cut out on the rear panel (32) the grooves (44) at the side of the lock casing (40) are not necessary. The lock assembly (4) in this case is then directly attached to the rear panel (32) and held in position with fasteners.

The lock assembly (4) of the present embodiment comprises a latch (8), a motorized latch activating mechanism (15) to activate said latch (8), a control module (12), a power source (11) to power said motorized latch activating mechanism (15) and said control module (12), an electronic key system (13) to activate said motorized latch activating mechanism (15) and with all the mentioned main components all housed within a lock casing (40) of resilient materials and a cradle cover (5) that is hinged to an outer edge of said lock casing (40) as shown in Fig. 3. The power source (11) can be externally placed or internally placed with both placements of said power source (11) falling within the scope of the present invention. In the preferred embodiment the power source (11) is internally placed in the lock casing (40) and functions independently enabling the firearm-locking device (1) to be operated as a stand alone unit. The lock casing (40) has a top opening for access to components housed within and a casing cover (42) for covering said opening and with said casing cover (42) attached to said lock casing (40) using fasteners (47). When the lock assembly (4), with the casing cover (42) attached, is assembled and fastened on to the cradle (3) said casing cover (42) is positioned next to the rear panel (32) of said cradle (3) with said casing cover (42) cannot be dismantled once a firearm is positioned onto said cradle (3).

The motorized latch activating mechanism (15), the power source (11), the control module (12) and the electronic key system (13) are all connected up electrically. The electronic key system (13) that is housed within the lock casing (40) has an externally exposed portion, as shown in Fig.1, that is designated for contact activation. The electronic key system (13) in the preferred embodiment is in the form of an iButton system. Other electronic key systems, eg. finger print recognition system or similar, are also acceptable and they all fall within the scope of the present invention. The control module (12) can be interfaced with a computer for remote monitoring and control and possible access. It is also possible to have a setup wherein a series of stations each comprising a plurality of firearm-locking device (1) to be connected up via their control modules (12) for remote monitoring and control. An example of such a setup, as indicated in Fig. 10, comprises a series of stations (108), each connected to a sub-controller (102) and linked to a switching system (104) with said switching system (104) also connecting a main controller (101), a database server (103) and a firewall unit (105) with said firewall unit (105) connected to a router (106) that is also connected to the internet system (107) that can be access remotely by a terminal (109).

The motorized latch activating mechanism (15) comprises a motor (95), a latch activating means (16) driven by said motor (95) to activate the latch (8), a base (6), mounting plate (7) and fasteners (71). In the preferred embodiment the motor (95) is a DC motor and mounted securely onto the output shaft (not shown) of said motor (95) is an output gear (96) as shown in Fig. 4. The base (6) is positioned fixed on to the lock casing (40) with said base (6) comprises a substantially level platform (60) and an upright panel (61) having an aperture (62) with said upright panel (61) connected at an edge of said level platform (60) as shown in Fig. 4. The base (6) that is positioned fixed on to the lock casing (40) is orientated such that the aperture (62) on the upright panel (61) is aligned with the opening (41), as shown in Fig. 3A, on the side wall of said lock casing (40) and with the extended bar (81) of the latch (8) able to extend outwardly through said aperture (62) and said opening (41) to locate in the slot (54) of the hinge member (53) of the cradle cover (5) as shall be explained further in the section describing said latch (8). Extending upwards from the level platform (60) of the base (6) is a plurality of upright columns (63). The upright columns (63)

support the mounting plate (7) and with said mounting plate (7) secured onto said upright columns (63) with fasteners (71) as shown in Fig. 5. The motor (95) is attached and fastened, using fasteners (71), to the plurality of side flanges of the mounting plate (7). The latch activating means (16), as mentioned above, comprises a

5 gear wheel (91) supported onto a gear wheel support (90), a lever (9) positioned on top of said gear wheel (91) and a ring (94) positioned on top of said lever (9) as indicated in Fig. 4. The lever (9) further comprises a lever body (92), an extended arm (93) and a pin (76) attached upright onto the upper face of said extended arm (93). The lever (9) is mounted at the lever body (92) onto the gear wheel (91) and

10 coupled co-axially to said gear wheel (91). The extended arm (93) of the lever (9) is normally positioned at the receiving slot (83) of the latch (8) and is able to induce linear displacements of said latch (8) through angular displacements of said lever (9). The gear wheel support (90), the gear wheel (91), the lever (9) and the ring (94) are positioned upright and substantially co-axially one on top of the other in this sequence

