

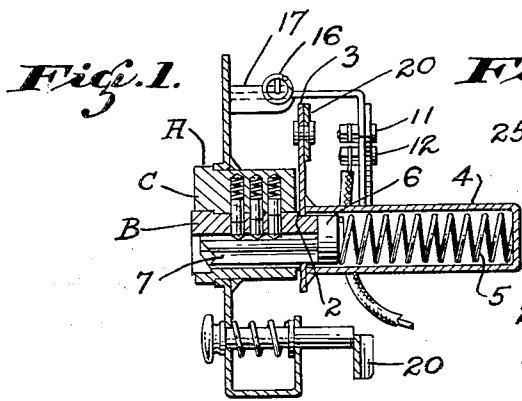
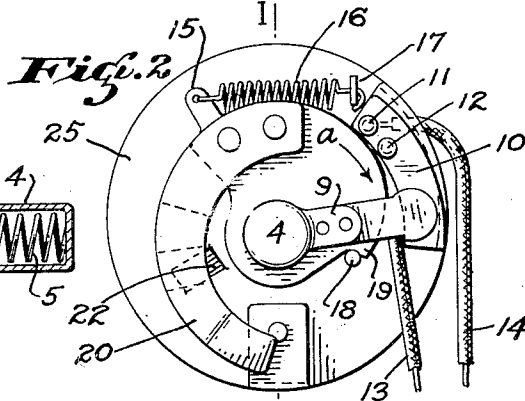
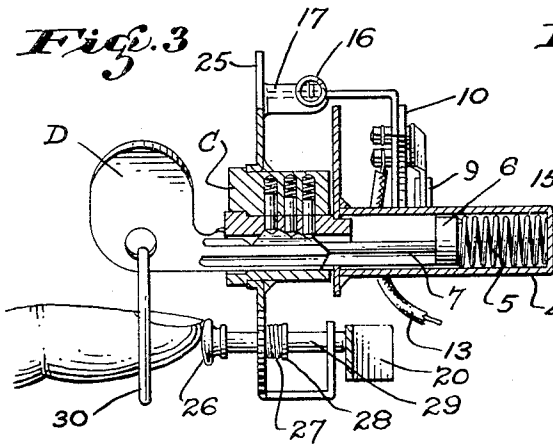
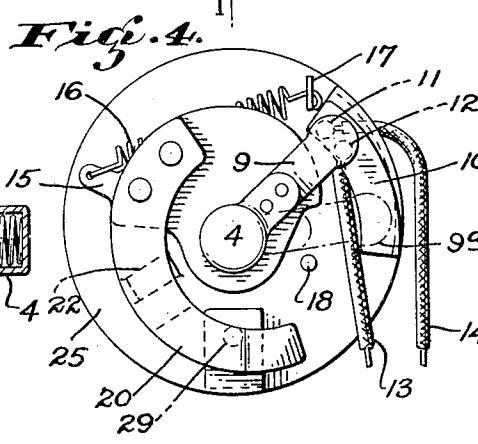
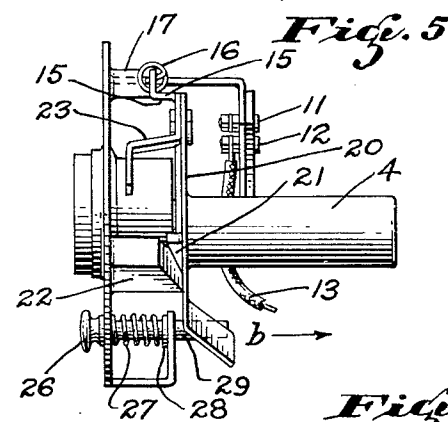
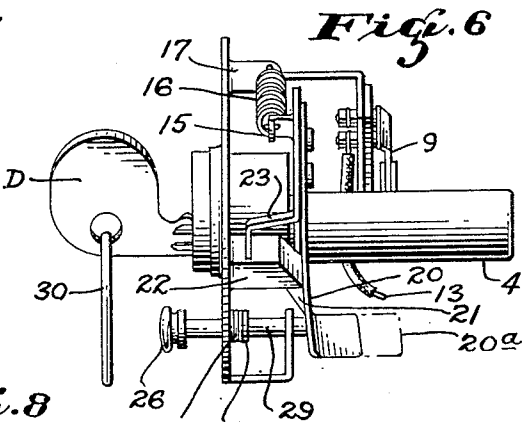
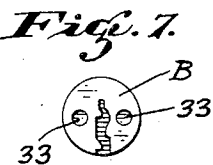
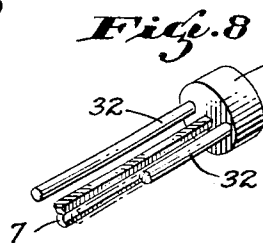
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R. B. SMITH

