United States Patent [19]

Messera et al.

[11] **3,826,116**

[45] **July 30, 1974**

[54] **IGNITION STARTER LOCK KEY REMOVAL SYSTEM**

[76] Inventors: **Dominic Messera; Louis Messera,** both of 28 Spring St., Oyster Bay, N.Y. 11771

[22] Filed: **May 3, 1973**

[21] Appl. No.: **356,787**

[52] **U.S. Cl.** **70/388**

[51] **Int. Cl.** **E05b 17/00**

[58] **Field of Search** 70/388, 414; 200/44, 45

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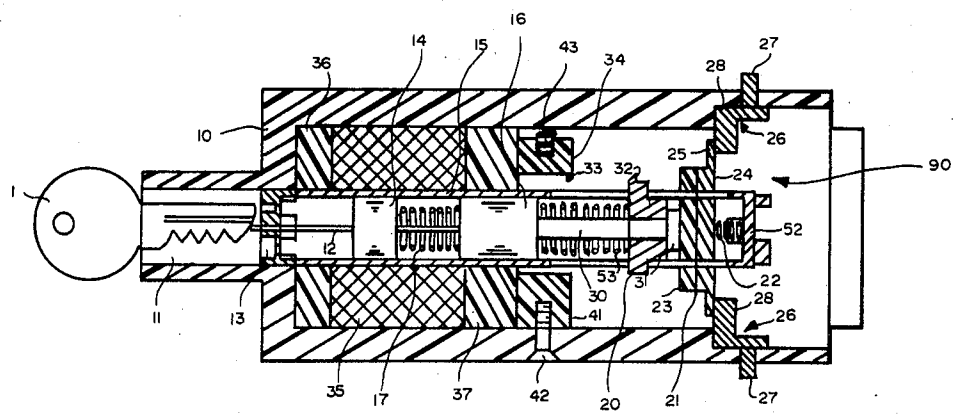
Primary Examiner—Robert L. Wolfe

Attorney, Agent, or Firm—Browdy and Neimark

[57] **ABSTRACT**

A key-actuated lock has a core member connected to the barrel, and a push rod and a plunger inside the core member. When a key is inserted in the lock, the push rod and plunger are pushed back into the core, with the push rod closing buzzer contacts. Further rotation of the key disconnects the buzzer and starts the ignition. When the key is returned to neutral the plunger is energized to eject the key.

