Title: LOCKING DEVICE FOR A FIREARM

Abstract: A gun locking device includes a tube that fits within the bore of a firearm and extends from the muzzle to the chamber. A first subassembly on the tube moves between a locked position, in which radial balls extend from the tube to obstruct removal of the tube from the barrel, and an unlocked position in which the tube may be removed. A second subassembly coupled to the first subassembly enables a user to move the position of the first subassembly. Operation of an actuator knob on the second subassembly causes a compression rod within the tube to rotate a threaded riser at the first subassembly to drive the radially moveable balls. The actuator knob can be locked with the tube secured in the barrel. Optionally, barrel locator cap prevents rotation of the actuator knob unless the muzzle of the barrel bears against the second subassembly.
LOCKING DEVICE FOR A FIREARM

Field of the Invention

The present invention relates generally to locking devices for firearms. More specifically, the present invention is a locking device for handguns, rifles, shotguns, and other firearms that prevents unauthorized use without significantly impeding authorized use.

Background of the Invention

Some existing handgun locking devices take the form of a "barrel lock." A hollow tube extends coaxially down the bore of the barrel, from a proximal end of the tube at the muzzle to a distal end of the tube at the chamber. A chamber-engaging arrangement at the distal end cooperates with a combination, key, or electronic lock arrangement at the proximal end to prevent unauthorized withdrawal. Once in place, the barrel blocking tube effectively renders the handgun inoperative until removed. The problem is that the right combination of barrel lock attributes to satisfy gun owners remains elusive.

First consider existing chamber-engaging arrangements at the distal end.

One existing design requires a separate, dummy cartridge be inserted in the chamber. A spring-biased cam forces locking balls to protrude radially outward through recesses in the distal end of the tube so that the locking balls engage recesses in the dummy cartridge. One problem with doing it that way is that an extra component is required (i.e., the dummy cartridge). Of course, the locking balls can bear directly against the chamber in smaller caliber handguns without using the dummy cartridge, but doing so can mar the chamber wall if ever the barrel lock is rotated within the barrel (e.g., a forced unauthorized removal attempt). The locking balls tend to
scrape across the chamber wall without rotating. In addition, a spring is required to force the cam against the locking balls, and springs eventually fail. Furthermore, accommodating the tolerance variations of various gun manufacturers can be more costly with this design. Thus, a better chamber-engaging arrangement is needed at the distal end.

Existing combination, key, or electronic lock arrangements at the proximal end also have certain drawbacks. Existing combination locks in use on barrel locks require the user to view the combination disks. That means the user may have to turn on a light to unlock the handgun. Key locks can be even more difficult. The key may have to be located and used at a very critical time. Electronic locks depend on battery power, and the battery may fail at a critical time. All these things can impede quick access by an authorized user, and so a better lock arrangement is needed at the proximal end.

In my prior U.S. Patent No. 6,560,910, incorporated herein by reference, a gun locking device was disclosed in which a rod coupled a locking assembly with an actuator subassembly using a rod and compression balls such that axial movement of the rod caused compression balls to raise locking balls through an aperture to secure the locking device in the gun barrel. However, in this device, the locking balls are held in place only by the rod bearing upon the compression balls. If the rod is removed from the tube, such as by cutting through the tube and sliding the rod out, the compression balls, and consequently the locking balls, are no longer held in the secured position and the locking device can be removed from the firearm.

Additionally, the locking device in my prior U.S. Patent No. 6,560,910 could be inserted into a firearm for which the barrel is the incorrect length. At a minimum, this could result in damage to the firearm. However, of greater concern, a user could insert the locking device into a firearm with a live cartridge in the chamber.
Summary of the Invention

The present invention is a locking device for a firearm having a barrel. The locking device includes a hollow tube adapted to fit coaxially within the bore of the barrel and extend from the muzzle to the chamber. A first or expandable subassembly on the distal end portion of the tube is adapted to be moved under user control between a first configuration that fits within the bore so that the first subassembly does not obstruct removal of the tube from the bore, and a second configuration that fits within the chamber but does not fit within the bore (i.e., it extends too far radially outward to fit) so that the first subassembly obstructs removal of the tube from the bore.

