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3,552,160

KEY EJECTOR LOCKS

Filed Sept. 25, 1968

2 Sheets-Sheet 1

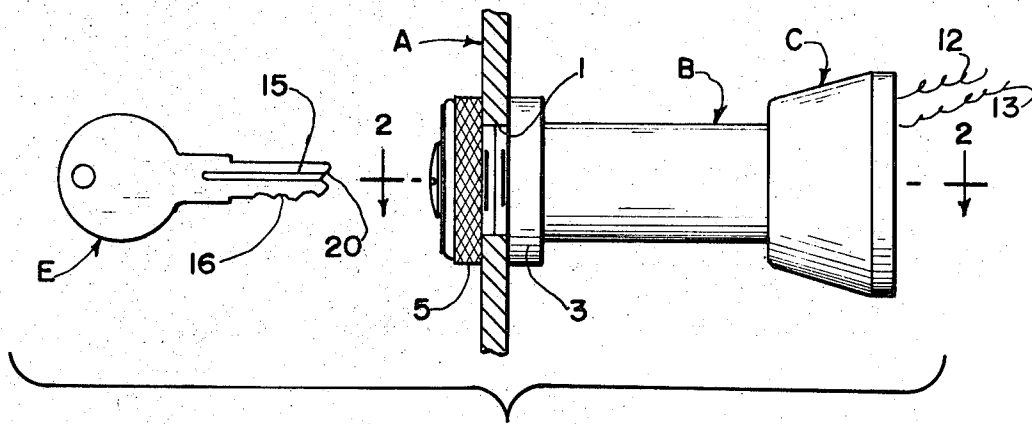


Fig-1

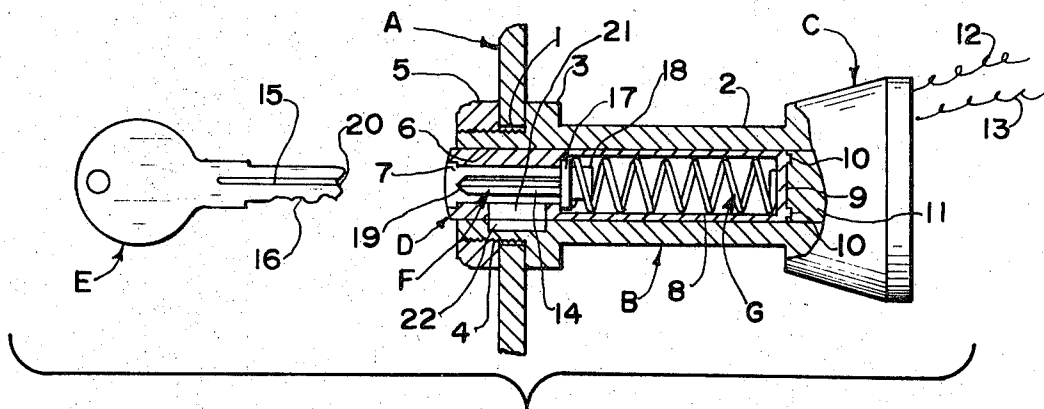


Fig-2

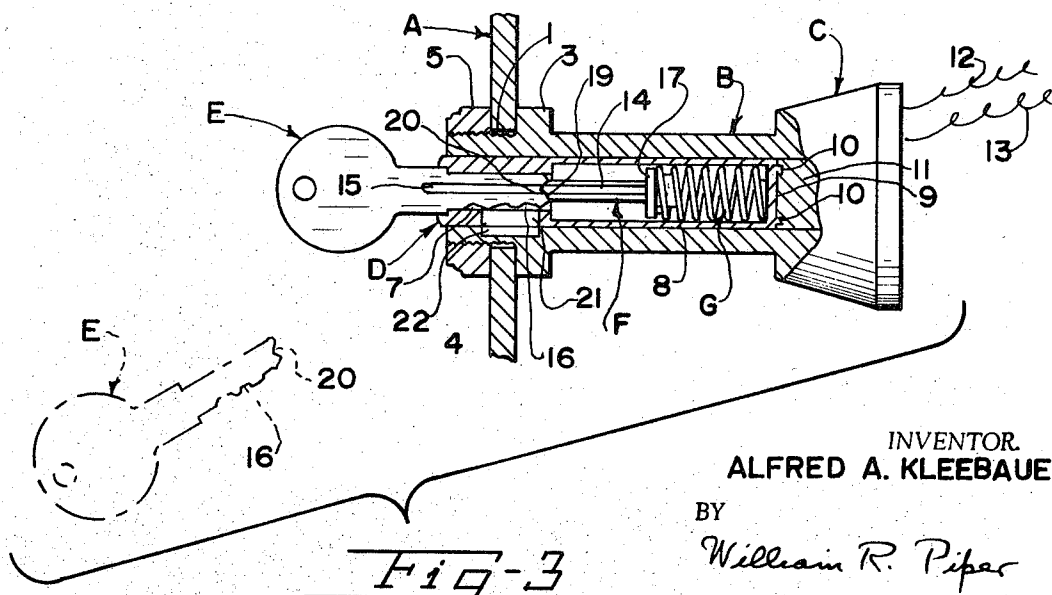


Fig-3

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2 Sheets-Sheet 2

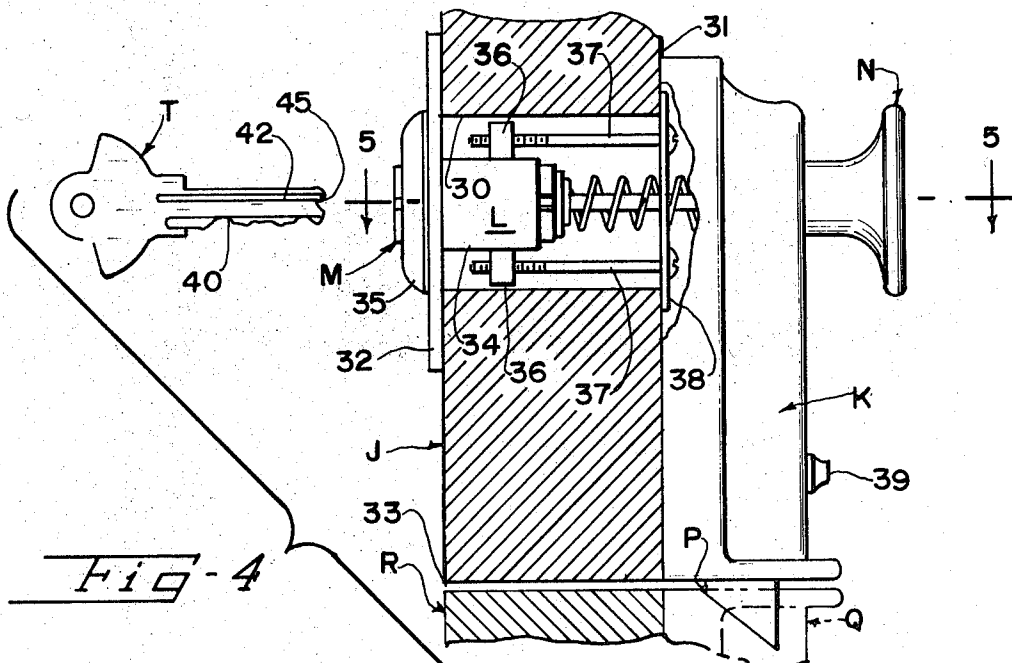


Fig-4

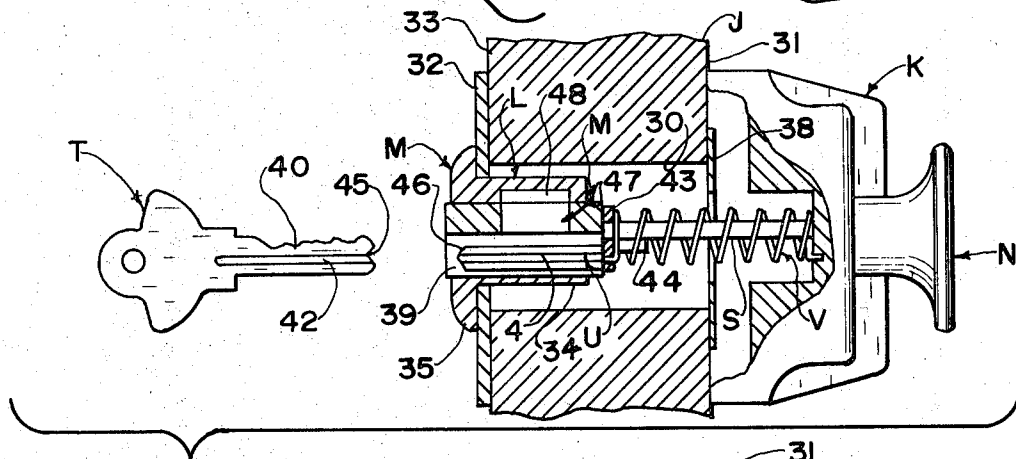


Fig-5

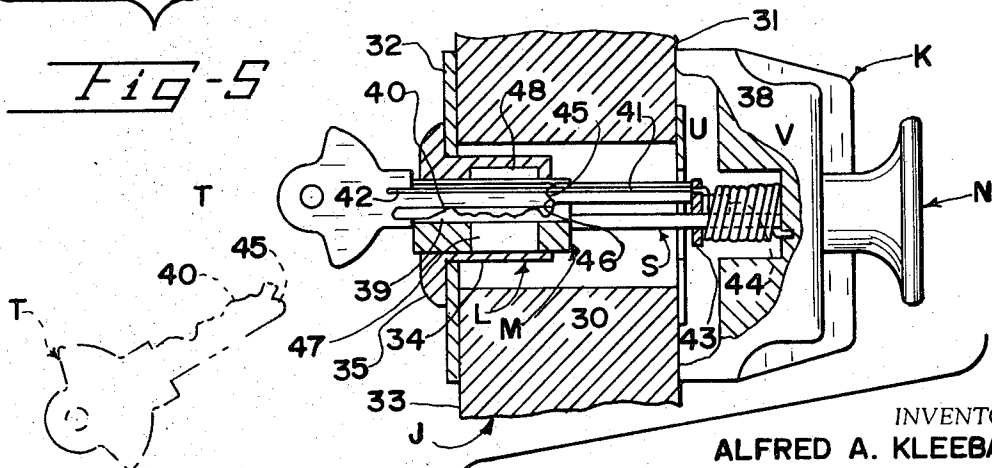


Fig-6

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3,552,160

KEY EJECTOR LOCKS

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1 Claim

ABSTRACT OF THE DISCLOSURE

A key ejector lock in which novel spring actuating means is used for automatically ejecting the key from the lock as soon as the tumbler barrel in the lock is returned to its normal starting position. In a modified form of the invention the key ejecting means includes a torsional spring that is compressed when the key is inserted into the lock and the spring is given a torsional when the key is rotated in one direction in the lock for opening the lock. The torsional force of the spring aids in rotating the tumbler barrel and key in the reverse direction when the key is freed so that the key is returned to its initial position and then the expanding force of the compressed spring is sufficient to eject the key from the lock.

BACKGROUND OF THE INVENTION

Field of the invention

A great many people forget to remove their key from a lock after it has once been opened. Many times automobile keys are left in the ignition switches when the engines are turned off and this permits unauthorized persons to steal cars by simply turning on the ignition switch to start the engine and then driving away with the car. My device will eject the key from the ignition switch as soon as the key is turned to shut off the engine from operating.