8 Claims, 7 Drawing Figures



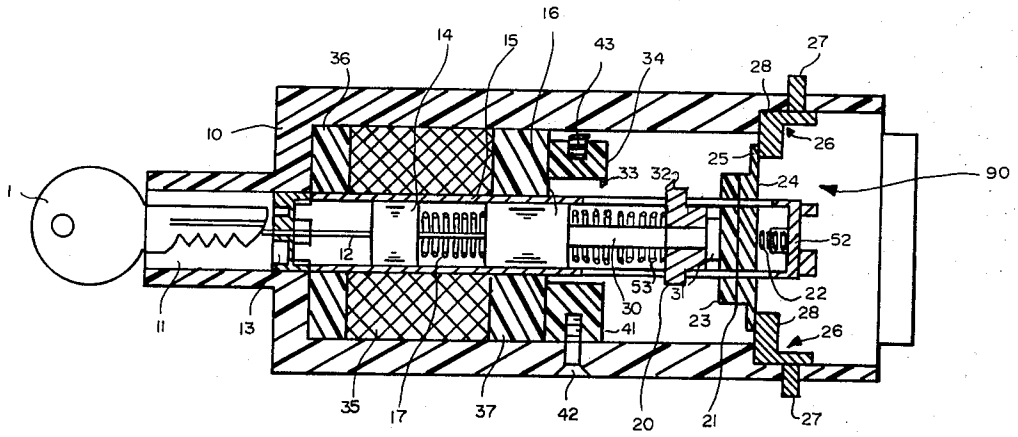

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FIG. 1

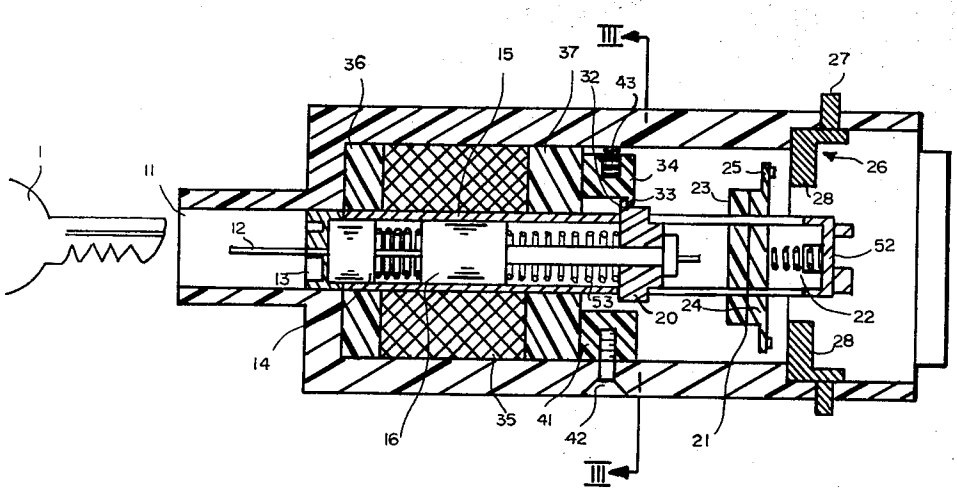
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FIG. 2

FIG. 4

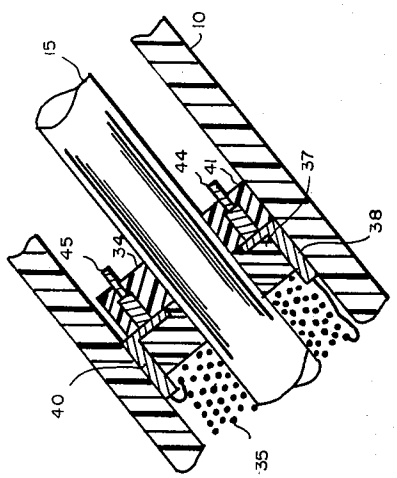


FIG. 5

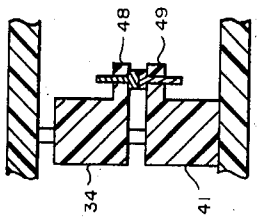


FIG. 7

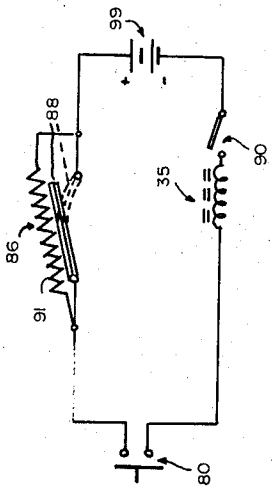
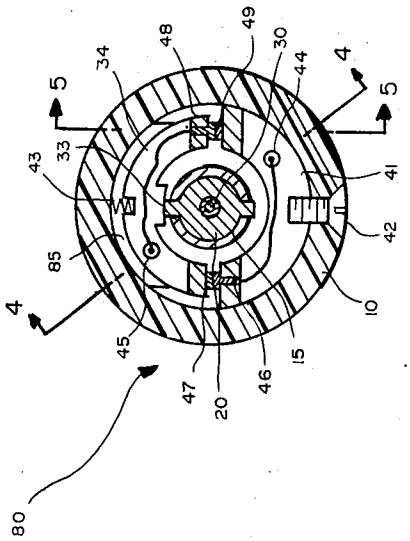