1,917,778

KEY EJECTING MECHANISM

Filed Feb. 3, 1931



INVENTOR.
Richard B. Smith
 BY *Townsend, Loftus & Abbott*
 ATTORNEYS.

UNITED STATES PATENT OFFICE

RICHARD B. SMITH, OF SAN FRANCISCO, CALIFORNIA

KEY EJECTING MECHANISM

Application filed February 3, 1931. Serial No. 513,126.

This invention relates to key actuated locks and especially to a mechanism whereby the key will be automatically ejected when the lock is locked and in which the key is retained in the lock against removal when the lock is unlocked.

The invention is particularly applicable to key actuated locks in automobiles and like vehicles, for instance, on ignition locks, transmission locks, steering wheel locks, etc.

An ignition lock is usually actuated by insertion of the key and by turning the key in the cylinder one-quarter revolution or more. This turning movement is transmitted through a rollback or the like to close the ignition circuit and thereby permits starting and operation of the motor. The key is usually left in the lock when the circuit is closed, that is, while the engine is in operation and when the engine is to be stopped, for instance when leaving the car, the operator turns the key and cylinder in the opposite direction. This opens or breaks the ignition circuit and brings the motor to a stop. The operator should then remove the key from the lock to prevent any unauthorized person from operating the car but the operator or driver often forgets, hence so many thefts of cars.

Where a transmission or steering post lock is employed the same operation takes place, that is, the driver inserts the key and locks the transmission lock. Upon leaving the car the driver should naturally remove the key after locking the transmission or steering wheel lock but many forget to do so. In such instances any unauthorized person could accordingly enter the car and unlock the mechanism and drive away.

The object of the present invention is to generally improve and simplify the construction and operation of locks of the character described; to provide a lock in which the key is retained against removal when the lock is unlocked; to provide means whereby the key is automatically ejected when the lock is locked; to provide means whereby the key is automatically ejected and practically speaking deposited in the hand of the operator when the lock is locked; to provide a

lock which is opened by means of a key only; and, further, to provide push button actuated means whereby the lock is locked and the key ejected.

The invention is shown by way of illustration in the accompanying drawing, in which—

Fig. 1 is a central, vertical, longitudinal section of the locking mechanism showing it used in conjunction with an ignition switch, the section being taken on line I—I of Fig. 2.

Fig. 2 is a rear end view of the mechanism.

Fig. 3 is a section similar to Fig. 1 showing the key inserted and turned to unlocked position.

Fig. 4 is a rear end view of Fig. 3.

Fig. 5 is a side elevation of the mechanism shown in Figs. 1 and 2 showing the lock in locked position.

Fig. 6 is a similar side elevation showing the lock in unlocked position.

Fig. 7 is a cross section of the cylinder plug.

Fig. 8 is a perspective view of the ejector.

Referring to the drawing in detail and particularly Figs. 1 and 2, A indicates a housing in which is turnably mounted a cylinder plug B. Co-operating with the cylinder plug are a plurality of spring actuated tumbler pins C and formed in the cylinder is a keyway for the reception of a key such as indicated at D. The housing A and the cylinder B, the tumblers and the key employed are of standard construction, hence further description of the same is thought unnecessary.

The pin tumbler lock mechanism illustrated is particularly intended for use in conjunction with an ignition switch such as used in automobiles and the like, but it will be understood that it is equally applicable to automobile transmission locks, steering wheel locks and the like. The principal object of the invention is to prevent the driver from leaving the key in the lock when he leaves the automobile. The manner in which this is accomplished will be fully described.

