United States Patent

Berube

[15] **3,650,132**

[45] **Mar. 21, 1972**

[54] LOCK

[72] Inventor: **Felix J. Berube,** 153 River St., Sanford, Maine 04073

[22] Filed: **Aug. 6, 1970**

[21] Appl. No.: **61,611**

[52] **U.S. Cl.** .....**70/364 A,** 70/447

[51] **Int. Cl.**.....**E05b 27/00**

[58] **Field of Search** .....70/364 R, 364 A, 386, 216, 70/431, 432, 447, 448; 200/44

[56] **References Cited**

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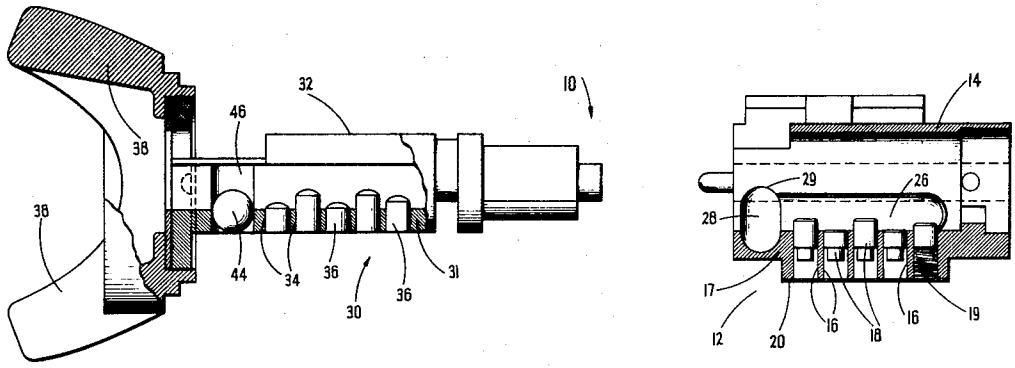
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Primary Examiner—Robert L. Wolfe
Attorney—Wolf, Greenfield and Sacks

[57] **ABSTRACT**

A lock mechanism preferably for use in a motor vehicle is disclosed and includes safety features to prevent an operator from leaving the keys in the vehicle when it is left unattended. One important purpose of the present invention is to provide means for preventing the operator from starting the vehicle after a proper key has unlocked the lock mechanism, without first withdrawing the key from the lock mechanism. After the key has been extracted, the lock mechanism can then be rotated to a vehicle start position, and the key need not be inserted again to thereafter rotate the lock mechanism to its locked position.

