

[54] **LOCKING DEVICE FOR NARROW OPENINGS**

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[51] Int. Cl. .. **F41c 27/00, E05b 65/00, B65d 55/14**

[58] Field of Search..... **42/1 N; 70/57; 215/98**

[56] **References Cited**

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[57]

ABSTRACT

A locking device for narrow openings in which an expandable member is disposed about the shaft of a combination lock mechanism. The combination lock mechanism includes an inner cylinder carrying the shaft and an outer cylinder into which the inner cylinder is threaded. Rotation of the shaft and inner cylinder will cause the inner cylinder to be threaded into the outer cylinder and thus drawn inwardly into the combination lock. This will result in axial compression of the expandable member which, in turn, results in circumferential expansion thereof, so that the expandable member will be urged into pressure engagement with the interior of the narrow opening. The lock mechanism is further adapted to prevent rotation of the shaft and inner cylinder, unless the combination lock is opened, to prevent unauthorized use of the locking device.

8 Claims, 9 Drawing Figures

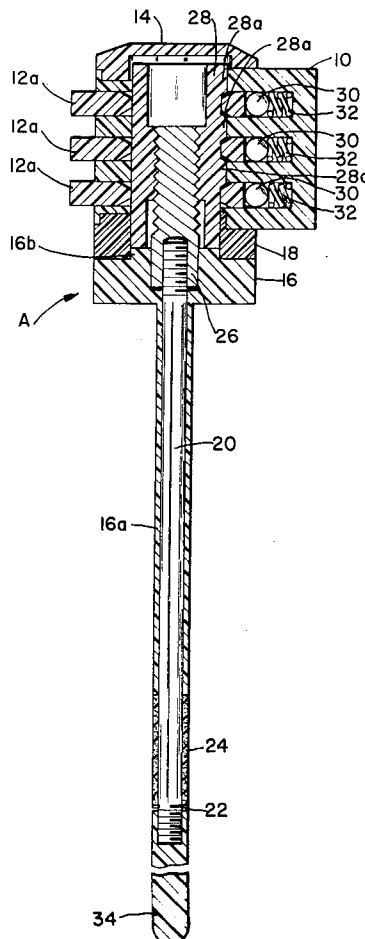


FIG_1

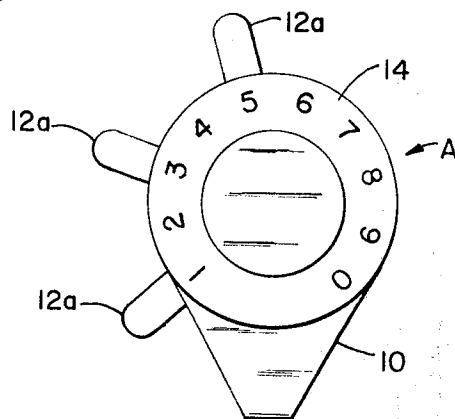
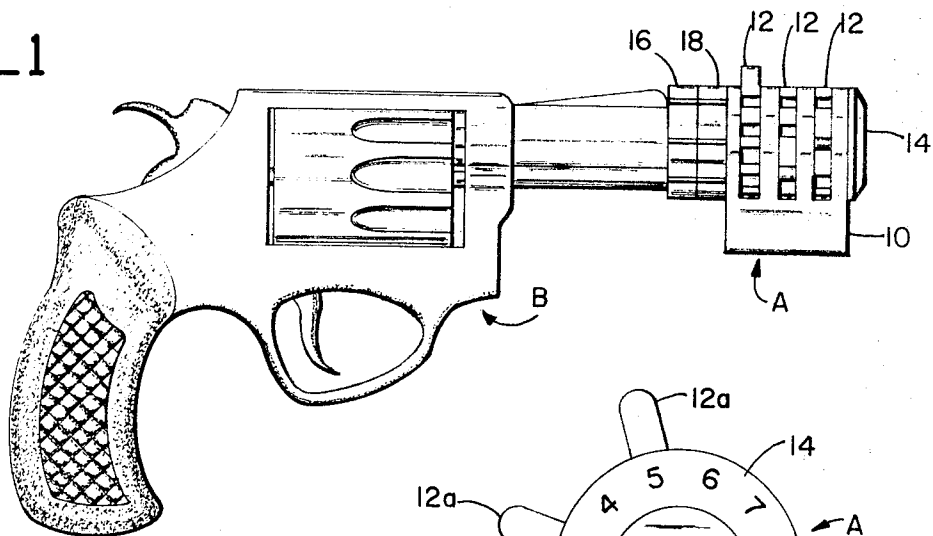