A second or actuator subassembly on the proximal end of the tube enables a user to selectively move the expandable subassembly between the first and second configurations while the tube is within the bore. The actuator subassembly includes an actuator knob adapted to be manually moved between a first position corresponding to the first subassembly being in the first configuration, and a second position corresponding to the first subassembly being in the second configuration. The actuator subassembly also includes means for selectively locking the actuator knob in the second position. A rod disposed coaxially within the tube couples rotational movement from the actuator subassembly to the expandable subassembly when the knob is rotated.

According to the present invention, the distal end portion of the tube defines a plurality of apertures disposed around the distal end portion. The expandable subassembly also includes a corresponding plurality of radially moveable balls disposed within the distal end portion of the tube. The expandable subassembly is adapted to hold each of the radially moveable balls in alignment with an associated
one of the apertures so that the radially moveable balls can be driven to protrude from the apertures.

The expandable subassembly also includes a riser with a graduated guide within the distal end portion of the tube. The radially moveable balls are positioned in contact with the graduated guide of the riser. As the graduated guide of the riser moves axially within the tube, the radially moveable balls can be driven radially outward or inward through the apertures. Optionally, the riser is threaded and engages threads inside the tube.

The actuator subassembly is so adapted that moving the actuator knob from the first position to the second position with the tube in the bore causes the rod to rotate. As the rod rotates, the rotational movement of the rod is translated to axial movement of the riser. The graduated guide of the riser bears against and moves the radially moveable balls to protrude through the apertures to obstruct removal of the tube from the bore. The actuator subassembly is also so adapted that moving the actuator knob from the second position to the first position causes the rod to rotate in the opposite direction. This rotation is translated to axial movement of the riser so that the radially moveable balls are free to move radially inward sufficiently to not obstruct removal of the tube from the bore.

In an optional embodiment, the means for locking the actuator knob facilitates fast operation in total darkness. The actuator knob is mounted on a lock body that is connected to the proximal end of the tube. A locking bar on the lock body moves under user control between an unlocked position of the locking bar in which the locking bar does not obstruct rotation of the actuator knob and a locked position of the locking bar in which the locking bar does obstruct rotation of the actuator knob.
A plurality of disks on the lock body are adapted to be manually rotated only a partial turn. Each of the disks defines a slot such that the slots of all the disks must be aligned by rotating the disks to a predetermined combination of disk positions in order for the locking bar to be moved between the unlocked and locked positions. A detent arrangement on the lock body partially restrains the disks at each disk position.

Each disk includes a tab portion that protrudes radially outward from the rest of the disk as an indication of disk position and as a structure for a user to bear against in order to rotate the disk between disk positions. Each disk includes an outer periphery portion that defines a fixed number of recesses corresponding to an equivalent number of disk positions. The detent arrangement is adapted to cooperate with the recesses in the outer periphery portion of each disk in order to partially restrain the disks at each disk position while providing tactile feedback to the user of movement between disk positions in order to facilitate operation in darkness.

In another optional embodiment, the present invention includes a barrel locator. The barrel locator permits movement of said actuator when said muzzle bears against the barrel locator, but prevents movement of said actuator when said muzzle is not pressing against the barrel locator.

**Brief Description of the Drawings**

FIG. 1 of the drawings is an isometric view of a gun lock in position to be inserted into the bore of a handgun barrel according to an embodiment of the present invention;

FIG. 2 is a side assembly view of a rod and riser according to an embodiment of the present invention;
FIG. 3 is a enlarged sectional view of a rod, riser, and locking balls shown in an unlocked configuration disposed in a firearm according to an embodiment of the present invention;

FIG. 4 is an enlarged cross sectional view of the gun lock shown in a locked configuration according to an embodiment of the present invention;

FIG. 5 is a cross sectional view of one of the combination disks of the gun lock, taken on line 5—5 of FIG. 4 with the gun lock in a locked configuration according to an embodiment of the present invention;

FIG. 6 is an enlarged cross sectional view of the locking balls in the ball plug component, taken on line 6—6 of FIG. 4 with the gun lock in a locked configuration according to an embodiment of the present invention;

FIG. 7 is an enlarged cross sectional view of the gun lock shown in an unlocked configuration according to an embodiment of the present invention;

FIG. 8 is a cross sectional view of one of the combination disks of the gun lock, taken on line 8—8 of FIG. 7 with the gun lock in an unlocked configuration according to an embodiment of the present invention;