In other types of door locks, the key is inserted into the lock and is rotated for retracting the lock bolt for unlocking the door. Then the person opens the door and may forget to remove the key from the lock. My modified form of key ejecting mechanism when used in such a lock permits the key to be inserted into the tumbler barrel and then rotated for opening the lock. The insertion of the key into the tumbler barrel will compress the key ejecting spring and the rotation of the key for rotating the tumbler for opening the lock will create a torsional force on the compressed spring of sufficient strength to aid in rotating the tumbler barrel in a reverse direction for bringing the key back to its initial position whereupon the expanding force of the spring is sufficient to eject the key from the lock.

SUMMARY OF THE INVENTION

An object of my invention is to provide a key ejector lock that makes use of an auxiliary key which is similar to the lock key in all respects except that it is not provided with the tumbler-receiving notches. A spring yieldingly holds the auxiliary key in the key slot provided in the tumbler. The manual insertion of the correct lock key into the slot in the tumbler barrel will move the auxiliary key out of the tumbler barrel and will compress the spring. The notches in the edge of the lock key will align the tumblers in the lock casing so that the key can be rotated for rotating the tumbler barrel and opening the lock. When the hand key is returned to starting position the force of the compressed spring is sufficient to eject the key from the lock as the spring returns to its normal position.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of my device when used in conjunction with an automobile ignition switch.

FIG. 2 is a longitudinal section through FIG. 1 and is taken substantially along the line 2—2 of that figure. A portion of the ignition switch is shown in elevation.

FIG. 3 is a sectional view similar to FIG. 2 and shows the hand key displacing the auxiliary key from the tumbler slot and compressing the hand key ejecting spring.

FIG. 4 is a side elevation of a modified form of my device when used in conjunction with a door lock.

FIG. 5 is a longitudinal section through FIG. 4 and is taken substantially along the line 5—5 of that figure. A portion of the door lock is shown in elevation.

FIG. 6 is a sectional view similar to FIG. 5 and shows the hand key displacing the auxiliary key from the tumbler slot and compressing the hand key ejecting torsional spring. The hand key has also been rotated about 180° from its initial starting position in the tumbler barrel shown in FIG. 5 and the end of the torsional spring connected to the barrel has likewise been rotated 180° with respect to the other anchored end of the spring.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In carrying out my invention I will first describe the form of the device shown in FIGS. 1, 2 and 3, which is especially adapted to be used with vehicle ignition switches. A vehicle instrument board is shown in section at A in these three figures and it is provided with an opening 1, therein. A lock casing indicated generally at B has an elongated tubular portion 2 whose outer end is connected to the ignition switch C of the vehicle. The tubular portion 2 has an outwardly extending annular flange 3 and an exteriorly threaded portion 4. FIG. 2 shows the threaded portion 4 projecting through the opening 1 in the instrument board A. A knurled nut 5 is mounted on the projecting part of the threaded portion 4 and secures the device to the instrument board A.

The lock casing B has a longitudinal bore 6 and a tumbler barrel D is rotatably mounted in the left hand end of the bore, see FIGS. 2 and 3. The tumbler barrel D is of standard construction and I have shown the tumblers in the barrel schematically at 21 and in the lock casing B at 22 in FIGS. 2 and 3 and I have shown the key slot 7, which removably receives an ignition key E. The tumbler barrel has an integral sleeve extension 8 that is rotatably received in the cylindrical bore of the tubular portion 2. The right hand end of the sleeve 8 is closed at 9 and the closed end has spaced apart lugs 10 that are received in complementary recesses provided in a rotatable portion 11 in the ignition switch body C. When the ignition key E is inserted into the tumbler barrel key slot D to rotate the barrel, the key will move the tumblers in the barrel and in the lock casing and then the sleeve 8 can be rotated by the key and will rotate the part 11 in the ignition switch C to close an electric circuit through the wires 12 and 13 for starting the vehicle engine, not shown.