5 Claims, 17 Drawing Figures



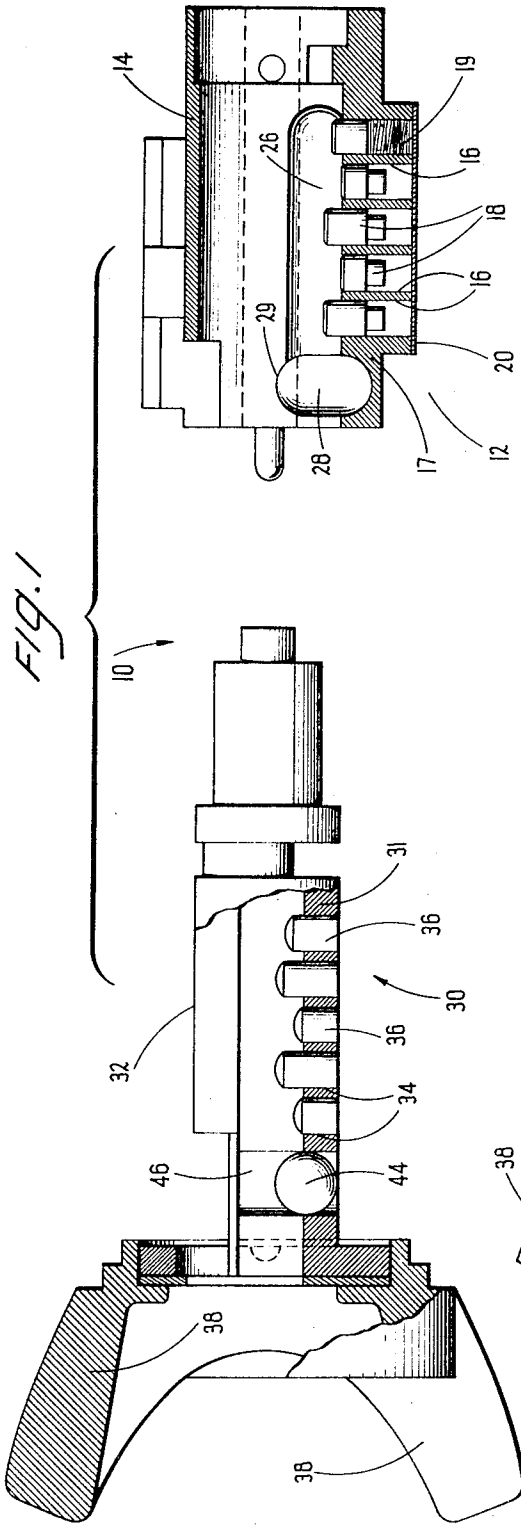


FIG. 1

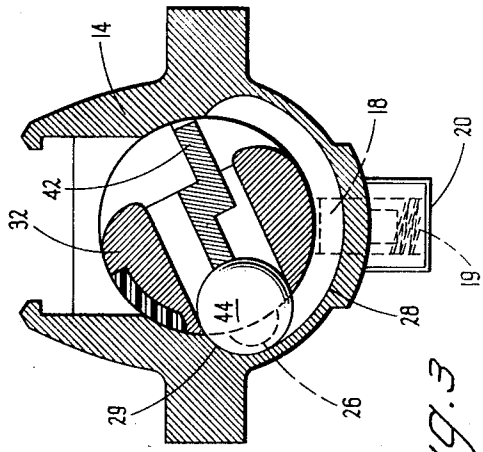


FIG. 3

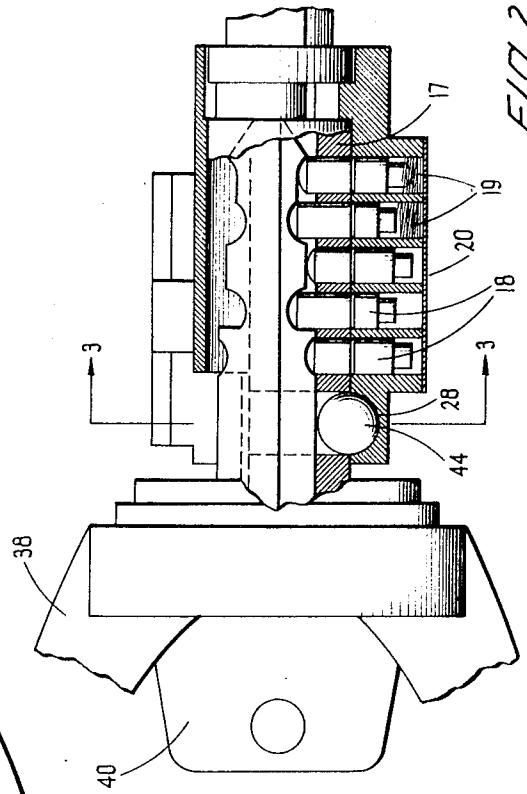


FIG. 2

Felix J. Berube INVENTOR
BY
Wolff, Greenfield & Sacks

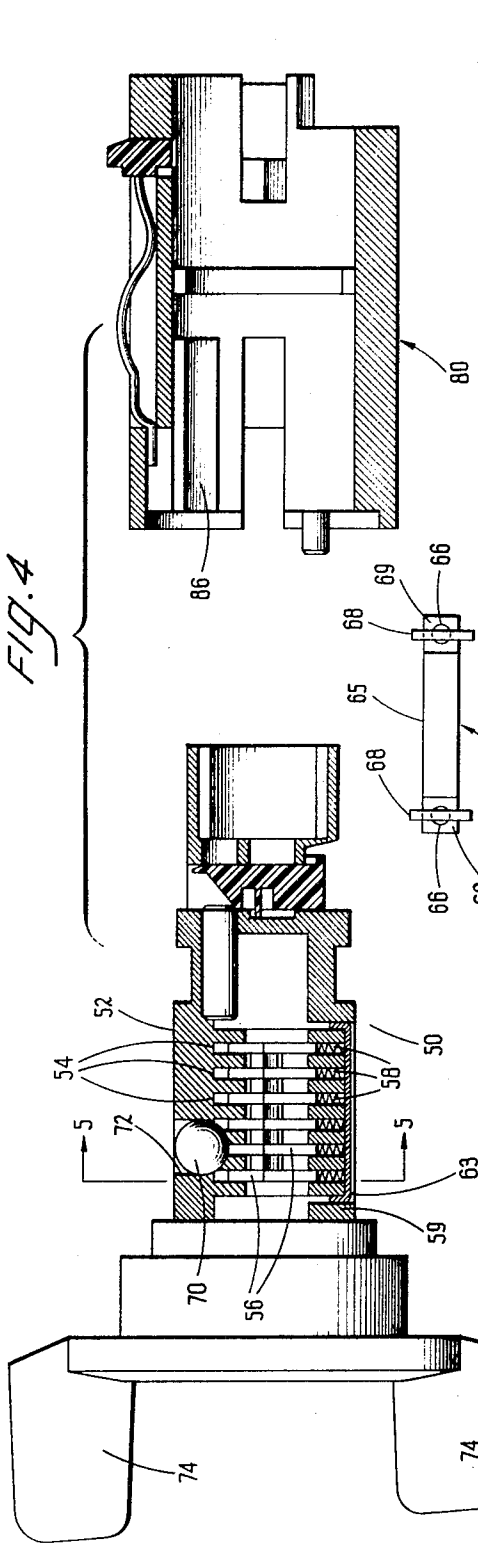


FIG. 4