FIG_2

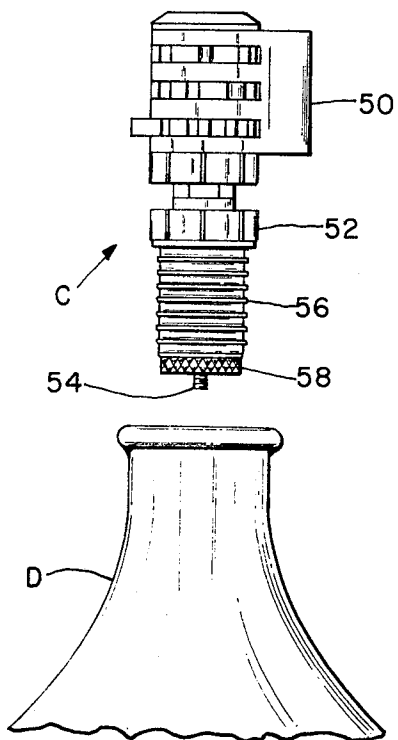


FIG_9

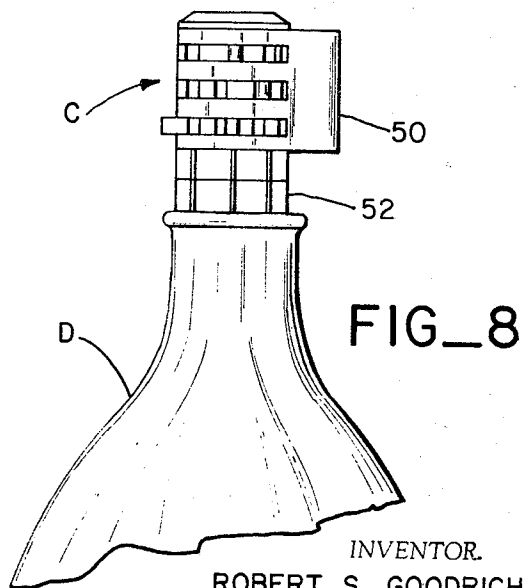


FIG_8

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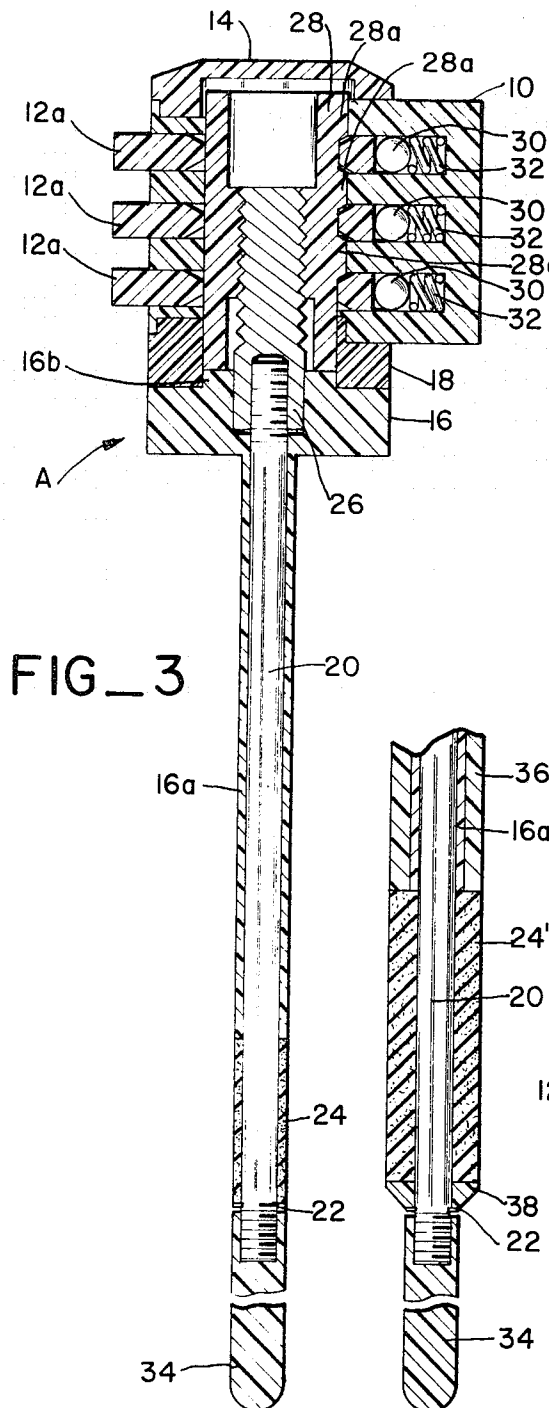