FIG. 3



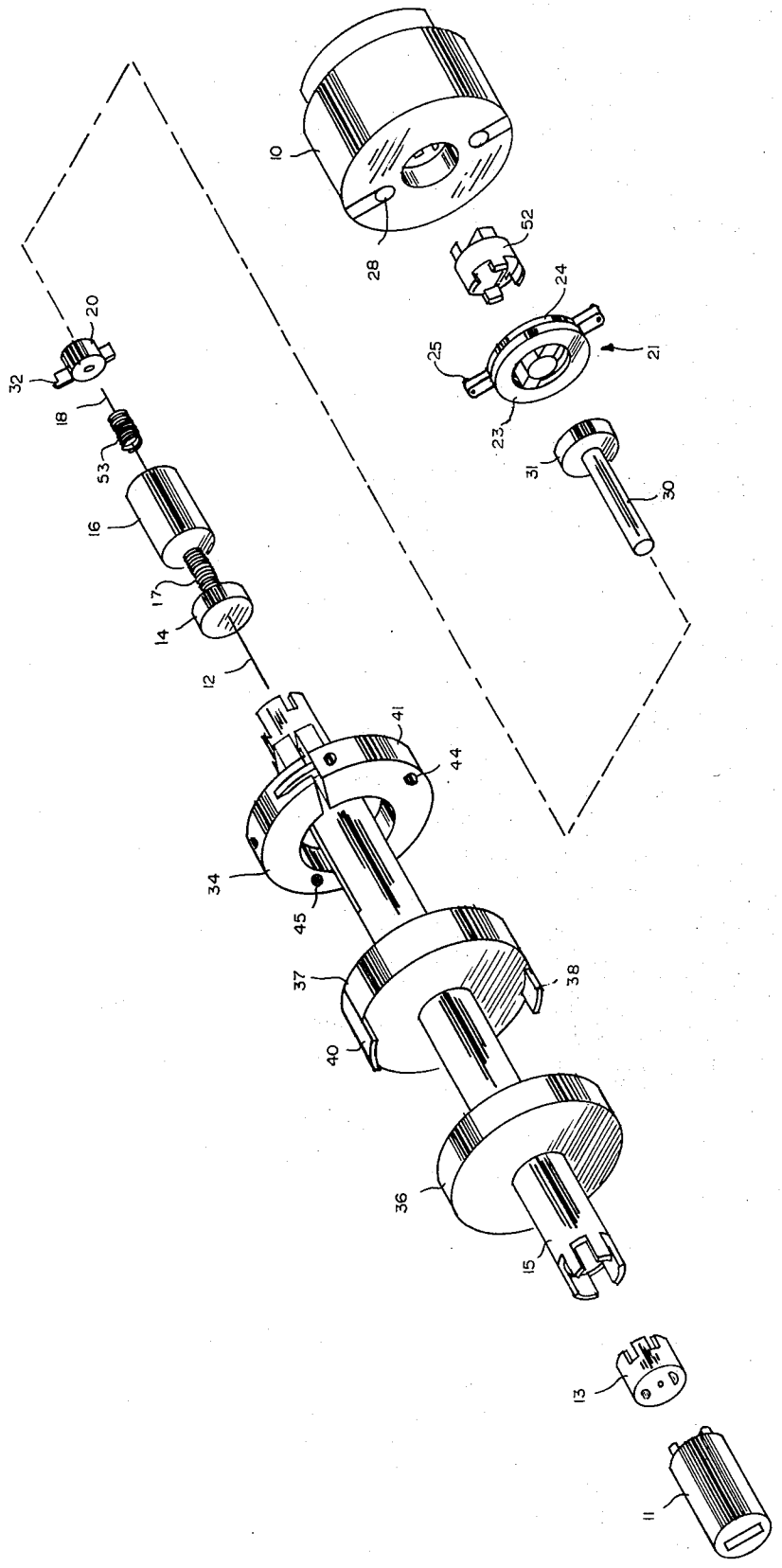

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FIG. 6

IGNITION STARTER LOCK KEY REMOVAL SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates generally to locking devices and, more particularly to a key-ejecting lock which utilizes means for ejecting the key from the lock when the key is in a non-operating position.

Motorists often inadvertently leave the key in the ignition switch of automobiles and the unauthorized use or theft of the automobiles therefrom has long been a problem of great concern. Similar problems also exist with respect to various other types of locks such as door locks, cabinet locks, and the like.

Heretofore, there have been attempts to provide a mechanism for forcing the key out of the lock when the key is in the neutral or inoperative position. These previous devices generally fall into two categories involving first, a spring mechanism disposed between the face of the lock and the handle position of the key and second, a spring mechanism provided to engage one end of the key whereby the spring is disposed in either axial or coaxial alignment with the key. The essential objection to these devices, and thus the reason that they are not currently being used extensively, is the pressure on the key exerted continually which causes excessive wear of the key and of the mechanism of the lock associated with the key thus causing a relatively short life for both the key and lock mechanism. Other systems are known wherein the pressure of a spring mechanism must first be overcome in order to insert the key into the barrel of the lock. Such systems similarly create undue attrition again on both the key and the lock barrel and are therefore objectionable.