By referring to Figs. 1 and 2, it will be noted that the inner end of the plug or cylinder B is slightly reduced in diameter to form a shoulder 2 which supports a plate 3. The

plate is secured to the cylinder so as to rotate with the same and the plate in turn forms a support for a tube 4 which is also adapted to rotate in unison with the plate and the cylinder. The tube 4 is closed at the outer end as shown and it encloses a compression spring 5. The tube further forms a guide for a head member 6 which carries an ejector bar or plate 7. This bar is best illustrated in Figs. 1 and 8. It has the same cross section as the keyway formed in the cylinder and normally extends into the keyway when the cylinder assumes locked position. It is, however, forced inwardly as shown in Fig. 3 when the key is inserted and as such places the spring 5 under compression.

The term locked and unlocked will be used to some extent, both in the description of the mechanism and in the claims. The term locked position in the present instance means that the ignition switch is off and the circuit through the ignition circuit is broken. The term unlocked in the present instance means that the key has been inserted and the cylinder rotated to a position where the ignition circuit is closed to permit starting of the motor.

The tube 4 carries a switch arm 9. The switch arm swings over an insulated segmental shaped plug 10 and this plug carries two terminal connections such as indicated at 11 and 12 to which wires 13 and 14 are connected. The normal or locked position of the switch arm is that shown in Fig. 2 and when this position is assumed the circuit through the wires 13 and 14 is broken. The unlocked position assumed by the switch arm is shown in Fig. 4 and in this position a circuit is closed between the two terminal connections 11 and 12.

Plate 3, as previously stated, is rotated in unison with the plug or cylinder B when this is rotated by means of the key. The plate is provided with an extension lug 15 and this is connected through means of a pull spring 16 with a lug 17. The spring exerts a pull on the plate 3 and on the cylinder B tending to rotate it in the direction of arrow *a*, see Fig. 2, but rotational movement is limited by a stop pin 18 which engages a shoulder 19 on the plate. The plate is also provided with a spring arm 20 and formed on the under surface thereof is a latch element 21, see Figs. 5 and 6, which is adapted to ride over a keeper 22. The plate is also provided with a stop lug 23 which also engages the keeper and which limits rotational movement of the cylinder and the plate 3 when the lock is unlocked by rotation of the key.

The mechanism as a whole, to-wit, the housing A, etc., is secured to a front plate 25 which may be secured to an instrument board of a car or the like in any suitable manner. This front plate supports the insulated segment or terminal block 10. It furthermore

supports the keeper 22 and the lug 17 and in addition thereto forms a support for a push button 26. This button is normally held in a depressed position by means of a spring 27 which engages a collar 28 secured on a pin 29 forming an extension of the push button. The inner end of the pin is adapted to be engaged by the spring arm 20 and the operation of the mechanism as a whole will be as follows. In Figs. 1 and 2 the lock is shown in locked position. When the driver enters the car and wishes to start the engine he must first close the ignition circuit and he does so by inserting the key D and by means of the key rotates the cylinder in a direction opposite to arrow *a*, see Fig. 2. The amount of rotation may be a quarter of a revolution or more and as plate 3 is secured to the cylinder this plate will rotate and will place the spring under tension as shown in Fig. 4. Tube 4 also rotates with the plate and as the switch arm 9 is attached thereto it will move from the dotted line position shown at *9a* to the full line position shown in Fig. 4. At this point it engages the terminal contacts 11 and 12 and thus closes the ignition circuit.

The cylinder, the plate 3 and the switch arm 9 are locked in this position by means of the latch element 21 and the keeper 22 as during rotation of the cylinder plate latch 21 rides up over the inclined inner surface of the keeper and thus engages the opposite side of the same, further movement being prevented by the stop lug 23 when this engages the keeper. The latched or locked position of the latch element 21 is shown in Fig. 6. The free end of the spring arm will during this movement move inwardly, that is, in the direction of arrow *b*, see Fig. 5, and will override the inner end of the push button pin 29, but when latch element 21 overrides the keeper the spring arm returns to normal position and as such depresses the pin 29 against the spring 27 and thereby forces the push button 26 to projected position.

