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LOCK KEY EJECTOR

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2 Sheets-Sheet 2

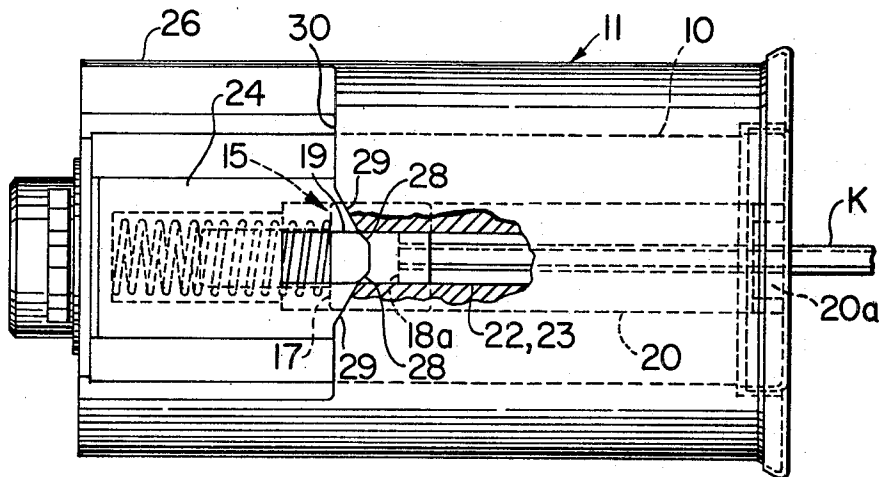


Fig. 2

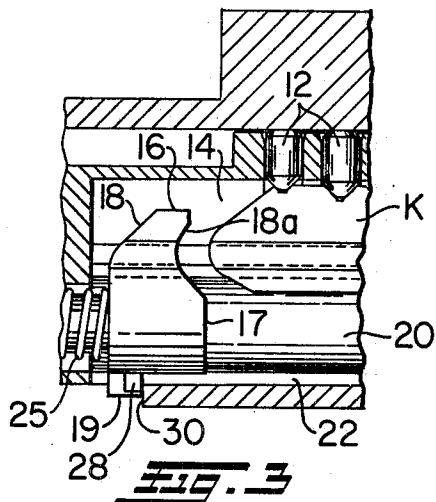


Fig. 3

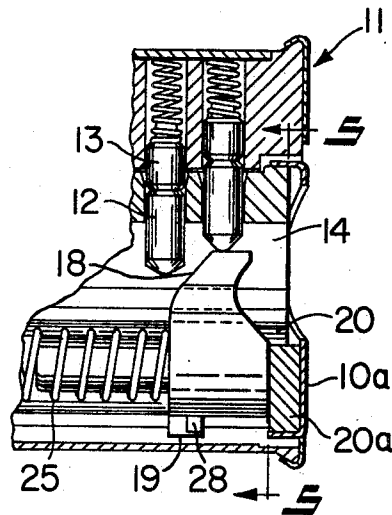


Fig. 4

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LOCK KEY EJECTOR

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12 Claims

ABSTRACT OF THE DISCLOSURE

A key ejector is mounted to slide in a guide bore that coextends with the keyway in a key plug of a lock cylinder, and has a portion moving in the keyway for coacting with a key. The ejector is pressed in ejecting direction by a spring that is supported on the key plug so as to apply no side pressures through the outer cylinder to the tumblers. When the key plug is rotated away from locked position, cam surfaces coact on the cylinder and ejector to move the ejector longitudinally away from the key so that no ejecting pressure will be applied through the key to the tumblers. The cam surfaces also act to center the key plug in its locked position, aligning the tumblers so that they may move freely and will not oppose a key ejecting movement of the ejector.

This invention relates to locks, and more particularly to a novel and effective ejector for ejecting a key from a lock.

As will be understood by persons skilled in the art, key ejectors generally comprise a spring pressed device that will be depressed by a key inserted into the keyway of a key plug, and that will apply its pressure for ejecting the key from the keyway. The key ejectors are much to be desired in automobile locks, where they prevent leaving a key in the lock when the ignition has been turned off by the movement of the key plug to locked position. In recent years, thefts of automobiles have increased to a large extent because owners tend to leave keys in ignition locks. Obviously, a key ejector will prevent carelessness of this type.

Despite their value, key ejectors have not reached wide acceptance. This is due at least in part to the fact that the usual key ejector maintains pressure on the key while the lock is in release position, causing wear on the tumblers and other parts of the lock so that the lock deteriorates, and sooner or later will not operate in the way it should. In some instances the ejectors have been designed to relieve their pressure against the key, but the pressures are not fully controlled and may oppose necessary movements of the tumblers. For that reason the ejector may fail to operate, and again there will be wear. So far as we know, there has not existed until the present time a key ejector that is fully satisfactory.