FIG_3

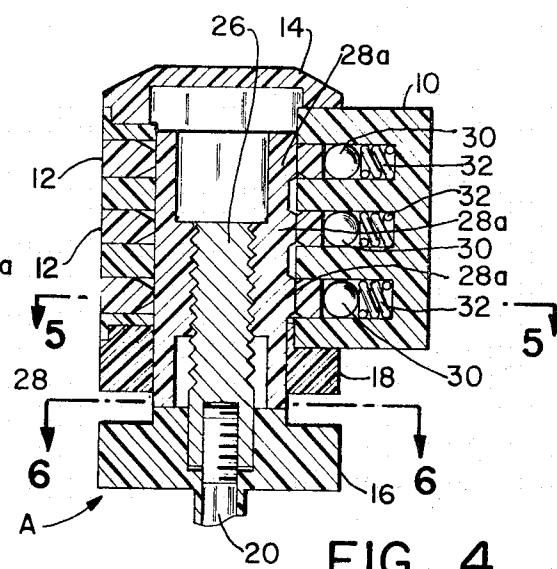


FIG_4

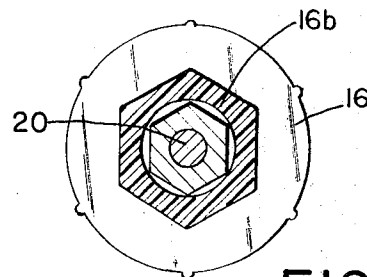


FIG_6

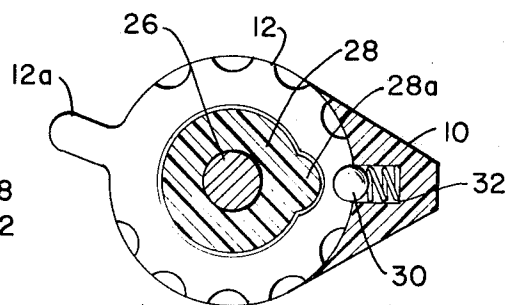


FIG_5

FIG_7

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LOCKING DEVICE FOR NARROW OPENINGS

This invention relates to locking devices for narrow openings, and more particularly, to a locking device which may be readily embodied in a firearm barrel combination lock or a combination locking bottle stopper.

Expandable members for plugging narrow or restricted openings are well known in the art. Such devices typically employ an expandable, resilient member and suitable means for expanding the member in the opening or orifice to be plugged. Heretofore, such expandable plugs generally have incorporated no positive locking feature to prevent unauthorized removal of the plug. U.S. Pat. Nos. 2,046,224 and 2,095,272 do disclose expandable bottle stoppers incorporating a key-type lock to prohibit unauthorized removal of the plug or stopper. However, such stoppers are disadvantageous in that the key may readily be lost or misplaced, thereby preventing authorized removal of the stopper.