By the operations described the key has been inserted, the cylinder rotated, the ignition circuit has been closed and the cylinder has been secured against reverse or return movement by means of the latch element 21 and the keeper 22. In this position the key cannot be retracted as it is locked against retraction by the tumblers. It will furthermore be noted that reverse rotary movement cannot be transmitted to the cylinder as this is locked or dogged against return movement by the latch 21 and keeper 22, hence it is impossible to remove the key or to open the ignition circuit by means of the key. The push button 26 is provided for this purpose, hence when the driver wishes to turn off the ignition when leaving the car he merely places his finger on the push button as shown in Fig. 3 and pushes it inwardly. During such movement the inner end of pin 29 engages the

spring arm 20 and raises it to the dotted line position indicated at 20a, see Fig. 6. The latch element is in that manner raised out of engagement with the keeper 22 and as
 5 spring 16 exerts a constant pull on the disc 3 reverse rotational movement will be transmitted to the plate 3 and the cylinder and such movement will not be stopped until
 10 shoulder 19 on plate 3 engages the stop pin 18. Plainly speaking, the lock mechanism is unlocked by insertion of the key and by rotating the cylinder through means of the key in one direction and it is locked through
 15 means of the push button as the push button releases the latch element and permits the spring to return the cylinder and key to normal or locked position. In this position the circuit through the ignition wires 13 and 14 is opened or broken as the switch arm moves
 20 from the full line position shown in Fig. 4 to the dotted line position indicated at 9a. The key is also automatically ejected when this position is assumed as the tumblers now align thus permitting spring 5 to force the
 25 ejector bar inwardly through the keyway thereby ejecting the key.

In the present instance the key has no tendency to fall on the floor as it is provided with a ring such as shown at 30. This ring hangs
 30 directly in front of the push button 26 so that when the driver wishes to break the ignition circuit he or she is almost bound to pass the finger through the ring in order to depress the push button. With the finger in
 35 this position and with the key forcibly ejected by means of the bar 7 and the spring 5 the key is quickly ejected and hangs by means of the ring directly from the finger of the driver. With the key deposited on the finger of
 40 the driver there is very little chance of the driver forgetting to remove the key. In fact, if it drops off the finger it will merely fall on the floor and thus further remind or attract his or her attention to the fact that the
 45 key should be removed and placed in his or her pocket. Theft or operation of the car by unauthorized persons is in this instance eliminated as any excuse on the part of the driver for not removing the key has been
 50 eliminated in view of the fact that the key is forcibly ejected and deposited on the finger of the driver the moment the ignition circuit is broken.

By referring to Figs. 7 and 8 it will be noted
 55 that the ejector bar has the same cross section as the keyway in the cylinder. To prevent any disalignment of the ejector bar with relation to the keyway a pair of guide rods or bars 32 are employed. These are secured in
 60 the head members 6 which carries the ejector bar and they extend into openings 33 formed in the cylinder. This is of considerable importance as it prevents disalignment between the keyway opening and the ejector bar and
 65 furthermore rigidly guides and supports the

ejector bar with relation to the cylinder whether one position or another is assumed.

While certain features of the present invention are more or less specifically described, I wish it understood that various changes
 70 may be resorted to within the scope of the appended claims. Similarly, that the materials and finish of the several parts employed may be such as the manufacturer may decide, or varying conditions or uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A housing having a keyway for the reception of a key, mechanism in the housing
 80 actuated by a key to lock or unlock the lock, means for retaining the key against removal when the lock is unlocked, means operable independent of the key for locking the lock, and means for automatically ejecting the key
 85 when the lock is locked by said last named means.

2. A housing having a keyway for the reception of a key, mechanism in the housing
 90 actuated by a key to lock or unlock the lock, means for retaining the key against removal when the lock is unlocked, push button actuated means for locking the lock, and means for automatically ejecting the key when the
 95 lock is locked.

3. In a lock of the character described a housing, a cylinder plug rotatably mounted
 100 in the housing and having a keyway formed therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder in one direction to unlock the lock, and said
 105 key being retained by the tumblers against removal while the lock is unlocked, and means operable independent of the key for returning the cylinder and key to a locked position.

4. In a lock of the character described a housing, a cylinder plug rotatably mounted
 110 in the housing and having a keyway formed therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder in one direction to unlock the lock, and said
 115 key being retained by the tumblers against removal while the lock is unlocked, means operable independent of the key for returning the cylinder and key to a locked position, and means for automatically ejecting the key when the cylinder assumes a locked position.