SUMMARY

Accordingly, the present invention resides in the provision of key-ejecting means whereby the existing of pressure against either key or lock barrel during the insertion of the key thereinto or during the retention of the key therein, has been obviated.

Therefore, in consonance with the foregoing, the instant invention has for an object the provision of key ejecting means, the latter becoming operative only when the key is turned to the inoperative position whereby at such time the key is ejected from the lock barrel.

Objects of the present invention are to overcome the deficiencies of the prior art, such as indicated above, and to provide for improved key-ejecting and reduced theft.

Another object of the present invention is the provision of a key ejecting means which employs a dual set of contacts mounted on the fixed and sliding members to provide more reliable operation and broader tolerances.

Still another object is the provision of a key ejecting means having two plungers so as to eliminate the hammering impact on the key, by having the impact absorbed by the front plunger.

Yet another object is the provision of a key ejecting means which includes solenoid means for urging a plunger against an end of the key, said solenoid being energized only when the key is turned to the inoperative position and de-energized upon accomplishment of the key ejecting operation.

A further object is the provision of a key ejecting means including resilient means engaging the key ejecting plunger to normally urge the latter out of engagement with respect to the key when the latter is turned to the inoperative position.

Another general object of the invention is to provide a device of the described character which will be simple in structure, economical of manufacture, ideally suitable to utilization and incorporation with conventional automobile ignition lock mechanism, easily and quickly installed and highly effective in use.

These and other objects, the nature and advantages of the instant invention and novel features which are considered as characteristic of the invention, will be best understood from the following description of the specific embodiment when read in connection with the accompanying drawing, wherein:

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** shows an elevation view of the invention when a key has just been inserted in the lock and the buzzer signal has been energized.

FIG. **2** shows an elevation view of the invention when the key has been returned to neutral and it is being ejected.

FIG. **3** shows a sectional view taken along the line **3—3** of FIG. **1.**

FIG. **4** shows a sectional view taken along the line **4—4** of FIG. **3.**

FIG. **5** shows a sectional view taken along the line **5—5** of FIG. **3.**

FIG. **6** shows an exploded view of the slidable core member and its related components.

FIG. **7** shows a wiring diagram representative of the electrical components and their cooperative relationship as utilized in the present device.

DETAILED DESCRIPTION OF EMBODIMENT

Referring now to the drawing wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. **1** an ignition lock housing **10** which is essentially cylindrical in configuration and which has a smaller portion at one end forming a standard ignition lock tumbler **11.** Protruding through the center of the lock tumbler **11** is a push rod **12,** which passes through a drive dog **13** dividing the lock tumbler **11** from the housing **10.** The push rod **12** also passes through a central bore in a cylindrical plunger **16** and continues through a hollow tube **30,** having a flared end **31,** which tube **30** is an extension of the cylindrical plunger **16.** Fixedly attached to the central portion of the push rod **12** is a disk-like plunger **14.**

Positioned through the center of the housing **10,** and forming a guide for the plunger **14,** and other components as will be described later, is an annular core member **15.** Behind the first plunger **14** and also movable along the inside of core member **15** is the second plunger **16.** A spiral spring **17** is disposed around the push rod **12** between the two plungers **14** and **16.** A cylindrical wafer or latch **20** is slidably mounted on the hollow tube **30** between the rear end of plunger **16** and the flared end **31** of the hollow tube **30.** A spring **53** is disposed around the hollow tube between the rear end of the plunger **16** and the latch **20.**

When the spring **17** is fully compressed by the rearward movement of push rod **12** and the plunger **14**

toward the plunger 16 so that the plungers 14 and 16 come into contact, the rear portion of the push rod 12 extends past the flared end 31 of the hollow tube 30, the flared end 31 serving to move latch 20, as will be described more fully below. During the rearward movement caused by the insertion of the ignition key 1 the terminal rearward end of the push rod 12 contacts a buzzer contact 21 which also moves rearward against a spring 22 placed between the buzzer contact 21 and the end of housing 10.