According to the present invention, an expandable plug or stopper is provided with a combination locking mechanism to positively prevent unauthorized use or removal. Specifically, an expandable member is disposed about the shaft of a combination lock mechanism. The combination lock mechanism includes an inner cylinder carrying the shaft and an outer cylinder into which the inner cylinder is threaded. A collar is provided to permit rotation of the shaft and inner cylinder, which will cause the inner cylinder to be threaded into the outer cylinder and thus drawn inwardly into the combination lock. This will result in axial compression of the expandable member which, in turn, results in circumferential expansion thereof, so that the expandable member will be urged into pressure engagement with the interior of the narrow opening. The collar and the lock body include registration means which prevent relative rotation of the collar and body when the collar and body are abutting. When the combination lock is opened, the outer cylinder may be slid outwardly, thereby separating the collar and lock body. In this position, the collar and lock body may be relatively rotated. Thus, the inner cylinder and shaft may only be rotated when the combination lock is open, thereby preventing unauthorized use or removal of the locking device.

According to the present invention, the locking device may be suitably dimensioned to fit the barrel of a firearm, thereby providing a firearm barrel lock which prevents unauthorized use of the firearm. Alternatively, the locking device of the present invention may be suitably dimensioned to form a locking bottle stopper or other locking device for narrow openings.

Accordingly, it is an object of the present invention to provide an expandable member for narrow openings incorporating a combination lock to prevent unauthorized use or removal.

Another object of the present invention is to provide a locking device for narrow openings in which an expandable member is disposed about a shaft connected to a combination lock, so that the shaft may be drawn inwardly to axially compress the expandable member when the combination lock is open.

Still another object of the present invention is to provide an expandable plugging device for the barrel of firearms.

Yet another object of the present invention is to provide a novel combination lock mechanism adapted to prevent rotation of a shaft or other member.

The locking device for narrow openings according to the present invention is advantageous in that unauthorized use or removal is positively prevented. Moreover, by employing a combination lock rather than a key-type lock, there is no key to be lost, misplaced or forgotten, so that use of the device is considerably facilitated. In addition, the locking device for narrow openings according to the present invention is simple, reliable and relatively inexpensive.

These and other objects, features and advantages of the present invention will be more readily apparent from the following detailed description, wherein reference is made to the accompanying drawings, in which:

FIG. 1 is a side view depicting a firearm barrel lock according to the present invention in a firearm;

FIG. 2 is an end view of the apparatus depicted in FIG. 1;

FIG. 3 is a side cross-sectional view of the apparatus depicted in FIG. 1;

FIG. 4 is a side cross-sectional view similar to FIG. 3 showing the combination lock in the open position;

FIG. 5 is a sectional view taken along the line 5—5 in FIG. 4;

FIG. 6 is a sectional view taken along the line 6—6 in FIG. 4;

FIG. 7 is a side cross-sectional view of a portion of the apparatus depicted in FIG. 3 as adapted for use in a firearm of larger bore;

FIG. 8 is a side view of a bottle stopper according to the present invention inserted in a bottle; and

FIG. 9 is a side cross-sectional view of the apparatus depicted in FIG. 8 with the combination lock in the open position.

Referring now to FIGS. 1—7, a firearm barrel lock embodiment of the locking device for narrow openings according to the present invention will now be described in detail. Referring initially to FIG. 1, there is depicted a firearm barrel lock A according to the present invention carried in the barrel of a pistol B.

Firearm barrel lock A generally comprises a combination lock body 10 having three tumbler rings 12. Tumbler rings 12 include extending tabs 12a which protrude beyond the lock body 10 to permit manual manipulation of the tumbler rings 12. An end cap 14 is secured to the end of lock body 10. End cap 14 functions to conceal the interior of the combination lock mechanism, and additionally carries thereon numerals or other indicia which are employed to characterize the angular positions of extending tabs 12a, and thus facilitate alignment of the tumbler rings 12.

A collar 16 is disposed in front of the lock body 10. As will be more readily apparent hereinafter, collar 16 may be slid outwardly away from the lock body 10 when the tumbler rings 12 are appropriately set to open the lock. Collar 16 may then be rotated with respect to the lock body 10 to expand or contract the expandable member of the barrel lock. To facilitate the rotation of collar 16 with respect to lock body 10, a front grip 18, similar in appearance to collar 16, is fixedly mounted to the front of lock body 10.

Collar 16 includes a hexagonal protuberant portion 16b. Front grip 18 includes a complementary hexagonal recess. Thus, when collar 16 abuts front grip 18, hexagonal portion 16b engages the recess in front grip

18, to prevent relative rotation between collar 16 and front grip 18. Thus, when the lock is locked, rotation of collar 16 is prevented.