The sleeve 8 houses the ignition key ejecting mechanism which will now be described. An auxiliary key F has longitudinal grooves 14 therein that are similar in shape and size to the longitudinal grooves 15 provided in the ignition key E. However, the auxiliary key is not provided with the tumbler-receiving notches which are provided at 16 on the ignition key E. The auxiliary key F is received in the key slot 7 when the ignition key E is not inserted into the slot. The auxiliary key enters the slot 7 from the inner end of the tumbler barrel D and

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its grooves correspond to the key slot grooves. The key is provided with a head 17 and the latter has a projection 18 of a smaller diameter than the head. A compression spring G is mounted in the sleeve 8 and has its left hand end receiving the projection 18 and this end bears against the head 17. The right hand end of the spring G bears against the closed end 9 of the sleeve 8. The outer end of the auxiliary key F is pointed as shown at 19 and the ignition key E has its end provided with a notch 20 that is adapted to receive the pointed end of the auxiliary key when the ignition key is inserted into the key slot 7.

The operation of the device is shown in FIG. 3. When the ignition key E is inserted into the key slot 7, it will contact with the end of the auxiliary key F and will move it for compressing the coil spring G. The ignition key when fully inserted into the slot 7 will align the tumblers in the barrel D and the casing B, and then the key can be rotated in the usual manner. The rotation of the key will rotate the tumbler barrel D and its sleeve 8 for causing the lugs 10 at the closed end of the sleeve to rotate the inner part 11 of the ignition switch C, to close the switch and start the vehicle engine. The manual releasing of the ignition key will permit the ignition switch to partially rotate the member 11 and rotate the E partially toward the unlocked position of the tumbler barrel D. The compressed spring G will maintain the pointed end of the auxiliary key F in the key slot 7 so that the auxiliary key will rotate with the tumbler.

The ignition key E will be held in the key slot 7 and cannot be freed therefrom until the key is manually rotated back into starting position. When the key E is thus rotated, the compression spring G will exert sufficient force to move the auxiliary key F back into the key slot and to eject the ignition key E from the lock as shown by the dot-dash line position of the key E in FIG. 3. In this way it is impossible for a person to leave his key in the ignition lock when the engine is turned off.

A modified form of my key ejecting lock is shown in FIGS. 4, 5 and 6, and it is built into a door lock. A door is shown in section at J and it has an opening 30 extending therethrough. A standard door lock casing is shown at K and is secured to the inner side 31 of the door by screws, not shown. A standard key lock casing L is partially received in the door opening 30 and it is carried by a plate 32 that is secured to the outer side 33 of the door. The key lock casing L has a cylindrical portion 34 that rotatably carries a key-receiving tumbler barrel M, see FIGS. 5 and 6. The cylindrical portion 34 extends through an opening in the supporting plate 32 and it has an outwardly extending annular flange 35 that bears against the plate. The cylindrical portion 34 has diametrically opposed and outwardly extending lugs 36, see FIG. 4. These lugs have threaded bores that receive the threaded portions of headed screws 37. The screws in turn extend through openings in an anchor plate 38 that bears against the inner surface 31 of the door and is covered by the casing K. In this way the key lock is secured in place.

The door lock casing K is provided with the usual knob N that may be rotated in either direction for retracting the bolt P from its keeper, shown by the dot-dash lines at Q in FIG. 4. The keeper Q is secured to the door frame R. A detent 39 on the door lock casing K may be moved for holding the bolt P in retracted position, otherwise the spring-actuated mechanism within the door lock casing, not shown, will return the bolt P to an extended position as soon as the knob N is released. The rotating of the knob N has no effect on the key-receiving tumbler barrel M.

On the other hand, the tumbler barrel M, carries a noncircular rod S, whose longitudinal axis is aligned with the tumbler axis. When the tumbler barrel M, therefore, is rotated by a hand key T, it will rotate the non-circular rod S, and actuate the mechanism, not shown, within the lock casing K for retracting the bolt P to unlock the

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door. The spring mechanism in the lock casing K has sufficient force to rotate the rod S to its initial position as soon as the key T is manually freed. This will return a key-receiving slot 39 in the tumbler barrel to its initial position and my key-ejecting mechanism will eject the key from the slot.