Through the novel concept of our invention, we contribute a key ejector that will not oppose the proper operation of a lock mechanism, yet will offer fully dependable ejecting action, all while causing the least possible wear on the lock mechanism.

In the novel concept of our invention, we utilize a key ejector that is movable on the key plug of a lock, with a spring pressing the ejector in key ejecting direction. Our concept resides more particularly in means that will be responsive to a rotating movement of the key plug to move the key ejector against the pressure of its spring, while the spring is merely supported on the key plug. In effect we not only free the lock tumblers of pressures due to the key ejector when the tumblers cannot move, as when the key plug rotates, but we also hold the tumblers free of pressures that might prevent a movement of the tumblers when they should move.

As a particular feature, we utilize camming means that will coact with the ejector upon rotation of the key plug, and that will hold the ejector against the pressure of its spring. As a part of this feature, we so construct the camming means as to move the ejector in a longitudinal direction on the key plug.

As another feature, we equip the camming means with surfaces through which the spring pressure of the key ejector will act to press the key plug toward its locked position. Some slight additional effort will be necessary to rotate the plug from locked position, but the key plug when rotated back to that position will actually be centered by the ejector pressure, so that the tumblers will be relatively free to move and it will be impossible for the tumblers to hold the key against the ejecting pressure. Again, wear of the key and the tumblers is avoided, and moreover, the ejector will not fail to operate at the proper time.

We have thus outlined rather broadly the more important features of our invention in order that the detailed description thereof that follows may be better understood, and in order that our contribution to the art may be better appreciated. There are, of course, additional features of our invention that will be described hereinafter. Those skilled in the art will appreciate that the conception on which our disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of our invention.

Referring now to the drawings:

FIG. 1 shows a longitudinal section of a lock utilizing our novel key ejector.

FIG. 2 shows a bottom view on the broken line 2—2 in FIG. 1.

FIG. 3 is similar to a portion of FIG. 1, but illustrates the retracted position of the ejector.

FIG. 4 shows the key ejecting position of the ejector.

FIG. 5 shows a view on the line 5—5 in FIG. 4.

For the purpose of describing our invention, we show in FIG. 1 a lock having a key plug 10 that is mounted in a bore of a cylinder 11, and that will be controlled through a usual arrangement of pin tumblers 12 and spring pressed drivers 13. The key plug 10 may rotate away from a locked position in the cylinder bore when tumblers 12 are set in a release position by a key K that is inserted into a keyway 14 of the key plug 10, as is shown in FIG. 1, all as will be understood by those skilled in the art.

The novel key ejector of our invention is indicated generally by the numeral 15 and is shown depressed by the key K in FIG. 1, it being understood that manual pressure is applied to the key. In the form that we prefer, the ejector 15 comprises a bar portion 16 that is movable in a longitudinal direction in the keyway 14, and a relatively wide guide portion 17 which is formed on the bottom of the bar portion 16 as viewed in FIG. 1. A rearward surface 18 on the bar portion 16 is inclined for moving the tumblers 12 so that ejector 15 may move in a rearward direction past the tumblers. We prefer to form the forward surface of bar portion 16 with a recess 18a for accepting the end of key K. The ejector 15 also comprises a cam part 19 on the bottom of the guide portion 17.

In the key plug 10 we form a longitudinal bore 20 that coextends with the keyway 14 and that will form a guide channel for sliding movements of the ejector guide portion 17. The bore or guide channel 20 communicates through a slot 21 with keyway 14, and offers clearance for movements of ejector bar portion 16 as the ejector substantially slides the length of keyway 14. In the form that we have chosen to illustrate, the key K will move in the keyway slot 21 while guided by the usual ribs 14a in keyway 14. When ejector 15 slides, its cam part 19 will move in a slot 22 that is formed through the bottom of

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key plug 10, while also moving in a groove 23 that is formed in the surface of the cylinder bore. For holding the ejector 15 assembled in the front end of bore 20, we show a disk 20a assembled inside a scalp 10a on the key plug 10.

The key plug 10 is equipped with a rearward end portion 24 into which extend the keyway 14, guide bore 20, and slots 21, 22, permitting ejector 15 to slide in a longitudinal direction somewhat farther than the point to which key K will move when inserted in keyway 14. The end portion 24 of the key plug further has a chamber for a coil spring 25 that will press the ejector 15 in a forward direction for ejecting the key K from keyway 14. The lock cylinder may have an extended part 26 on which is a bearing 27 for the end portion 24 of the key plug.

When inserted into the keyway 14, the key K naturally will move in contact with the ejector portion 16 and will slide the ejector against its spring pressure. Full insertion of the key K, that is, to its position setting the tumblers 12, will place the ejector 15 in the depressed position shown in FIGS. 1 and 2, the cam part 19 on the ejector remaining at least partly in the cylinder groove 23. As best seen in FIG. 2, we form coacting cam surfaces 28, 29 on the ejector cam part 19 and cylinder 11. Cam surfaces 28, 29 are closely juxtaposed to one another when ejector 15 is in its depressed position, and are so inclined that the spring pressure of ejector 15 will tend to hold key plug 10 centered in its locked position.