A shaft 20 extends longitudinally from lock body 10 and a resilient C-ring 22 engages shaft 20 toward the end thereof remote from lock body 10. An expandable member 24, typically a sleeve or resilient material such as rubber or the like, is disposed around shaft 20 adjacent C-ring 22. Collar 16 includes a sleeve portion 16a which circumscribes shaft 20 and abuts expandable member 24. It is thus apparent that when shaft 20 is drawn inwardly toward the interior of lock body 10, expandable member 24 will be axially compressed between C-ring 22 and sleeve 16a, thereby causing circumferential expansion of expandable member 24. It is this expansion that is employed to lock the firearm lock A in the barrel of the firearm.

The end of shaft 20 interior of lock body 10 is threadably mounted to a cylinder inner member 26. Cylinder inner member 26 comprises a hexagonal portion and a threaded portion. The hexagonal portion of inner cylinder 26 engages a hexagonal recess in collar 16 so that rotation of collar 16 will produce concurrent rotation of inner cylinder 26. The threaded portion of inner cylinder 26 is threadably engaged into an outer lock cylinder 28. Thus, rotation of collar 16 will cause inner cylinder 26 to be threaded into or out of outer cylinder 28, depending upon the direction of rotation. Thus, such rotation will draw shaft 20 inwardly or outwardly, to produce the desired longitudinal compression or expansion of expandable member 24.

As is particularly apparent from FIGS. 3, 4 and 5, outer cylinder 28 is generally cylindrical with a threaded central bore. However, the exterior of cylinder 28 includes three protuberances 28a. Protuberances 28a engage tumbler rings 12 to prevent axial movement of lock cylinder 28. Specifically, tumbler rings 12 have a generally circular central opening including a notch on the circular interior perimeter. When the notch is in registration with the protuberance 28a, the tumbler ring 12 will not engage the lock cylinder 28. Thus, when all of the tumbler rings are aligned so that the notches therein are in registration with the protuberances 28a, the lock cylinder 28 may move axially within the lock body 10. If, however, one of the tumbler rings is aligned so that the notch therein is not in registration with the protuberance 28a, axial movement of the lock cylinder 28 will be prevented by the engagement of protuberance 28a and lock cylinder 12.

Of course, the notch in tumbler ring 12 may be provided in various angular positions with respect to the extending tab 12a. In this manner, a particular numeral or other indicia means may be associated with each of the tumbler rings 12, so that when the extending tab 12a is aligned with the numeral or indicia, the notch will be in registration with the protuberance 28a. In this manner, each of the tumbler rings 12a will be associated with a particular numeral, so that the lock may be opened by aligning the extending tabs 12a with the appropriate numerals or indicia.

To further define the angular positions of the tumbler rings 12, the tumbler rings 12 may include a plurality of recesses about the perimeter thereof. The lock body 10 may contain three ratchet spheres 30, which are urged against the perimeters of the tumbler rings 12 by three springs 32. The notches in the perimeter of tumbler rings 12 will then, in cooperation with ratchet

spheres 30 and springs 32, provide a ratchet action for the rotation of tumbler rings 12. This ratchet action will tend to detent the tumbler rings in the various angular positions, thereby further defining each position associated with a numeral or other indicia, and prevent accidental movement of the tumbler rings.

The firearm barrel lock A according to the present invention may typically be constructed of opaque plastic or other suitable material. However, applicant has found it desirable to employ metal for shaft 20 and inner cylinder 26. Of course, for high security applications, all of the components of the locking device may be constructed of metal.

When employing the locking device according to the present invention in a firearm, applicant has found it desirable to block the shell chamber of the firearm, in addition to plugging the barrel thereof. Specifically, if the chamber were not blocked, it might still be possible to load and fire a shell, notwithstanding the fact that the barrel is plugged, and thereby risk dangerous explosion. Thus, according to the present invention, the end of shaft 22 may be threaded, and an extension shaft 34 may be threadably engaged thereon. Extension shaft 34 may then be cut to a desired length sufficient to extend into the shell chamber of the firearm, to thereby prevent the loading of a shell into the firearm. Thus, by providing extension shaft 34, the firearm barrel lock according to the present invention may be readily adapted for use in firearms of varying barrel length.