FIG. 9 is an enlarged cross sectional view of the locking balls in the ball plug component, taken on line 9—9 of FIG. 7 with the gun lock in an unlocked configuration according to an embodiment of the present invention;

FIG. 10 is an enlarged, disassembled view of four combination disks and an associated detent arrangement according to an embodiment of the present invention; and

FIG. 11 is an enlarged side view of a locking bar according to an embodiment of the present invention.
Reference is now made to the figures wherein like parts are referred to by like numerals throughout. FIGS. 1–11 of the drawings show various aspects of a gun lock 10 constructed according to an embodiment of the present invention. Although the illustrated gun lock 10 is described with reference to a .45 caliber, clip fed, semi-automatic handgun 11 shown in FIG. 1, the inventive concepts disclosed and claimed are not so restricted. A gun lock constructed according to the invention can be configured for use with any of various firearms, including semi-automatic handguns, revolvers, and rifles, so long as the firearm has a barrel with a bore and a muzzle, and a chamber wall that defines a chamber. A muzzle 12 of the handgun 11 is designated in FIG. 1, while a barrel 13 and its bore 14 are designated in FIGS. 4 and 7, along with a chamber wall 15 that defines a chamber 16. Those are all well known parts of a handgun.

For the illustrated .45 caliber handgun 11, the bore 14 has a first diameter measuring about 0.443 inches and the chamber 16 has a second diameter measuring about 0.477 inches. Of course, those diameters will be different for different caliber handguns and other firearms. They also may vary for different handguns and other firearms of the same caliber depending on the manufacturer. But the difference in diameter of the bore and the chamber enables the gun lock 10 to lock in place by enlarging radially.

Generally, the gun lock 10 includes a hollow tube 17 having a proximal end portion 18, a distal end portion 19, (FIGS. 1, 2, 4, and 7) and a length sufficient to extend within the bore 14 from the muzzle 12 to within the chamber 16 as illustrated in FIG. 3. The tube 17 is composed of a rigid material (e.g., steel). It is adapted to fit coaxially within the bore 14 in the sense that its outside diameter is less than the diameter of the bore 14 so that the tube 17 can be inserted into the bore 14 from the muzzle 12, as depicted in FIG. 1, with the tube 17 and the bore 14 coaxially
disposed about an axis 20 (FIG. 1). As a further idea of size, the illustrated tube 17 measures about 0.435 inches in diameter and about 5.5 inches in length in order to work with the illustrated .45 caliber handgun 11.

A first subassembly within the distal end portion 19 of the tube 17 (an expandable subassembly 21 designated in FIGS. 4 and 7) expands radially in response to user operation of a second subassembly connected to the proximal end portion 18 (an actuator subassembly 22 designated in FIGS. 1, 4, and 7) to selectively obstruct removal of the tube 17. The user unlocks and then rotates a knurled actuator knob 23 (FIGS. 1, 4, and 7) a partially turn from a first or unlock position of the actuator knob 23 shown in FIG. 7 to a second or locked position shown in FIG. 4, thereby causing the expandable subassembly 21 to expand or enlarge radially. To unlock the actuator knob 23, the user moves a plurality of combination disks 24, 25, 26, and 27 (FIGS. 1, 4, and 7) to a predetermined combination of disk positions as explained later on in this description.

The expandable subassembly 21 (FIGS. 3, 4, and 7) is located at the distal end portion 19 of the tube 17. The distal end portion 19 also includes at least one tube aperture. In the optional embodiment of the figures, a plurality of tube apertures are provided 34A–34D. Optionally, the tube apertures 34A–34D are arranged at equal intervals in a ring formation around the circumference of the distal end portion 19 (e.g., 0.150-inch diameter apertures for the .45 caliber handgun 11). Only the tube apertures 34A, 34B, and 34C are visible in FIG. 2, but the fourth tube aperture 34D is diametrically opposite the tube aperture 34B and it is designated in FIGS. 6 and 9.

So configured, the tube 17 is adapted to hold a quantity of locking balls 36–39 to correspond to the quantity of tube apertures 34A–34D. That is, at least one locking ball is provided since the tube 17 will include at least one tube aperture. In
the optional embodiment shown, the locking balls 36–39 measure about 0.155 inches in diameter for the .45 caliber handgun 11 (FIGS. 4, 6, 7, and 9). The term “locking ball” is chosen simply to reflect the fact that the locking balls 36–39 serve to move radially outward and protrude through corresponding tube apertures 34A–34D for locking purposes.