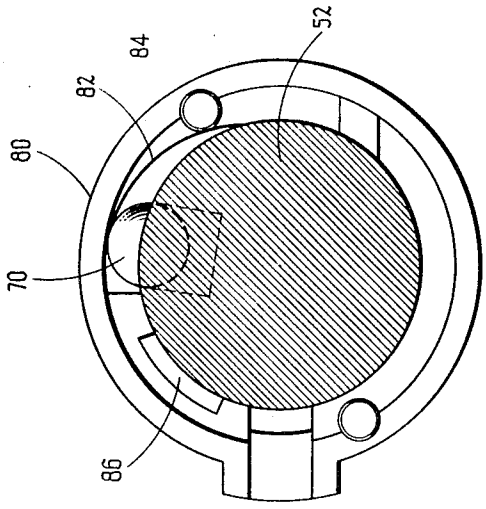


FIG. 7

FIG. 5A

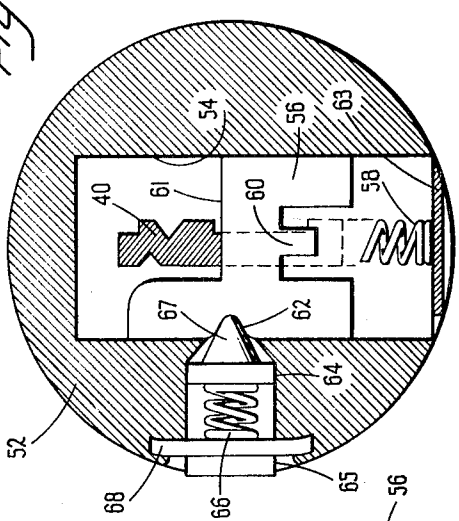


FIG. 5

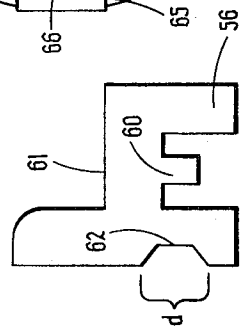


FIG. 8

INVENTOR
Felix J. Berube
BY
Wolf, Greenfield & Sacks

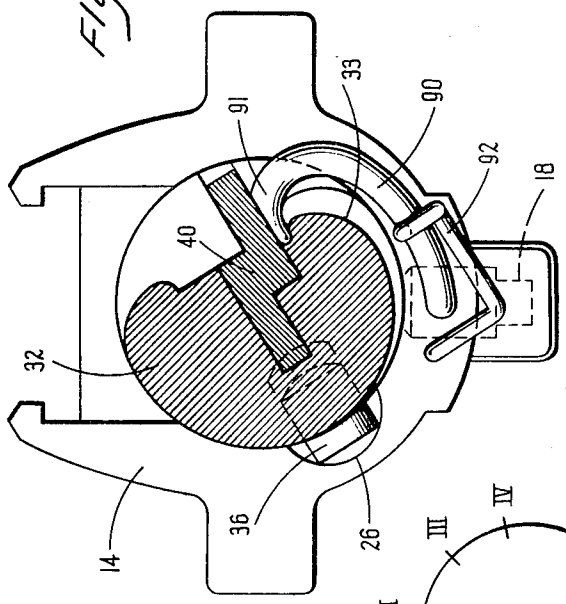
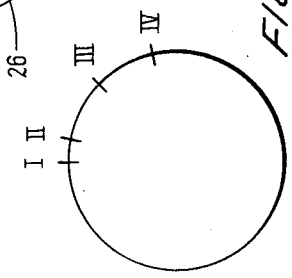