5. In a lock of the character described a
 120 housing, a cylinder plug rotatably mounted in the housing and having a keyway formed therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder
 125 in one direction to unlock the lock and said key being retained by the tumblers against removal when the lock is unlocked, and push button actuated means for returning the cylinder and key to a locked position.

6. In a lock of the character described a housing, a cylinder plug rotatably mounted in the housing and having a keyway formed therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder in one direction to unlock the lock, and said key being retained by the tumblers against removal when the lock is unlocked, push button actuated means for returning the cylinder and key to a locked position, and means for automatically ejecting the key when the cylinder assumes locked position.
7. In a lock of the character described a housing, a cylinder plug rotatably mounted therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder in one direction to unlock the lock and said key being retained by the tumblers against removal when the lock is unlocked, a spring connected with the cylinder and adapted to rotate said cylinder in a direction opposite to the direction in which it is rotated by the key, a latch element connected with the cylinder, a keeper adapted to be engaged by said latch element when the cylinder is rotated by the key to prevent return movement of the cylinder, and means for releasing the latch element with relation to the keeper to permit the spring to return the cylinder and key to locked position.
8. In a lock of the character described a housing, a cylinder plug rotatably mounted therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder in one direction to unlock the lock and said key being retained by the tumblers against removal when the lock is unlocked, a spring connected with the cylinder and adapted to rotate said cylinder in a direction opposite to the direction in which it is rotated by the key, a latch element connected with the cylinder, a keeper adapted to be engaged by said latch element when the cylinder is rotated by the key to prevent return movement of the cylinder, means for releasing the latch element with relation to the keeper to permit the spring to return the cylinder and key to locked position, and means for automatically ejecting the key when the cylinder is returned to locked position.
9. In a lock of the character described a housing, a cylinder plug rotatably mounted in the housing and having a keyway formed therein, tumbler pins cooperating with the cylinder and a key when inserted in the keyway, said key adapted to rotate the cylinder in one direction to unlock the lock and said key being retained by the tumblers against removal when the lock is unlocked, a spring connected with the cylinder and adapted to rotate said cylinder in a direction opposite to the direction in which it is rotated by the key, a latch element connected with the cylinder, a keeper adapted to be engaged by said latch element when the cylinder is rotated by the key to prevent return movement of the cylinder, and a push button engageable with the latch element to release the latch with relation to the keeper so as to permit the spring to return the cylinder and key to locked position.
10. In combination with a lock of the character described adapted to be operated by a key having a ring thereon, means whereby rotation of the key in the lock will unlock the lock, a push button, means whereby depression of said button will lock the lock and eject the key therefrom, said push button being so disposed that a finger will be passed through said ring in operating it whereby the key when ejected will hang by said ring on the finger.
11. In combination with a lock of the character described adapted to be unlocked by a key having a ring thereon, a push button to lock the lock and eject the key therefrom, said push button being so positioned with relation to the lock that a finger will be passed through the ring to depress the push button.
12. In combination with a lock of the character described adapted to be unlocked by a key having a ring thereon, a push button depressible to unlock the lock and eject the key therefrom, said push button being positioned directly below the keyway of the lock whereby the ring will hang in front of the button and a finger depressing the button will be inserted through the ring.
13. In a lock of the character described, key actuated means for unlocking the lock, means operable upon unlocking of the lock to dog the key against rotation or retraction from the lock, means for releasing said dogging means, and springs for locking the lock and ejecting the key upon actuation of said releasing means.
14. A device of the character described, comprising a housing having a cylinder plug and cooperating tumbler pins, said cylinder plug adapted to receive a key and to be rotated from locked to unlocked position by the key, means for dogging the cylinder plug against rotation when rotated by the key from locked to unlocked position, said dogging of the cylinder preventing removal of the key, and means operable independent of the key for releasing the dogging mechanism and for automatically returning the cylinder plug to locked position to permit removal of the key.
15. A device of the character described, comprising a housing having a cylinder plug and cooperating tumbler pins, said cylinder

plug adapted to receive a key and to be rotated from locked to unlocked position by the key, means for dogging the cylinder plug against rotation when rotated by the key from locked to unlocked position, said dogging of the cylinder preventing removal of the key, and push-button actuating means for releasing the dogging mechanism and for automatically returning the cylinder plug to locked position to permit removal of the key.

RICHARD B. SMITH.

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