A riser 28 is disposed coaxially in the distal end 19 of the tube 17. The locking balls are disposed proximate the riser 28 and are aligned with a corresponding one of the four tube apertures 34A–34D. In the optional embodiment of the figures, the locking balls 36, 37, 38, and 39 are disposed in a ring around a teat 101 on the riser 28 so that each of the locking balls 36, 37, 38, and 39 is aligned with a corresponding one of the ball plug apertures 30–33 and a corresponding one of the tube apertures 34A–34D. The riser 28 includes a graduated guide 102 that, in the optional embodiment of the figures, is adjacent the locking balls 36–39.

As can be appreciated, when the riser 28 moves axially in the tube 17, the graduated guide 102 drives the locking balls 36–39 to protrude through the tube apertures 34A–34D toward the chamber wall 15. While the axial movement of the riser 28 in the tube 17 could be accomplished in any manner, optionally, the riser 28 is threaded and disposed in mating threads inside the tube 17. In such an embodiment, the riser 28 is coupled to a rod 42, such that rotational movement of the rod 42 is translated by the threaded surfaces to axial movement of the riser 28. As the riser 28 moves axially, the locking balls 36–39 are forced radially outward a small amount from a first or unlocked configuration illustrated in FIG. 9 to a second or locked configuration illustrated in FIG. 7. That is, the rod 42 serves as a means for coupling axial movement from the actuator subassembly 22 to the expandable subassembly 21 when the actuator knob 23 is moved to the second position.
In the unlocked configuration, the locking balls are disposed radially inward enough to fit within the bore 14 so that they do not obstruct removal of the tube 17 from the bore 14. In the locked configuration, each of the locking balls 36–39 protrudes through a corresponding one of the tube apertures 34A–34D sufficiently to obstruct removal of the tube 17 from the bore 14.

Optionally, the locking balls 36–39 are all spherical, hard, and smooth. Thus, they have what might call for the purposes of this description as a point contact with each other, with the chamber wall 15, with the rod 42, and with the riser 28. Such point contact coupled with the ball arrangement minimizes frictional influence of one component over the other and leaves the balls free to rotate. Instead of marring the chamber wall 15, the locking balls rotate if someone rotates the gun lock 10 within the bore 14 of the barrel 13.

As described in greater detail below and shown in FIGS. 1–11, the rod 42 couples movement between the first subassembly 21 and the second subassembly 22. In the optional embodiment of the figures, the rod 42 is free to rotate relative to the actuator subassembly 22. In fact, in the optional embodiment of the figures, the rod 42 is driven by the actuator subassembly 22 to rotate. This could be accomplished in many different ways, but in an optional embodiment, the rod 42 is coupled to the actuator knob 23 so that rotation of the actuator knob 23 causes rotation of the rod 42. The rod 42 is also coupled to the riser 28. In the optional embodiment of the figures, the rod 42 is removably, that is non-permanently, coupled to the riser 28. Again, this could take many different forms, but in an optional embodiment, the rod 42 includes a male member that removably mates with a female receiver on the riser 28. For example, the male member could be a substantially flat end 103 and the female receiver may be a slot 104. By rotating the rod 42, the rotation is transmitted through the male member to the female receiver to
thereby cause the riser 28 to rotate. In the optional embodiment of the figures, the riser 28 is threadably received into the tube 17 and, thus, the rotation of the riser 28 in the threads of the tube 17 is translated to axial movement of the riser 28 in the tube 17.

When the gun lock 10 is transferred to the first or unlocked configuration shown in FIG. 7, the riser 28 moves axially so that the graduated guide 102 allows the locking balls 36–39 to move radially inward to rest upon the teat 101 in an unlocked configuration in which the expandable subassembly 21 again fits within the bore 14 and does not obstruct removal of the tube 17 from the bore 14. Stated another way, the expandable subassembly 21 on the distal end portion 19 of the tube 17 is adapted to be moved under user control between a first configuration of the expandable subassembly 21 that fits within the bore 14 so that the expandable subassembly 21 does not obstruct removal of the tube 17 from the bore 14, and a second configuration of the expandable subassembly 21 that fits within the chamber 16 but does not fit within the bore 14 so that the expandable subassembly 21 does obstruct removal of the tube 17 from the bore 14.