FIG. 11



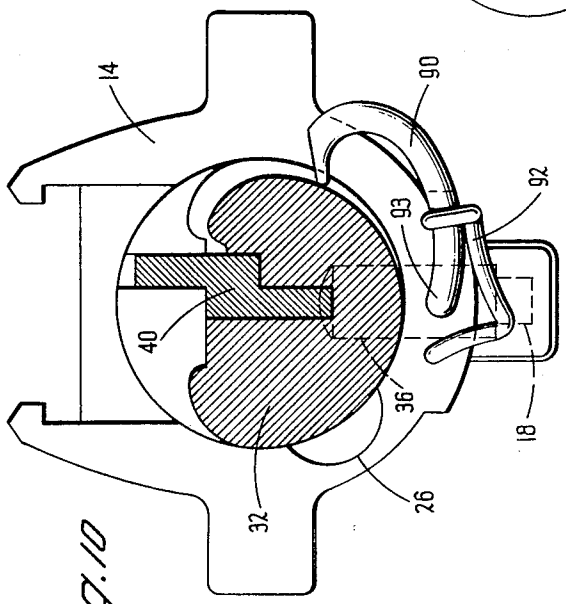


FIG. 10

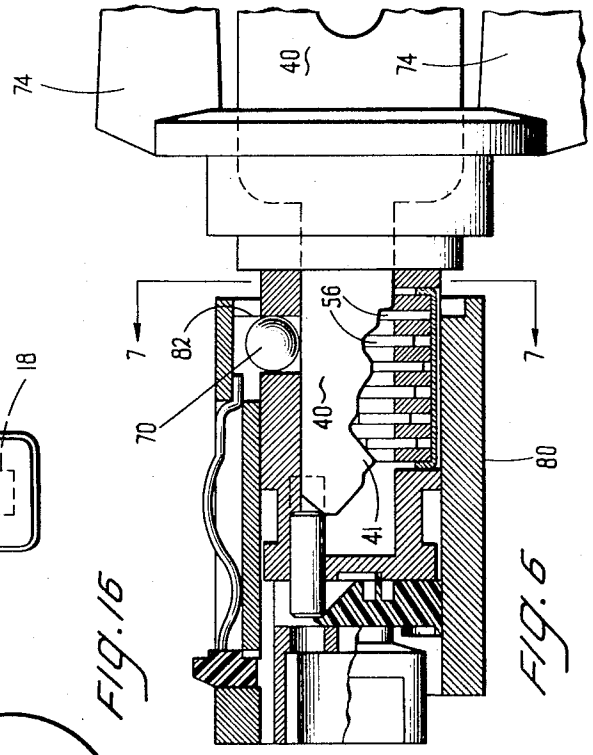


FIG. 16

FIG. 6

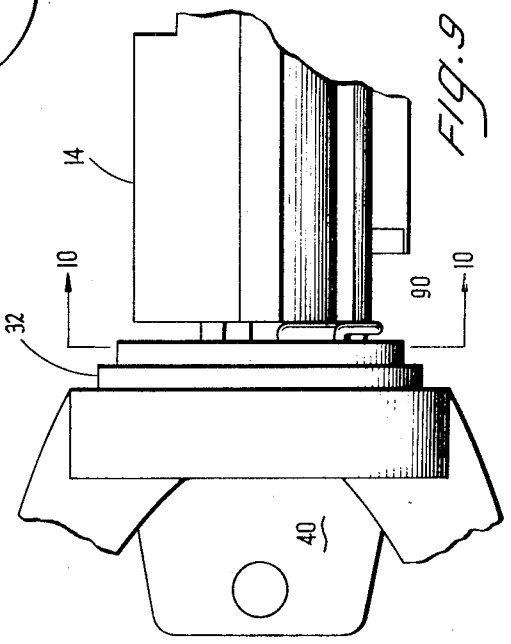


FIG. 9

INVENTOR
Delux J. Berube
BY
Wolf, Greenfield & Sacks

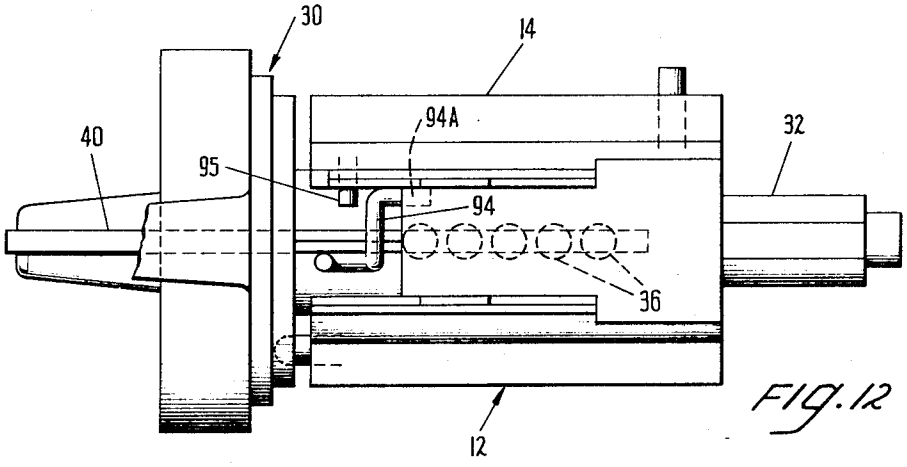


FIG. 12

FIG. 14

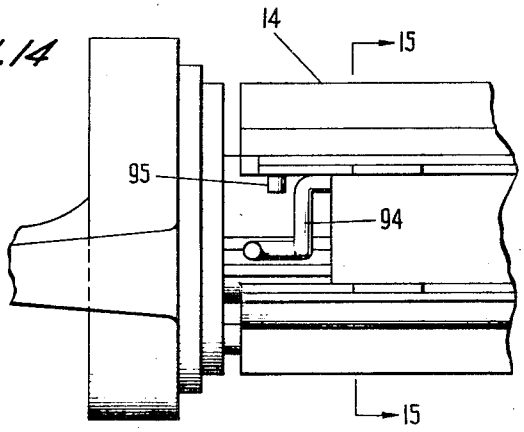
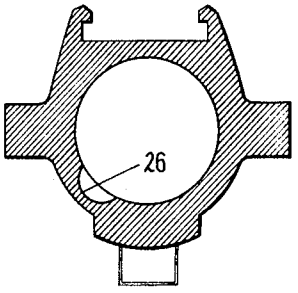