Of course, the firearm barrel lock thus described may only be employed in a firearm having a bore or caliber corresponding to the diameter of expandable member 24. However, according to a further aspect of the present invention, the firearm barrel lock may be readily adapted for use in firearms of varying bore or caliber. Referring specifically to FIG. 7, there is depicted a portion of the firearm barrel lock A, adapted for use with a firearm of somewhat larger bore or caliber. Specifically, the barrel lock A is modified by removing C-ring 22 and expandable member 24. A sleeve 36 having an outer diameter slightly smaller than the bore or caliber of the firearm and an inner diameter slightly greater than the diameter of sleeve portion 16a of collar 16, is provided about sleeve portion 16a. An expandable member 24' of appropriate diameter is then substituted for expandable member 24. A washer or disc 38 is next placed about shaft 20 abutting expandable member 24'. Preferably, washer 38 is bevelled or tapered as depicted in FIG. 7. C-ring 22 may then be reinserted, to complete the adaptation or modification of the firearm barrel lock A. It is apparent that the lock A as modified will function substantially identically as the firearm lock previously described. Of course, expandable member 24', being of a greater diameter than expandable member 24, will permit the firearm lock to be employed with a firearm having a greater diameter or caliber.

Accordingly, applicant has found it desirable to provide each firearm lock A with a plurality of sleeves 36, expandable members 24' and washers 38, to permit the firearm lock to be employed with firearms of any bore or caliber. The operator of the firearm lock A may then readily modify or adapt the lock for use with any desired firearm.

In operation, extending tabs 12a of tumbler rings 12 are suitably rotated to the position corresponding to the numeral or other indicia associated with the open

position of the lock, wherein the notch of each tumbler ring 12 is in registration with the protuberance 28a of lock cylinder 28. Of course, the lock 10 is opaque, so that such alignment cannot be accomplished visually, but is accomplished in accordance with the predetermined number or combination associated with the particular lock A.

Collar 16 is then drawn outwardly away from the lock body 10. The operator may then rotate collar 16 with respect to front grip 18, so as to permit axial expansion of expandable member 24. This, of course, will insure that the expandable member is sufficiently decompressed so as to permit insertion into the firearm.

After inserting the lock into the firearm, collar 16 is rotated with respect to front grip 18 so as to draw shaft 20 inwardly into lock body 10, and thus axially compress expandable member 24. Expandable member 24 will then circumferentially expand so as to grip the interior of the barrel of the firearm to prevent removal thereof. The operator then slides collar 16 inwardly toward the combination lock body 10, so as to achieve engagement of the hexagonal portion 16b with the hexagonal recess in front grip 18, and thereby prevent rotation of front grip 16. The tumblers 12a may then be turned to random positions, so as to prevent axial movement of lock cylinder 28. The firearm barrel lock A is thus locked in the firearm, to prevent unauthorized use thereof.

In order to remove the firearm lock A, the procedures thus described need merely to be reversed. Specifically, extending tabs 12a are aligned so as to once again open the combination lock. Front grip 16 is then drawn outwardly and rotated so as to decompress expandable member 24. The firearm lock A may then be removed from the barrel of the firearm.

Referring now to FIGS. 8 and 9, an embodiment of the present invention particularly adapted for plugging bottles and the like will now be described in detail. Specifically, there is shown a bottle stopper C according to the present invention carried in the neck of a bottle D. The bottle stopper C includes a combination lock body 50, substantially identical to the combination lock A of the embodiment previously described. Thus, combination lock 50 includes a collar 52 and a shaft 54. Similarly, rotation of collar 52 with respect to combination lock body 50 will cause shaft 54 to be drawn inwardly or outwardly of the lock body 50, depending upon the direction of rotation. Disposed about shaft 54 is an expandable member 56. Expandable member 56 has a diameter slightly smaller than the smallest opening to be plugged. The end of shaft 54 is threaded, and a knurled disc or nut 58 is threadably engaged thereon, abutting expandable member 56. Thus, rotation of collar 52 with respect to lock body 50 will cause axial compression of expandable member 56 between disc 58 and collar 52, accompanied, of course, by circumferential expansion thereof. Thus, the bottle stopper C functions substantially identical to the firearm lock A previously described.