Turning now to the actuator subassembly 22 shown FIGS. 4 and 7, it is connected to the proximal end 18 of the tube 17 where it enables a user to selectively move the expandable subassembly 21 between the first and second configurations while the tube 17 is within the bore 14. For that purpose, the actuator subassembly 22 includes a lock body 44 having a first end portion 44A and a second end portion 44B (FIGS. 4 and 7). The lock body 44 may take any of various shapes within the inventive concepts disclosed, including the illustrated 1.375-inch diameter by 1.75-inch long cylindrically shaped steel body. The first end portion 44A of the lock body 44 is connected to the proximal end portion 18 of the tube 17 by a metal end cap 45 that is secured to the first end portion 44A.
Motion of the actuator subassembly 22 may be transmitted in many different ways. For example, in the optional embodiment of the figures, the actuator knob 23 is mounted rotatably on the lock body 44 and is coupled to the rod 42, such that rotation of the actuator knob 23 causes the rod 42 to rotate. Thus, rotating the actuator knob 23 a partial turn from the first position illustrated in FIG. 7 to the second position illustrated in FIG. 4 causes the rod 42 to rotate and, in turn, rotate the riser 28. In other words, rotation of the actuator knob 23 is translated to rotation of the riser 28 through the rod 42. The rotation of the riser 28, as described above, is translated to axial motion of the riser 28 by threads on the outer surface of the riser 28 engaged to threads on the inner surface of the tube 17. The axial movement of the riser 28 causes the locking balls 36, 37, 38, and 39 bearing on the graduated guide 102 of the riser 28 to move radially outward to engage the chamber 16 in the handgun 11. In this manner, the actuator knob 23 is adapted to be rotated manually a partial turn between a first position of the actuator knob 23 corresponding to the expandable subassembly 21 being in the first or unlocked configuration and a second position of the actuator knob 23 corresponding to the expandable subassembly 21 being in the second or locked configuration.

The actuator subassembly 22 also includes means for locking the actuator knob 23 in the second position, i.e. with the expandable subassembly 21 in the locked configuration, in order to lock the tube 17 in the bore 14 of the handgun 11. That is accomplished with a combination lock built into the lock body 44. The combination lock includes a plurality of disks 24, 25, 26, and 27 that work in cooperation with a locking bar 49 (FIGS. 4, 5, 7 and 8). Each of the disks is rotatable, optionally a partial turn, between a plurality of disk positions. In the optional embodiment shown, each disk is rotatable to six disk positions, although any number of disk positions could be provided. When the disks 24, 25, 26, and 27
are set in the predetermined combination of disk positions for the plurality of disks, in this case four disks, the locking bar 49 is free to move axially between the first or unlocked locking bar position shown in FIG. 7 and the second or locked locking bar position shown in FIG. 4.

In the second or locked locking bar position shown in FIG. 4, a locking bar tab 49A on the locking bar 49 engages the actuator knob 23 so that the actuator knob 23 can not be rotated. With the disks 24, 25, 26, and 27 in the predetermined combination of disk positions, the user bears against the locking bar tab 49A to move the locking bar 49 to that position. Then, the user rotates the disks 24, 25, 26, and 27 out of the predetermined combination of disk positions. Doing so locks the locking bar 49 in the second position and that locks the actuator knob 23 from being rotated.

Moving the disks 24, 25, 26, and 27 back to the predetermined combination of disk positions frees the locking bar 49 so that a small spring 50 (FIG. 7) can automatically move the locking bar to the first or unlocked locking bar position shown in FIG. 7. Moving the disks 24, 25, 26, and 27 out of the predetermined combination of disk positions then locks the locking bar 49 in the first or unlocked locking bar position.

Operation of each of the disks 24, 25, 26, and 27 is similar and so operation of only the disk 26 is illustrated in FIGS. 5 and 8. The disk 26 defines a locking bar slot 26A and it includes a tab portion 26B. The tab portion 26B protrudes radially outward from the rest of the disk where it helps indicate disk position. It also serves as a structure for a user to bear against in order to rotate the disk 26 between disk positions. By bearing against the tab 26B, the user can rotate the disk 26 to any of six different disk positions in order to selectively align the locking bar slot 26A with the locking bar 49. With the disk 26 in the fifth disk position shown in FIG. 5, the
locking bar slot 26A is not aligned with the locking bar 49 and so the disk obstructs axial movement of the locking bar 49. With the disk 26 in the second disk position shown in FIG. 8, the locking bar slot 26A is aligned with the locking bar 49 and so the disk 26 does not obstruct axial movement of the locking bar 49.