A portion of the buzzer contact 21 lies inside the core 15 and a portion outside, and these portions are connected through slots in the core 15. It will be noted that the buzzer contact 21 is composed of two layers; an insulating layer 23 which is contacted by the push rod 12, and an electrically conducting layer 24 which is flattened out around its periphery to form projecting ears 25. Mounted in the walls of the housing 10 are metallic strips 26, the outer ends of which form a terminal 27 for connection to the automobile battery, and the inner ends of which form electrical contacts 28 for cooperation with ears 25 of the buzzer contact 21. While the illustrated embodiment has two ears 25 and two corresponding strips 26, it will be understood that one or more may be used, or that the ear and strip may be annular.

Extending from the latch 20 through a slot in the core 15 is a tongue 32 which cooperates with a catch 33, such catch 33 being constructed as a curved lip on a sliding member 34 on the inside of housing 10. Near the forward end of the large portion of housing 10, and surrounding the core 15, is a coil winding or solenoid 35 which, when energized, serves to activate plungers 14 and 16.

As clearly shown in FIGS. 1, 2 and 6, two circular flanges 36 and 37 are located within the housing 10 and are attached to the core 15, flange 36 being just forward of coil winding 35 and flange 37 being immediately behind the coil 35 and next to the sliding half collar 34. Diametrically opposite each other around the outer rim of flange 37 there are two electrical contact plates 38 and 40 (See: FIG. 6).

As best understood from FIG. 6, the core 15 and the flanges 36 and 37 form a unit which is axially stationary within the housing 10. The rod 12, the plungers 14 and 16, the tube 30, the latch 20 and the buzzer 21 are all adapted to slide axially within the core 15.

FIGS. 3 and 6 show in better detail the structure of sliding half collar 34. Such sliding half collar 34 constitutes a half circle element which cooperates with another fixed half collar 41; neither half collar 34 nor 41 is rigidly fixed to core 15, but instead, core 15 moves through the opening betwen half collars 34 and 41. The fixed or bottom half collar 41 is integrally attached to housing 10 by means of a bolt 42 or the like, while the sliding or top half collar 34 is urged toward the bottom half collar 41 by means of a spring 43.

The fixed half collar 41 may be provided with projections or ears 85 extending upward from each of its two top surfaces (See: FIG. 3). The ears 85 ride in slots provided in the outer peripheral surface of the sliding half collar 34, thereby, acting as a guide for the sliding cooperation of half collars 34 and 41. Embedded in the side face of fixed half collar 41 is an electrical contact 44, for connection with contact plate 38 of the flange 37. Also embedded in the side face of the sliding half collar 34 there is an electrical contact 45 for connection with contact plate 40 of the flange 37.

At the common junction points of the two half collars 34 and 41 are additional sets of electrical contacts. Contacts 46 and 49 are in the bottom or fixed half collar 41, while contacts 47 and 48 are in the top or sliding half collar 34. See FIG. 5 for a detailed view of one set of contacts. Electrical terminals 50 and 51 are connected to the automobile battery, not shown.

For a clearer understanding of the components located within the housing 10, reference is made to the exploded view of FIG. 6, as well as FIG. 3 for the arrangement of electrical contacts.

Referring now to FIG. 7, the buzzing switch means 90 comprises contacts 25 carried by the contact member 21 and contacts 28 mounted on the rear end of the housing 10. The key ejecting switch means 80 comprises electrical contacts 46, 47, 48 and 49; spring-loaded contacts 44 and 45; and contact plates 38 and 40. Energization and deenergization of solenoid 35 is regulated or controlled by the relative opened or closed positions of the buzzing circuit or switch means 90 and the ejecting circuit or switch means 80.

More particularly, it will be understood that the solenoid 35 will receive current from a power supply 99, usually the vehicle's battery, only when both the buzzing and ejecting circuits or switch means 80 and 90 are in the closed position. Further, closure of the circuit shown in FIG. 7 will prevail only momentarily when the ignition key is turned from ignition or accessory to neutral. Such momentary energization ceases once sliding half collar 34 is forced away from fixed half collar 41 by latch 20 and contact is broken between contacts 46,47 and 48,49.