However, applicant has found that the variation in the inner diameter of bottle necks may be substantial. Thus, knurled disc 58 may be employed to preadjust the compression of expandable member 56, and thus to preadjust the diameter or circumference thereof. Specifically, prior to inserting the stopper C at the bottle D, the operator rotates knurled disc 58 to compress expandable member 56 to the extent that the diameter

thereof becomes only slightly smaller than the inner diameter or bore of the bottle neck. Thereafter, the bottle stopper C is employed in a manner substantially identical to firearm lock A. Of course, if it is desired to employ the bottle stopper C in a different bottle D, knurled disc 58 may be rotated to permit compression or expansion of expandable member 56, as needed.

While particular embodiments of the present invention have been shown and described in detail, it is apparent that the combination lock thus described may be employed in numerous other applications where it is desired to prevent unauthorized rotation of a shaft or other member. Of course, these and other modifications and adaptations may be made without departing from the true spirit and scope of the present invention, as set forth in the claims.

What is claimed is:

1. A firearm barrel lock for a firearm having a barrel communicating with a shell chamber comprising a shaft, an expandable member dimensioned to be received in said barrel disposed about said shaft, a stop attached to one end of said shaft adjacent said expandable member and lock means disposed on the other end of said shaft, said lock means having locked and unlocked states, in said unlocked state said lock means being movable axially relative said shaft to permit axial compression and expansion of said expandable member and in said locked state said lock means being fixed relative said shaft.

2. Apparatus according to claim 1, wherein said lock means comprises a threaded member attached to said shaft, a mating member threadably engaging said threaded member and means for preventing relative rotation between said threaded member and said mating member in said locked state.

3. Apparatus according to claim 2 wherein said means for preventing relative rotation comprises a lock body slidably disposed about said mating member, tumbler means for engaging said mating member to prevent sliding thereof relative said lock body in said locked state, a collar rotatably engaging said threaded member disposed between said expandable member and said lock body and abutting said lock body in said locked state, said collar and said lock body including registration means to prevent relative rotation when said collar and said lock body are abutting.

4. Apparatus according to claim 3 wherein said mating member is substantially cylindrical and includes at least one protuberance, and wherein said tumbler means comprises at least one tumbler ring rotatably carried in said lock body having a substantially cylindrical opening disposed about said mating member, said opening including a notch dimensioned to clear said protuberance, said tumbler ring being aligned with said protuberance abutting said tumbler ring in said locked state and said tumbler ring being aligned with said notch and said protuberance in registration in said unlocked state.

5. Apparatus according to claim 4 comprising indicia means to characterize the rotational positions of said tumbler ring whereby a particular indicia will be associated with the registration of said notch and said protuberance.

6. Apparatus according to claim 1 comprising an extension shaft threadably mounted to said one end of said shaft, said extension shaft being of a length suitable

to extend through said barrel into the shell chamber of said firearm.

7. A firearm barrel lock comprising a shaft, an expandable member disposed about said shaft, a stop attached to one end of said shaft adjacent said expandable member, an inner lock cylinder attached to the other end of said shaft, an outer lock cylinder threadably engaging said inner lock cylinder, a lock body slidably disposed about said outer cylinder, a collar rotatably engaging said inner lock cylinder disposed between said expandable member and said lock body and abutting said lock body in said locked state, said collar and said lock body including registration means to prevent relative rotation thereof when said collar and said lock body are abutting and tumbler means having

locked and unlocked states, in said locked state said tumbler means engaging said outer cylinder to prevent axial movement thereof.

8. Apparatus according to claim 7 wherein said outer cylinder includes at least one protuberance and said tumbler means comprises at least one tumbler ring carried in said lock body, said tumbler ring having a substantially cylindrical opening disposed about said outer lock cylinder, said opening including a notch dimensioned to clear said protuberance, said protuberance abutting said tumbler ring in said locked and said tumbler ring aligned with said notch and said protuberance in registration in said unlocked state.

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