FIG. 15



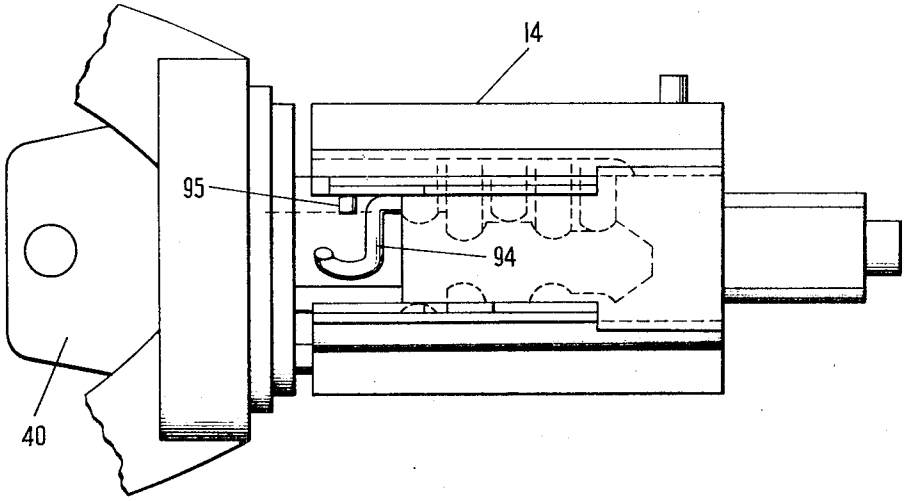


FIG. 13

INVENTOR
Felix J. Berube
BY
Wolf, Greenfield & Sacks

LOCK

BACKGROUND OF THE INVENTION

The present invention relates to a lock that is preferably used in a motor vehicle for starting the vehicle engine and is adapted to prevent an authorized operator from leaving the keys in the vehicle when the operator leaves the motor vehicle. More particularly, the present invention pertains to a lock mechanism that is adapted to prevent the operator from starting the vehicle after the proper key has unlocked the lock mechanism without first extracting the key from the lock mechanism. The lock mechanism is preferably constructed to prevent reinsertion of the key after the vehicle engine has started, thereby most probably causing the operator to deposit the key in a safe place such as his pocket.

A horrendous number of motor vehicles are stolen each year because an operator of the motor vehicle carelessly leaves the ignition key in the vehicle when it is left unattended. Various types of lock mechanisms are found in the prior art to prevent theft of motor vehicles. One known device is a buzzer which is activated when the operator turns the vehicle engine off and opens the vehicle door. There are some disadvantages, however, associated with this type of a safety device. Firstly, the circuit to the buzzer may be interrupted by merely extracting the key a slight amount such as a half inch out of the lock mechanism. Thus, the operator can still leave the key in the lock without the buzzer being activated. Secondly, assuming that the key is left in the lock, the buzzer is only activated as long as the door is open. Thus, an operator could quickly open and close the door producing a relatively short buzzer signal that might not be detected by others.

In another known lock mechanism, a key ejector is provided usually as part of the lock mechanism to eject the key automatically when the key is returned to the normal lock position. This type of a safety device is effective but only if the operator decides to return the lock mechanism to its locked position. With this type of a device, the operator would be tempted to hold the key in the lock mechanism after the engine had been turned off and subsequently return the lock to its ignition position without starting the vehicle again. As a result, the key remains in the lock mechanism and the operator leaves the vehicle in an unsafe condition. Another drawback to the use of a key ejector is that the additional parts required to produce a lock having this feature are usually costly.

Accordingly, it is one important object of the present invention to provide a lock that prevents an operator from leaving the keys in the vehicle when it is left unattended.

Another important object of the present invention is to provide a lock having means for preventing the operator from starting the vehicle after the proper key has unlocked the lock without first extracting the key from the lock.

A further object of the present invention is to provide a lock mechanism which includes means for preventing the operator from turning off the vehicle engine by rotating the key toward the locked position without first extracting the key from the lock.

Still another object of the present invention is to provide a lock mechanism for starting the motor vehicle including means for preventing reinsertion of the key into the lock mechanism after the vehicle engine has started. Normally, the lock mechanism is rotated clockwise to start the vehicle and thereafter returns slightly counterclockwise to a vehicle running position.

Still a further object of the present invention is to provide a lock mechanism wherein the proper key can be easily withdrawn from the lock mechanism when it has been moved to a position where the key has to be extracted in order to start the vehicle.

Still another object of the present invention is to provide a lock mechanism having means for deterring an operator from leaving the keys in the vehicle, that can be fabricated as cheaply or cheaper than known conventional lock mechanisms, and that can be easily adapted for use with such conventional lock mechanisms.

SUMMARY OF THE INVENTION

To accomplish these and other objects, the lock of the present invention comprises a mounting housing and a key-receiving means which is rotatable within the mounting housing and includes a key-receiving opening and means for locking the key-receiving means against rotation. The locking means is operable by insertion of a proper key in the opening of the key-receiving means to free it for rotation. Means are provided coupled between the mounting housing and the key-receiving means for limiting rotation of the key-receiving means after it has been freed for rotation and before it has reached a vehicle start position. To move to the vehicle start position, the key is extracted from the lock thereby most probably causing the operator to deposit the key in a safe place such as his pocket.

According to another aspect of the present invention, the lock includes a mounting housing and a key-receiving means rotatable within the housing and including a key-receiving opening and means for locking the key-receiving means against rotation. The locking means is operable by insertion of a proper key in the opening of the key-receiving means to free it for rotation. The key-receiving means has a vehicle running position which is a position assumed after the vehicle has been started. Means are provided in this embodiment for preventing rotation of the key-receiving means after it has assumed the vehicle running position and before it has been moved to the locked position. Thus, if the key is in the lock when the car is running, it has to be withdrawn from the lock before the vehicle engine can be turned off.

Numerous other objects, advantages, and features of the present invention should now become apparent upon a reading of the following detailed description in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded plan view partially in cross section of one embodiment according to the invention showing the mounting assembly and key assembly.

FIG. 2 is a plan view partially in cross section of the lock of FIG. 1 in an assembled position with the key inserted.