In operation, the ignition key 1 is inserted into the standard ignition lock tumbler 11, forming part of the housing 10, and the push rod 12 which is fixedly attached to the front plunger 14 is pushed back inside the core 15. The push rod 12 advances rearwardly against the force of springs 17 and 53 passing through the hollow tube 30 until it reaches the sliding buzzer contact member 21. The push rod 12 then advances the buzzing contact member 21 rearward against the force of spring 22 until contacts 25 touch contacts 28 mounted on the rear end of the housing 10. The buzzer then sounds, current being conducted through terminals 27.

At this time, the spring 17, between plungers 14 and 16, is being compressed as shown in FIG. 1, thereby pushing the rear plunger 16 back. Rear plunger 16, in turn, compresses the spring 53 which is disposed on the hollow tube 30 just in front of the latch 20. The tongue 32 of the latch 20 is caught under the catch 33 and therefore prohibits any rearward movement of the latch 20. Consequently, the push rod 12 exerts a force produced by the compressed springs 17, 53, and 22 on the ignition key 1. However, this force by itself is inadequate to eject the ignition key 1 from the ignition lock tumbler 11.

When the key is turned either to ignition or accessory, the tumbler 11 rotatably drives the core 15 through means of the self-centering drive dog 13, that mates with the prongs on the end of the tumbler. The flanges 36 and 37 are fixedly attached to the core 15 so that the coil wire terminal and contact plates 38 and 40 may be rotated out of contact with the stationary spring loaded electrical contacts 44 and 45 when the

key 1 is turned to ignition or accessory (See: FIGS. 3, 4 and 6).

The latch 20 is slidable inside of the core 15 and rotates with the core 15 through means of the two slots spaced 180° apart in the wall of core 15. When the ignition key 1 is turned, as described above, the tongue 32 of the latch 20 is rotated out of engagement with the catch 33 and the spring 53 is thereby permitted to push the latch 20 rearward away from the catch 33.

Prior to the disengagement of the latch 20 from the catch 33, the latch 20 acts to force the spring biased sliding half collar 34 upward thereby keeping the sliding half collar's 34 contacts 47 and 48 out of contact with the fixed half collar's 41 contacts 46 and 49.

Upon disengagement, the latch 20 from the catch 33, half collar 34 is forced downward toward the fixed half collar 41 by the spring 43 (See: FIGS. 3 and 5).

New terminal 50 (marked plus) which is connected to the vehicle's battery is conducted to contact 46 while electrical contact 47 is conducted to spring-loaded contact 44. Similarly, spring-loaded contact 45 is conducted to electrical contact 48 while contact 49 is conducted to the terminal 51 (marked minus) which is also connected to the vehicle's battery (See: FIG. 3). However, the ejecting circuit 80 is still open and the solenoid 35 is not energized because the coil wire terminal and contact plates 38 and 40 located on flange 37 have been rotated out of contact with the spring-loaded contacts 44 and 45 when the ignition 1 was turned to ignition or accessory.

Also, as the ignition key 1 is turned to ignition or accessory, sliding buzzer contact member 21 turns with the core 15 through means of the same slots used by latch 20, thus turning past contacts 26 and 28 that are conducted to terminals 27,27 and since the circuit is now open the buzzer stops.

The ignition terminal drive plate, mounted inside its standard housing 10, is driven through means of another self-centering drive dog 52 with prongs the same size as those on the end of the standard ignition lock tumbler 11.

When the ignition key 1 is brought back to neutral, the coil wire terminal and contact plates 38 and 40 mounted on flange 37 are rotated into contact with the spring-loaded contacts 44 and 45, thus closing the circuit and energizing solenoid 35. The energized solenoid 35 creates magnetic flux which draws the plunger 16 toward the ignition key 1, thereby driving into the back of plunger 14 as they both push forward and eject the ignition key 1, through means of the push rod 12, as shown in FIG. 2.