The disk 26 has an outer periphery portion 26C (FIGS. 5, 8, and 10) that defines six recesses 51–56 (FIG. 10) corresponding to an equivalent number of six disk positions. In an optional embodiment, adjacent ones of the recesses 51–56 are spaced apart center-to-center by about 16–17 degrees of arc. A detent arrangement 57 (FIGS. 5, 8, and 10) cooperates with the recesses 51–56 to partially restrain the disks 24, 25, 26, and 27 at each disk position while providing tactile feedback to the user of movement between disk positions in order to facilitate operation in darkness (i.e., facilitate user movement of the disks to desired disk positions without the user having to visually determine disk position). The disks 24, 25, and 27 are similar to the disk 26 except that the location of the locking bar slots 24A, 25A, and 27A are different in order to set a predetermined combination of different disk positions that must be used to unlock the combination lock. The term “tactile feedback” is chosen to reflect the fact that the user can feel operation of the detent arrangement 57 as it passes the recesses 51–56.

In an optional embodiment of the detent arrangement 57, a datum bar 59 holds a detent ball 58 to the disks 24, 25, 26, 27 with the assistance of a spring 60 (FIGS. 5 and 8). The spring 60 is optionally a coil spring that bears against the detent ball 58 to spring bias the detent ball 58 toward the disk 26. As a disk is rotated, the detent ball 58 “clicks” into recesses in the disk. Consequently, the user can feel the recesses pass by the detent balls. By counting the number of recesses that pass a detent ball, the user can move each disk to a desired disk position by feel, without viewing the disk.
The datum bar 59 and a shoulder portion 44C of the lock body 44 (FIGS. 5 and 8) restrict rotational movement of the disk 26 to a partial turn (in this optional embodiment, about 100 degrees of arc) between a first stop position where the tab 26B abuts the datum bar 59 and a second stop position where it abuts the shoulder portion 44C. To move the disk 26 to a desired disk position without viewing the disk 26, the user moves the disk 26 until it abuts the datum bar 59 (i.e., the first stop position) or until it abuts the shoulder portion 44 (i.e., the second stop position). From that stop position as a starting position, the user counts the number of recesses that pass the detent ball 58 until the disk 26 is moved to the desired disk position. When the detent ball 58 passes into one of the recesses 51–56, it provides tactile feedback in the form of a user discernible vibration or "click." The user can use the clicks to determine disk position. Rotational movement of the disks 24, 25, and 27 could be restricted in a similar way, so the user could rotate them to a desired disk position in a similar manner.

Typically, the user sets the position of disk 26 by first moving the disk 26 to the first stop position where it abuts the datum bar 59. Then the user rotates the disk 26 while noticing and counting each click as the detent ball 58 passes the recesses 51–56. The first click occurs as the detent ball 58 moves into the first recess 51. The second click occurs as the detent ball 58 moves into the second recess 52. The third click occurs as the detent ball 58 moves into the third recess 53. The fourth, fifth, and sixth clicks occur as the detent ball 58 moves progressively into the fourth, fifth, and sixth recesses 54, 55, and 56. After counting a desired number of clicks, the user stops rotating the disk 26 so that it remains at a desired disk position. This procedure is performed for each of the disks 24, 25, 26, and 27 in order to set the disks in the predetermined combination of disk positions.
Concerning the locking bar 49, it includes a protruding portion 61 shown in FIG. 11 that contacts the spring 50 shown in FIG. 7. When one or more of the disks 24, 25, 26, and 27 are not in the predetermined combination of disk positions, those one or more disks obstruct movement of the locking bar 49 by contacting corresponding ones of upstanding fingers 62–66 (FIG. 11). When the disks 24, 25, 26, and 27 are moved to the predetermined combination of disk positions so that they do not obstruct movement of the locking bar 49, the locking bar 49 may be moved distally so that it no longer engages the actuator knob 23. Optionally, a spring 50 is provided to automatically move the locking bar 49 out of engagement with the actuator knob 23.