15 and collectively act substantially as an integral unit. The lower end of said gear wheel support (90) fits into a receiving cavity (66) of the level platform (60) while the upper end of said ring (94) locates beneath a flange (70) of the mounting plate (7) and secured in position with a fastener (71b). Along the outer perimeter of the flange (70) is an inner limiter (72) and an outer limiter (73), as shown in Fig. 5 and Fig. 6, with

20 said inner limiter (72) and said outer limiter (73) to limit the extend of movements of the extended arm (93) of the lever (9) when the pin (76) comes in contact with either said inner limiter (72) or outer limiter (73). The gear wheel (91) is coupled to and driven by the output gear (96) that is attached to the output shaft of the motor (95) with both said gear wheel (91) and said output gear (96) are bevel type in the

25 preferred embodiment. Any rotational movement of output gear (96) is transmitted to the gear wheel (91) and translated as an angular movement for the lever (9) and an arc movement for the extended arm (93) that is further translated as a linear displacement for the latch (8) along the rail (64). As a safety precaution, a sensor (14) is mounted onto the mounting plate (7) with said sensor (14) able to detect and to monitor the

30 position of the latch (8). In the preferred embodiment the sensor (14) used is an infrared sensor. The circuitry linked to the sensor (14) is such that it could provide a

positive signal to the user should the latch (8) not at its intended position when the firearm-locking device (1) is set to lock.

The latch (8) comprises a body (80) with a extended bar (81), a slot guide (82), a receiving slot (83), an upright first face (85), an upright second face (86) and a pin (84) that extends from the lower face of said body (80) as shown in Fig. 4 and Fig. 5. The upright first face (85) acts in conjunction with the extended arm (93) of the lever (9) to prevent manipulation of the latch (8) to unlock the lock assembly (4) as shall be described later. The latch (8) rests onto the level platform (60) of the base (6) and is able to translate linearly along the guide rail (64) of said level platform (60) guided by the pin (84) that fits into said guide rail (64). Additionally a stationary upright post (65) mounted to the level platform (60) of the base (6) extends through the slot guide (82) of the body (80) of the latch (8) with said upright post (65) acting as an additional guide to linear translation of said latch (8). A fastener (71a) attached on top of the upright post (65), as shown in Fig. 5, prevents the latch (8) from being displaced from level platform (60).

The cradle cover (5) of the lock assembly (4) comprises a top plate (50) with a hinge member (53) attached onto one edge of said top plate (50) and a side plate (51) at the opposed edge as shown in Fig. 2. The hinge member (53) has a passageway (55) for positioning the mid-section (46) of the hinge pin (10) and a through slot (54) with said through slot (54) of a size and design such that it is capable to receive the extended bar (81) of the latch (8) when the lock assembly (4) is in the locked position. Additionally the position of the through slot (54) on the hinge member (53), when the firearm-locking device (1) is in the locked position, is such that it is aligned to the opening (41) on the side wall of the lock casing (40) and the aperture (62) of the upright panel (61) of the base (6) and with the extended bar (81) of the latch (8) able to advance forward passing through said aperture (62) and said opening (41) to locate in said slot (54) to lock the cradle cover (5) at this fixed position. At an edge of the top plate (50) and opposed to that of the hinge member (53) is a side plate (51) and an intermediate groove (56) at the junction between said top plate (50) and said side plate (51). The top plate (50) acts as a restrain means to prevent the firearm from being removed from the cavity (31) of the cradle (3). It is possible to have a top plate (50) of basic design and without the side plate (51) with said top plate (50) partially

covering the opening (35) of the cavity (31) leaving a gap between the free edge of said top plate (50) and the front panel (30) of the cradle (3) as long as the firearm positioned on to said cavity (31) of said cradle (3) cannot be removed through said gap. However in the preferred embodiment and for the sake of appearance and marketability the top plate (50) is of a width that fully covers the opening (35) of the
 5 cavity (31) and with the intermediate groove (56) locating over the top edge of the front panel (30) of the cradle (3) as shown in Fig. 8.

A hinge pin (10) is used in the hinge (17) that connects the cradle cover (5) to the lock casing (40) as indicated in Fig. 2 with said hinge pin (10) comprises a bar
 10 having opposing end sections (45a and 45b) that have substantially circular cross-sections and a mid-section (48) with a milled flat (46). At one of the end section (45a) is a radial hole (49) that can be positioned in line with a similar hole (49a) on the edge of the lock casing (40) and when they are in line a pin (not shown) can be inserted through said hole (49a) and said radial hole (49) locking the hinge pin (10) at
 15 a specific position. At this specific position the flat (46) at the mid-section (48) of the hinge pin (10) faces the through slot (54) of the hinge member (53) of the cradle cover (5). The hinge pin (10) is fixed at this specific position in order to provide additional space for the extended bar (81) of the latch (8) to be forwarded further to positively lock in position the cradle cover (5).