The key slot 39 is associated with tumblers shown schematically at 47 in the tumbler barrel M, see FIGS. 5 and 6, and with the tumblers shown schematically at 48 in the casing L, and the insertion of the key T into the slot 39 will cause the notches 40 on the key to align the tumblers so that a rotation of the key will rotate the tumbler barrel. The key slot extends to one side of the axial center line of the tumbler barrel, see FIGS. 5 and 6. An auxiliary key shown at U has longitudinally extending grooves 41 similar to the longitudinally extending grooves 42 in the hand key T and similar to the grooves in the key slot 39. The auxiliary key U is normally received in the tumbler barrel key slot 39 and it is provided with a disc 43 that is slidable on the non-circular rod S. The disc 43 also has an integral guide finger 44 that slides along the rod S when the auxiliary key U is moved out of the key slot 39 to the same extent as the hand key T is manually moved into the key slot.

The movement of the auxiliary key U out from the key slot 39 will compress a coil spring V that encloses the rod S and the finger 44. The left hand coil of the spring V bears against the adjacent surface of the disc 43 and the adjacent end of the spring is inserted into an opening in the disc, see FIGS. 5 and 6. The right hand end of the coil spring is anchored in a part of the door lock casing 2. When the hand key T is inserted into the key slot 39 in the tumbler barrel M, the notched end 45 will receive the pointed end 46 of the auxiliary key U and this will prevent the auxiliary key from slipping into an angular position when the greater part of the auxiliary key is moved out of the key slot by the hand key as shown in FIG. 6.

Note in FIG. 5 that the notches 40 in the hand key T are facing upwardly whereas in FIG. 6 the full line showing of the hand key T indicates that the key has been rotated about 180° while in the lock, and the tumbler barrel M as well as the disc 43 will have been rotated through a similar arc. The forcing of the auxiliary key U to the right in FIG. 6 will compress the key ejecting spring V and the rotation of the disc 43 through an arc caused by the rotation of the hand key T will rotate the left hand end of the coil spring through a similar arc while the right hand end of the spring is not rotated. This will create a torsional effect in the spring and this torsional spring force will be used in aiding the rod S to return the tumbler barrel to initial position as soon as the hand key is manually released. The spring mechanism in the lock casing K and not shown, will also rotate the rod S to return it and the tumbler barrel to initial position. As soon as this is accomplished the compressed spring V will expand and will move the auxiliary key back into the tumbler barrel and this movement will be rapid enough for ejecting the hand key T from the key slot, as shown by the dot-dash line position of the freed hand key T in FIG. 6.

I claim:

1. A key ejector lock comprising:

- (a) a unitary structure including a lock casing, a tubular housing for a sleeve and an ignition switch;
- (b) a tumbler barrel rotatably mounted in the bore and having a longitudinally extending key-receiving slot extending throughout the length of the barrel, said tumbler barrel also having an integral cylindrical compression spring receiving cylindrical sleeve extending rearwardly from the rear end of the key slot;
- (c) an auxiliary key without tumbler receiving notches, insertable into said slot from the rear end of the slot and normally remaining in the slot;

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- (d) a compression spring mounted in said sleeve and yieldingly bearing against said auxiliary key for normally holding the key in the slot;
- (e) an ignition switch, said lock casing having a tubular portion enclosing said spring-receiving sleeve, said ignition switch being rigidly secured to said tubular portion; and
- (f) connecting means between said spring-receiving sleeve and said ignition switch whereby when a lock operating hand key is moved into said key slot for contacting and moving said auxiliary key for compressing said spring, the subsequent rotation of the hand key will rotate said tumbler barrel and said spring-receiving sleeve for causing the latter to actuate said connecting means for operating said ignition switch, the rotation of the barrel holding the hand key in the slot, the spring causing said auxiliary key to eject the hand key from the slot as soon as the hand key is rotated for returning said barrel and key slot to their initial position.

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