Hollow tube 30 is attached to the plunger 16, and has a flared end or shoulder 31 at the opposite end. When plunger 16 moves forward the hollow tube 30, by means of its houlder 31, pulls latch 20 forward along with it so that tongue 32, which is beveled, exerts an upward pressure on catch 33. In so doing, the sliding half collar 34 is forced away from the fixed half collar 41 and contact is broken between contacts 46,47 and 48,49. Thus the key ejecting circuit is opened and the solenoid 35 is, thereby, de-energized (See: FIGS. 2 and 3). It should be recalled that tube 30 is hollow to accommodate the rear portion of push rod 12.

Also, when the ignition key is neutralized, the contacts 25 on the buzzer contact member 21 are rotated into contact with contacts 28 mounted on the rear end of the housing 10 thereby closing the buzzing circuit. When the ignition key 1 is subsequently ejected and left out of the lock, the buzzer circuit or switch means 90 is opened and the buzzer stops as the spring 22 located between contact member 21 and drive dog 52 forces the contact member 21 forward, thereby separating the contacts 25 carried thereon from the contacts 28.

It has been determined that the inclusion of delay circuit closing means such as heat-responsive switching element 86 provided in series with the buzzing switch means 90 and the key ejecting switch means 80 (See: FIG. 7) provides the user an increment of time sufficient to permit removal of his hand from the key after turning the latter from ignition or accessory to neutral, prior to energization of the solenoid. Such delayed energization of the solenoid 35 permits the plunger 16 to commence its movement toward the key after the hand leaves the key, to thereby provide plunger momentum otherwise absent were the plunger already in abutting position with respect to the key at the time the hand is removed therefrom. It is this plunger momentum which accounts for more positive ejection of the key. The switching element 86 is of conventional construction and may be the simple directional signal flasher used on automobiles. That is, e.g. the switch opens and closes the circuit in response to the cyclical heating and cooling of a bimetallic element 88 which controls the disposition of the switch. An electrical resistance member 91 becomes heated upon passage of current therethrough and in turn heats the bimetallic member to cause the latter to flex into switch-closing position. Once the bimetallic member so flexes it moves away from the resistance member and after a short time cools to thereby return to its normal switch-open position, whereafter it is again heated to repeat the cycle.

It will be appreciated that ejection of the key will be accomplished with or without use of the aforedescribed delay circuit-closing means 86, utilization thereof, however, being preferable.

From the above description of the structure and operation of the invention it is obvious that the device offers many improvements over the weaknesses and shortcomings of prior art key ejecting means. The contact point and latch arrangement offer a smoother and less cumbersome action, while the use of dual sets of contacts mounted on the fixed and sliding members provides for much broader tolerances on the sliding member guides. Furthermore, with the use of two plungers any hammering impact is absorbed by the front plunger and not by the end of the key. Also, the fact the back plunger slams against the front plunger, that is in constant contact with the key, causes the key to move easier.

It should be noted that the buzzer contact member can be made out of either a conductor or non-conductor; in the latter, a conductor strip will be included to connect the two spring-loaded contact carried thereon.

Also, the terminals, electrical contact points, etc. can all be molded in their respective parts, i.e. screws are not necessarily needed to attach the metal parts to the plastic ones. Further, with the proper connections it is possible to use only two terminals for both ejecting and buzzing.

This is an improvement of the devices in our earlier U.S. Pats. Nos. 3,390,560 and 3,391,260.

The foregoing description of the specific embodiments will so fully reveal the general nature of the invention that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiment without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiment. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

What is claimed is:

1. In a key operated automobile ignition system having means to eject the key comprising an ignition means, movable by means of the key, for opening and closing sets of electrical contacts in response to the position of said ignition means, said ignition means being adapted to be electrically connected to a source of electrical potential; and a key ejection means for ejecting the key from said ignition means in response to the motion of said ignition means, the improvement wherein:

said ignition means includes a tubular core member, push rod means, including a push rod disposed in a position to come into contact with the key for moving in a first axial direction upon insertion of the key and moving in a second, opposite direction to eject said key, said push rod extending through said core member; and a first plunger slidably disposed within said core and fixedly attached to said push rod; and

said key ejection means includes a magnetic coil wound around said core, a second plunger means slidably disposed within said core for moving axially in said second direction within said core in response to the attraction of said magnetic coil, said push rod extending through and axially disposable within said second plunger means and electrical means for energizing said coil in response to the motion of said ignition means,

wherein said first plunger is located within the path of travel of said second plunger means,

whereby upon energization of said magnetic coil said second plunger means moves axially within said core in said second direction and engages said first plunger thereby causing the axial movement of said first plunger and said push rod in said second direction and the ejection of the key.