20 When the firearm-locking device (1) is in the open position, as shown in Fig. 7, the cradle cover (5) is flipped away from the opening (35) of the cavity (31) of the cradle (3) with access to said cavity (31) unrestrained. The firearm, if present, can be removed from the cradle (3) or if there is none initially a firearm can be positioned on to said cradle (3). For the lock assembly (4) the latch (8) is retracted along the rail (64), as indicated in Fig. 5, with the extended bar (81) of said latch (8) within the lock
 25 casing (40) and with the cradle cover (5) free to rotate about the hinge (17). The extended arm (93) of the lever (9) is at the lower position and proximate to the outer limiter (73) of the flange (70).

When the firearm-locking device (1) is in the locked or closed position, as
 30 shown in Fig. 8, the cradle cover (5) closes up the opening (35) of the cavity (31) of the cradle (3) and access to said cavity (31) is denied and the firearm, if present, that is positioned on to said cavity (31) cannot be taken out. For the lock assembly (4) the

latch (8) is forwarded along the rail (64), as indicated in Fig. 6, with the extended bar (81) of said latch (8) positioned through the aperture (62) of the upright panel (61) of the base (6), the opening (41) at the side wall of the casing (40) and locates at the through slot (54) of the hinge member (53) of the cradle cover (5) with said cradle cover (5) now restrained from rotating about the hinge (17) to uncover the cavity (31) of the cradle (3). The extended arm (93) of the lever (9) is at the upper position and proximate to the inner limiter (72) of the flange (70) as shown in Fig. 6. The outer edge of the extended arm (93) is now positioned next to and facing the upright face (85) of the latch (8). Manipulation of the latch (8) to force unlocking of the lock assembly (4) by pushing downwards the extended bar (81) of said latch (8) is prevented by the reaction of the extended arm (93) of the lever (9) against the upright face (85) of said latch (8).

The foregoing description is considered as illustration of the principles of the invention. Furthermore, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

CLAIMS

1. A firearm-locking device (1) of modular construction for mounting to a stationary or a mobile rack with said firearm-locking device (1) comprises a cradle (3) with an opening (35) at the top to receive or to withdraw the firearm with said opening (35) leading to a cavity (31) to support a portion of said firearm and a separate lock assembly (4), attachable to said cradle (3), that comprises a latch (8) activated by a motorized latch activating mechanism (15) that further comprises a latch activating means (16), an electronic key system (13), a control module (12), a power source (11) connected to and power said motorized latch activating mechanism (15) and said control module (12) and a cradle cover (5) hinged at an outer edge of a lock casing (40) of said lock assembly (4) with said cradle cover (5) comprises a top plate (50) lockable in position over said opening (35) by said latch (8) for positive locking said firearm-locking device (1) to prevent firearm from being withdrawn wherein the firearm-locking device (1) is provided with;
 - a restraining means to prevent withdrawal of said firearm from said cradle (3) along the longitudinal direction;
 - a sensing means to confirm that said latch (8) has positively locked said firearm-locking device (1) as intended;
 - a restraining means to prevent force manipulation of the latch (8) to unlock said firearm-locking device (1) once it is being locked.
2. A firearm-locking device (1) as in claim 1 wherein the restraining means to prevent withdrawal of said firearm from said cradle (3) along the longitudinal direction is a barrier (34) at each end of the cradle (3).
3. A firearm-locking device (1) as in claim 1 wherein the sensing means to confirm that the latch (8) has positively locked said firearm-locking device (1) comprises a sensor (14) and linked circuitry with said sensor (14) suitably placed to detect and to monitor the position of said latch (8) to provide a positive signal to the user should said latch (8) not at its intended position when said firearm-locking device (1) is set to lock.

4. A firearm-locking device (1) as in claim 1 wherein the power source (11) is internally placed in the lock casing (40) and functions independently enabling said firearm-locking device (1) to be operated as a stand alone unit.
- 5 5. A firearm-locking device (1) as in claim 1 wherein the restraining means to prevent force manipulation of the latch (8) to unlock said firearm-locking device (1) once it is being properly locked is by having the outer edge of an extended arm (93) of a lever (9) of the latching activating means (16) reacting against at an upright face (85) of said latch (8) to prevent said latch (8) being pushed down.