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2.

FIG. 4 is an exploded plan view partially in cross section of another embodiment according to the invention showing the mounting housing and key assembly.

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 4.

FIG. 5A is a fragmentary side view of the locking member of FIG. 5.

FIG. 6 is a plan view partially in cross section of the lock of FIG. 4 with the key assembly and mounting housing joined.

FIG. 7 is a cross-sectional view taken along line 7—7 of FIG. 6.

FIG. 8 is a plan view of one of the steps in FIG. 5 showing a modified notch.

FIG. 9 is a fragmentary plan view of another embodiment of a lock constructed according to the invention.

FIG. 10 is a cross-sectional view taken along line 10—10 of FIG. 9 with the lock in a locked position.

FIG. 11 is a cross-sectional view similar to FIG. 10 with the lock in a key-extracting position.

FIG. 12 is a plan view of another lock constructed in accordance with the invention in the normal locked position.

FIG. 13 is a plan view similar to FIG. 12 with the lock in a vehicle start or running position.

FIG. 14 is a fragmentary view similar to FIGS. 12 and 13 with the lock in a key-extracting position.

FIG. 15 is a cross-sectional view taken along 15—15 of FIG. 14.

FIG. 16 is a state diagram that schematically depicts one illustrative arrangement of the different positions of the lock.

DETAILED DESCRIPTION

Referring now to FIG. 1, there is shown a plan view partially in cross section of a lock constructed in accordance with the principles of this invention. This lock is a typical 1970 Ford lock modified to incorporate the principles of the present invention. The two main components of the lock shown separated in FIG. 1 are mounting assembly 12 and key assembly 30.

Mounting assembly 12 includes a hollow housing 14 which may be fabricated by a metal casting operation and is adapted to accommodate key assembly 30. Housing 14 has a series of five tubular passages 16 extending through its bottom wall 17. These passages 16 are aligned in a row, and a series of five pins 18 fit within these passages 16. Springs 19 are provided for each pin 18 to bias it in an upward direction. Retaining plate 20 is secured to the bottom of bottom wall 17 below the passages 16 and the bottom end of each spring 19 rests upon plate 20.

In accordance with this invention, hollow housing 14 is also provided with longitudinal groove 26 and arcuate groove 28 both of which are discussed hereafter with reference to FIGS. 2 and 3.

Key assembly 30 includes housing 32 which may at least in part be fabricated by a metal casting operation. Housing 32 is partially hollow and includes a bottom wall 31 having a series of five holes 34 extending therethrough. Housing 32 also has a passage 46 in which ball bearing 44 may freely move in an up-down direction. The outer end of passage 46 may be peened so that ball bearing 44 remains therein. Gripping flanges 38 are provided as a part of housing 32 to assist in rotating key assembly 30 when the key is inserted therein.

Referring now to FIG. 2, there is shown a plan view mostly in cross section of the assembled mounting assembly 12 and key assembly 30. In FIG. 2, key 40 is inserted into assembly 30 but assembly 30 is not rotated with respect to mounting assembly 12. The proper key 40 has been inserted into key assembly 30 and the different heights of pins 36 mate with grooves provided in key 40. The bottom surfaces of all pins 36 define a horizontal plane with both the bottom surface of wall 17 and the top of pins 18. In this position, key assembly 30 can rotate relative to assembly 12, and ball bearing 44 is forced downward in passage 46 by key 40, moves into slot 28 in housing 14.

FIG. 3, which is a cross-sectional view taken through ball bearing 44, shows key assembly 30 rotated to a second position wherein further rotation is prevented as long as key 40 remains in lock 10. This position may be referred to as the key-extracting position. Ball bearing 44 remains in slot 28 as long as key 40 is within recess 42 of assembly 30. In FIG. 3, ball bearing 44 has touched against shoulder 29 of slot 28 and thus limiting further rotation of assembly 30 relative to mounting assembly 12.

Longitudinal groove 26 is shown in FIG. 1 and in dotted in FIG. 3. Groove 26 is provided so that key 40 can be easily withdrawn from key assembly 30. Thus, when ball bearing 44 has prevented rotation of key assembly 30 pins 36 are allowed to drop into groove 26 and key 40 can be easily withdrawn without any of the taller pins 36 obstructing such withdrawal. When key 40 is withdrawn, ball bearing 44 may then move upwardly in passage 46 and key assembly 30 may be rotated further clockwise to start the vehicle.

Referring now to FIG. 4, there is shown a plan view partially in cross section of a lock constructed in accordance with this invention. This lock is a typical 1970 Chevrolet lock modified to incorporate the principles of the present invention. The two main components of the lock shown separated in FIG. 4 are key assembly 50 and mounting housing 80. Mounting housing 80 may be fabricated to a metal casting technique and is adapted to accommodate key assembly 50. Mounting housing 80 includes an arcuate groove 82 having a shoulder 84 (see FIG. 7) and a slot 86.

Key assembly 50 includes a housing 52 which may be least in part be fabricated by a metal casting operation. Housing 52 is partially hollow and includes a series of six slots 54 for accommodating six steps 56. FIG. 5 shows the configuration of each step 56 most clearly. A series of six springs 58 are positioned below each respective step 56 for biasing the step upwardly. The bottom end of each spring 58 rests on retaining plate 63 which is secured to a bottom wall 59 of housing 52. Housing 52 is also provided with a passage 72 through its top portion for accommodating ball bearing 70 which is adapted to slide within passage 72, and when a key 40 is inserted into assembly 50 ball bearing 70 is adapted to rise above the top surface of key assembly 50 into groove 82.