2. An ignition system in accordance with claim 1 further including a buzzer means for producing an audible sound in response to the motion of said ignition means, said buzzer means including a buzzer circuit means having buzzer switch contacts thereon for producing said sound when said buzzer switch contacts are closed and wherein said buzzer switch contacts are opened and closed in response to the axial motion of said push rod and the rotary motion of said ignition means.

3. The ignition system of claim 1 wherein said electrical means for energizing said coil comprises:

a first electrical contact means connected to said coil for intermittently connecting coil with a source of potential;

a second electrical contact means for intermittently supplying electricity to said first electrical contact means, said second electrical contact means being connectable and disconnectable with said first electrical contact means; and

a third electrical contact means for intermittently supplying electricity from said source of electrical potential to said second electrical contact means, said third electrical contact means being electrically connected to said source of electrical potential and said second electrical contact means.

4. The ignition system of claim 1 wherein said ignition means further comprises:

two electrical contacts fixedly connected to said core, and electrically connected to said coil;

a first half collar radially displaceably disposed about said core including a first electrical contact means for connecting and disconnecting with one of said core-mounted electrical contacts in response to the rotation of said core, and a first and second electrical contact, said first electrical contact being electrically connected to said collar's first electrical contact means and said second electrical contact being electrically connected to one terminal of a source of electrical potential;

a second half collar fixedly disposed about said core and positioned opposite said first half collar, said second half collar including a second electrical contact means for connecting and disconnecting with the other of core mounted said electrical contacts in response to the rotation of said core and a third and fourth electrical contact, said third electrical contact being electrically connected to said second electrical contact means and said fourth electrical contact being electrically connected to the other terminal of a source of electrical potential; and

latch means for causing the radial displacement of said first half collar in response to the axial motion of said second plunger means and the rotary motion of said ignition means.

5. An ignition system in accordance with claim 2 wherein said buzzer circuit means includes means for closing said contacts only when said push rod is fully extended in said first direction and when said ignition means is in a single predetermined rotary position.

6. The ignition system of claim 4 wherein said second plunger means comprises

a magnetically attractable cylindrical plunger slidably disposed within said core and around said push rod; and

a cylinder attached at one end to said magnetically attractable plunger;

a flange connected to said cylinder at the end thereof opposite the end attached to said magnetically attractable plunger; and wherein said latch means comprises a ring-shaped latch axially slidable about said cylinder and within said core, said latch further including a tongue means thereon for causing the outward radial displacement of said second half collar when said latch is in a predetermined axial and rotary position.

7. The device of claim 1 wherein said electrical means comprises a first and second electrical switch means for independently opening and closing in response to the axial and rotary motion of said ignition means and for connecting said coil with the source of potential only when both of said electrical switch means are closed;

wherein said first electrical switch means closes in response to the rotary motion of said ignition means and opens in response to the axial motion of said

push rod means in said second direction; and wherein said second electrical switch means open and close solely in response to the rotation of said ignition means.

8. The ignition system of claim **7** further comprising:

a first half collar rotatably disposed about said core and fixed in the radial direction, said half collar including first and second electrical contact thereon, said first contact being connected to one terminal of the source of electrical potential;

a second half collar rotatably disposed about said core opposite said first half collar, said second half collar being radially displaceable about said core in response to the axial and radial motion of the components of said ignition means, and including a first electrical contact means for connecting and disconnecting with said first and second electrical contacts on said first half collar in response to the radial motion of said second half collar, said first electrical contact means including a third electrical contact connected to the other terminal of the source of electrical potential and a fourth electrical contact;

a second contact means connected to said first half collar for connecting and disconnecting with one of said core mounted electrical contacts;

a third contact means connected to said second half collar for connecting and disconnecting with the other of said core mounted electrical contacts; and

wherein said first electrical switch means includes said first and second electrical contacts and said first electrical contact means and said second electrical switch means includes said core-mounted contacts and said third and fourth electrical contact means.

* * * * *