In a further optional embodiment, a barrel locator may be provided. In an optional embodiment, the barrel locator may be used to measure the length of the barrel 13 so that the gun lock 10 is not engaged in the locked configuration in the incorrect position or in the incorrect firearm. In an optional embodiment, the barrel locator includes a barrel locator cap 39 proximate the actuator subassembly 22 that enables the actuator knob 23 to be moved only when the muzzle 12 bears against the barrel locator cap 39. In a further optional embodiment, the barrel locator cap 39 may cooperate with a chamber locator (not shown) proximate the expandable subassembly 21 so that the actuator knob 23 can be moved only when the gun lock 10 is properly located with respect to the muzzle 12 and the chamber 16.

While certain embodiments of the present invention have been shown and described it is to be understood that the present invention is subject to many modifications and changes without departing from the spirit and scope of the claims presented herein.
CLAIM:

1. A locking device for a firearm having a barrel with associated bore having a first diameter extending along the barrel length from a muzzle to a chamber having a second diameter greater than the first diameter, the locking device comprising:
   a tube with a diameter less than said first diameter, the tube having a proximal end portion, a distal end portion, and a length greater than or equal to said barrel length, the distal end portion of the tube having at least one aperture;
   a first subassembly on the distal end portion of the tube selectively moveable between a first configuration in which the first subassembly has a diameter less than said first diameter, and a second configuration in which the first subassembly has a diameter greater than said first diameter and less than or equal to said second diameter, the first subassembly comprising:
      at least one radially moveable ball, the radially moveable balls disposed within the distal end portion of the tube, each radially moveable ball in alignment with an associated aperture; and
      an axially movable riser in the distal end portion of the tube, the riser including a graduated guide with said ball located adjacent said riser, said graduated guide positioned with respect to said radially moveable ball to drive the radially moveable ball radially outward when the riser is moved axially in said tube; and
   a second subassembly connected to the proximal end of the tube, the second subassembly coupled to said first subassembly to transmit motion from the second subassembly to the first subassembly, the second subassembly comprising:
      an actuator selectively moveable between a first position corresponding to the first subassembly being in the first configuration in which the actuator causes the riser to move axially in said tube to permit the
radially moveable balls to move radially inward to reduce the first
subassembly diameter to less than said first diameter, and a second position

5 corresponding to the first subassembly being in the second configuration in
which the actuator causes the riser to move axially in said tube to drive the
radially moveable ball to protrude through said aperture to extend the first
subassembly diameter to greater than said first diameter; and

a lock to secure the actuator in said second position.

2. The locking device of claim 1, further comprising a rod disposed coaxially
within the tube, one end of said rod coupled to said actuator and the other end of said
rod coupled to said riser to couple rotational movement from the second
subassembly to the first subassembly when the actuator is rotated to the second
position, wherein said riser is threaded and said threaded riser engages threads inside
said tube such that the rotational movement of said rod coupled to said riser causes
axial movement of said riser in said tube.

3. The locking device of claim 2, wherein said rod is removably coupled to said
riser such that said rod may be removed from said tube without axial movement of
said riser.

4. The locking device of claim 1, wherein the lock comprises:

a lock body on which the actuator knob is mounted, said lock body
connected to the proximal end of the tube, said lock body including a detent
arrangement thereon;

a locking bar on the lock body that is adapted to be moved by a user between
an unlocked position of the locking bar in which the locking bar does not obstruct
rotation of the actuator knob on the second subassembly and a locked position of the locking bar in which the locking bar does obstruct rotation of the actuator knob; and a plurality of manually rotatable disks on the lock body, each of the disks defining a slot such that the slots of all the disks must be aligned by rotating the disks to a predetermined combination of disk positions for the locking bar to be moved between the unlocked and locked positions, each disk including an outer periphery portion that having a fixed number of recesses corresponding to an equivalent number of disk positions, said recesses cooperating with said detent arrangement to partially restrain the disks at each disk position and provide tactile feedback to the user of the movement between disk positions to facilitate operation in darkness.

5. The locking device of claim 1 further comprising a barrel locator at said second subassembly, said barrel locator releasing said actuator for movement when said muzzle is pressed against said barrel locator, and prevents said actuator from movement when said muzzle is not pressed against said barrel locator.