Referring now to FIG. 5 there is shown a cross-sectional view taken along line 5—5 of FIG. 4. This view indicates how the lock is unlocked. Step 56 which fits within slot 54 includes a top edge 61 over which a key 40 may move, a notch 62 and a downwardly extending tab 60. Spring 58 fits about tab 60 and biases step 56 upwardly.

Notch 62 is provided to accommodate wedge-shaped end 67 of locking member 64. A pair of retaining strips 68 are imbedded in housing 52 at both ends and are spaced as indicated in FIG. 5A. A set of springs 66 extend between strips 68 and extending sidewalls 69 of locking member 64. These springs 66 bias locking member 64 toward the right as viewed in FIG. 5. Locking member 64 also includes protruding flange 65 which is adapted to fit within slot 86 (see FIGS. 4 and 7) when the lock is in a locked position and to move to the position shown in FIG. 5 when the lock is unlocked.

When a proper key 40 is inserted into assembly 50 all of the notches 62 of each step 56 are aligned in a straight line and wedge 64 is permitted to move into these notches 62 with flange 65 no longer extending outwardly into slot 86. The lock is then in a position wherein key assembly 50 may be rotated clockwise relative to mounting housing 80.

FIG. 6 shows a plan view partially in cross section of the lock of FIG. 4 with key assembly 50 within mounting housing 80. Key 40 is shown inserted into key assembly 50 and some of the steps 56 are shown in a different vertical positions. The insertion of key 40 has also forced ball bearing 70 up into arcuate groove 82. The view of FIG. 7 taken along line 7—7 of FIG. 6 indicates the position of ball bearing 70 when the lock has been unlocked and before the key assembly 50 is rotated. When the key assembly 50 is rotated, ball bearing 70 follows arcuate groove 82 until it hits shoulder 84. This prevents further clockwise rotation of key assembly 50. In order to start the vehicle, key 40 must be withdrawn from assembly 50 thus enabling ball bearing 70 to fall within passage 72 and key assembly 50 to rotate in a clockwise direction to start the vehicle.

In order to enable easy withdrawal of key 40, the notch 62 shown in FIG. 8 may have to be lengthened on some of the steps 56. In a conventional lock, each of these steps is assigned code Nos. 1–5. The higher the code number of each step 56, the lower the notch is, as viewed in FIGS. 5 and 8. It has been found that by providing longer notches for steps having code Nos. 3, 4, and 5 that the key may be withdrawn quite readily. FIG. 8 shows a modified step 56 with a notch 62 having a length *d*. Referring again to FIG. 6, it is apparent that the lower portion 41 of key 40 would prevent withdrawal of the key if these higher numbered steps 56 were not notched as shown in FIG. 6.

Referring now to FIG. 9, there is shown a fragmentary plan view of another embodiment of a lock constructed according to the invention. The lock shown in FIG. 9 is a Ford lock similar to that shown in FIG. 1. This lock includes a hollow housing 14 and a mounting housing 32. FIG. 10 shows a cross-sectional view taken along line 10—10 of FIG. 9 when key 40 is first inserted into the key assembly 30 but before key assembly 30 is rotated clockwise. For this embodiment of the invention, a limiting arm 90 having an L-shaped spring 92 extending thereabout is fixed at its end 93 to housing 14. Spring 92 is also usually imbedded within a hole in housing 14. Spring

92 is adapted to bias arm 90 inwardly so that it will hit against key 40 when key 40 is rotated.

Referring now to FIG. 11, there is shown a cross-sectional view with key 40 rotated to an approximate 45° angle. The flat end 91 of limiting arm 90 has hit against key 40 preventing further rotation thereof. A slot 26 similar to that shown in FIG. 1 is provided so that key 40 may be withdrawn by allowing pins 36 to fall into slot 26. Once the key 40 is withdrawn, however, arm 90 no longer blocks the rotation of key assembly 30 and the vehicle may be started.

Referring now to FIG. 12, there is shown a plan view of still another lock constructed in accordance with this invention. This lock is also a modified Ford lock. This embodiment is adapted to prevent an operator from leaving the key in the vehicle when he desires to shut the vehicle engine off. For this embodiment, the key is assumed to be within the key assembly 30 prior to stopping the vehicle. A stop hook 94 is provided for preventing the vehicle from being turned off unless the key 40 is withdrawn. FIG. 12 shows a plan view of the mounting assembly 12 and key assembly 30. Key 40 has been inserted into assembly 30 and stop hook 94, which extends from a hole 94A in the housing 14, has ridden above key 40. In FIG. 13, key 40 has been rotated clockwise about 90° and hook 94 has followed the contour of assembly 30. The vehicle can then be started. When the operator decides to shut the vehicle engine off, the key 40 is rotated counterclockwise (see FIG. 14) and the hook 94 hits against key 40 preventing further counterclockwise rotation. In FIG. 15, the slot 26 is provided to allow withdrawal of the key. After the key has been withdrawn, stop hook 94 falls within key recess 42 in key assembly 30 and the vehicle ignition may be turned off.

Referring now to FIG. 16, there is shown a typical state diagram indicating different positions that the key assembly may assume relative to the secured mounting housing. This diagram may relate to either the Ford or Chevrolet locks, for example. State I is the locked position. State II is shown relatively close to State I and may be referred to as the extracting position wherein the key has been rotated clockwise and cannot be rotated any further. State III is the ignition on state or the normal running State which usually are one and the same. State IV is the position to which the key assembly would have to be rotated in order to start the vehicle. After such rotation a spring means (not shown) is conventionally provided for returning the key assembly to position III.

In FIG. 16, State I has been provided close to State II so that when the vehicle is running and the key assembly is in the State III position, the key may not be reinserted. In the Ford lock, for example, the key can only be inserted and extracted when the slot 26 is aligned with the key 40. In position III, this would not be the case and the operator would have to turn the key almost to the off (locked) position fore the key could be inserted. This is a helpful deterrent to prevent the operator from reinserting the key, thereby preventing a possible theft of the vehicle. To physically implement this type of operation, the groove 28 would be made shorter in length than that shown in FIG. 3.

The Chevrolet lock shown in FIG. 4 may also be designed in accordance with the state diagram of FIG. 16. With this lock, the key cannot be reinserted unless ball bearing 70 is allowed to move into groove 82. Thus, if groove 82 is made shorter in length than shown in FIG. 7, position II would be close to position I, and the key could not be inserted in position III because ball bearing 70 would be entirely within passage 72 thus preventing insertion of the key. The key assembly would have to be turned almost to the locked position I before the key could be inserted.

Having described certain features of the present invention, numerous modifications can be made in the embodiment disclosed. For example, the drawings indicate one placement for the ball bearing and associated groove. However, other arrangements could be used depending on the peculiar structure of other locks. Also, the teachings herein of some of the different embodiments, particularly the Ford lock, may be combined to provide an extremely safe lock. For example, the embodiments of FIGS. 1 and 12 could be combined thereby requiring the operator to withdraw the key prior to starting the engine and also to withdraw the key, if it is reinserted, prior to turning off the engine.

According to this invention means are also provided for withdrawing the key when in the accessory position also. Then the operator can use the vehicle accessories and subsequently return the lock to the locked position without using the key. To provide this feature in the Ford lock a second longitudinal groove similar to groove 26 may be provided in housing 14 at an opposite angle to that shown in FIG. 3 so that when housing 32 is rotated counterclockwise to the accessory position the key can be withdrawn. With the Chevrolet lock the key can be easily withdrawn from the lock if the steps 56 are altered as shown in FIG. 8. The arcuate grooves in both the Ford and Chevrolet locks would also extend in both directions similar to that shown in FIG. 3, so that the key can be inserted and turned without the ball bearing hitting any shoulder.

Certain embodiments of the present invention have been disclosed herein. However, numerous changes in and modifications of these embodiments are contemplated as falling within the scope of this invention which should be limited only by the appended claims.

What is claimed is:

1. A lock comprising;
a mounting housing,
a key-receiving means rotatable within said housing including a key-receiving opening and means for locking the key-receiving means against rotation, said locking means operable by the insertion of a proper key in the key-receiving opening to free the key-receiving means for rotation,
and means coupled between the mounting housing and the key-receiving means for preventing rotation of said key-receiving means after said key-receiving means has been freed for rotation and before said key-receiving means has reached a vehicle start position,
said mounting housing having means defining a slot extending lengthwise of said housing,
said locking means including a plurality of pins that are alignable when the proper key is inserted in the key-receiving opening to free the key-receiving means for rotation, and that are free to extend into said slot when the means for preventing rotation has stopped further rotation of the key thereby enabling withdrawal of the key.

2. A lock as set forth in claim 1 wherein said means for preventing rotation includes a ball bearing, said key-receiving means having a passage therein for accommodating said ball bearing, said mounting housing having a groove therein for accommodating said ball bearing when said lock is in a locked position with said key inserted into said lock.

3. A lock as set forth in claim 2 wherein said groove in said mounting housing terminates in a shoulder against which said ball bearing may move to prevent further rotation of said key-receiving means relative to said mounting housing as long as said key is in said key-receiving means.

4. A lock as set forth in claim 1 wherein said means for preventing rotation is operative after said key has been withdrawn from said key receiving means to allow said key-receiving means to be rotated to the vehicle start position.

5. A lock comprising;
a mounting housing,
a key-receiving means rotatable within said housing including a key-receiving opening and means for locking the key-receiving means against rotation, said locking means operable by the insertion of a proper key in the key-receiving opening to free the key-receiving means for rotation,
and means coupled between the mounting housing and the key-receiving means for preventing rotation of said key-receiving means after said key-receiving means has been

freed for rotation and before said key-receiving means has reached a vehicle start position,

said locking means including a locking member and a plurality of actuable members each having a surface engageable with the key when the key is inserted in the key-receiving means and a second surface having a notch therein for accommodating the locking member,

all said notches being aligned when the proper key is inserted to enable freeing of the key-receiving means for rotation,

at least one of said actuable members having a notch that has a length greater than the length of other notches.

* * * * *