The tumblers 12 being set by the key K, as in FIG. 1, the coaction between cam surfaces 28, 29 will enable the key plug 10 to rotate away from locked position through yielding of the key ejector 15. A rotated position of key plug 10 is shown in FIG. 3, in which it will be seen that the yielding of ejector 15 has placed it in a retracted position that is beyond the position to which it was depressed by the key K. The cam part 19 now has moved behind a laterally extending surface 30 on the lock cylinder 10, and that surface 30 will hold ejector 15 in its retracted position while the key plug rotates farther.

It will thus be seen that the cam part 19 of our key ejector 15 forms a control portion that will impinge upon the lock cylinder 11 when key plug 10 rotates, so that the cylinder will hold the ejector out of contact with a key. Thereby the ejecting pressures need not be accepted by biting surfaces of the key K or by the tumblers 12 while the key plug is away from its locked position.

Now let us see what happens when the key plug 10 is rotated back to locked position. Ejector 15 at first will be held retracted, as in FIG. 3, but when the key plug is very nearly in locked position, a cam surface 28 on the ejector control portion 19 will move against one of the cylinder cam surfaces 29. Ejector 15 then will move by its spring pressure, acting through surfaces 28, 29 to center the key plug in its locked position while the control portion 19 moves into the key plug slot 22.

To appreciate the centering operation of our ejector, it should be realized that its movement actually has placed the tumblers 12 in aligned relation to the drivers 13. It should be recalled also that the ejector spring 25 acts merely between its mounting on the rearward plug portion 25 and the ejector 15. The ejector lug 19 now is free to move in the groove 23 of the lock cylinder, but the ejector spring 25 can cause no movement in an axial direction between cylinder 11 and key plug 10, as might be possible due to manufacturing tolerances. Therefore, the plug and cylinder will apply no side pressures to the tumblers and drivers, and the tumblers and drivers will not fail to move to locking position when key K moves from the keyway 14. Also the tumblers 12, being relatively free to move due to the actual centering of the key plug, cannot oppose key ejecting pressures to any great extent. Upon centering the key plug 10, the key ejector 15 has moved into contact with the key, as in FIGS. 1 and 2, and now will move by its spring pressure to the

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position shown in FIG. 4 whereby to eject the key, all without causing pressures that may injure the tumblers 12 or other parts of the lock.

We wish to point out also that our key ejector 15 will act substantially through the length of the keyway 14. That enables us to eject the key fully from the keyway even though there may be some opposition to the ejecting movements, as by the weight of further keys that may be attached to the particular key.

We believe it will now be understood that we contribute by our invention a novel key ejector that will operate extremely well, and that also will permit a locking mechanism to operate with full efficiency and without undue wear. Therefore, we believe that the very considerable value of our invention will be understood, and that its merits will be fully appreciated by those skilled in the art.

We now claim:

1. In a combination of the class having a cylinder, a key plug equipped with tumblers and rotatably mounted in a bore of said cylinder, said key plug having a keyway for the insertion of a key to set the tumblers so as to release the key plug for rotation from a locked position relatively to the cylinder, a key ejector movable in said key plug, a spring mounted in said key plug, and including surfaces between which said spring presses on said key plug and on said ejector to move said ejector in a direction ejecting a key from said keyway unless the tumblers are effective to hold the key in the keyway, the improvement that comprises camming means acting between the cylinder and said ejector in opposed relation to the pressure of said spring as said key plug rotates whereby to relieve said key of the pressure of said key ejector.

2. In the combination of claim 1, the feature that said key ejector is mounted in said key plug for rotation therewith when said key plug is key rotated, a portion of the ejector impinging upon the cylinder when the key plug rotates so as to hold the ejector against the pressure of its spring.

3. In the combination of claim 2, the feature that said key ejector slides in the keyway of said key plug, and said camming means including surfaces coacting on said portion of the ejector and on said cylinder to slide the ejector rearwardly in the keyway and away from the key upon rotation of the key plug.

4. In the combination of claim 1, the feature that said key ejector slides in the keyway of said key plug, and said camming means including surfaces coacting on said ejector and on said cylinder to slide the ejector rearwardly in the keyway and away from the key upon rotation of the key plug.

5. In the combination of claim 1, the feature that said camming means include surfaces that engage for pressing said key plug to its locked position.

6. In the combination of claim 2, the feature that said camming means include surfaces that engage for pressing said key plug to its locked position.

7. In a lock having a cylinder and a key plug that is mounted in a bore of said cylinder, said key plug being rotatable relatively to a locked position in said bore when a key is inserted into a tumbler setting position in the keyway of the key plug, a key ejector movable longitudinally in the keyway, and a spring mounted in said key plug and acting between a surface on the key plug and a surface on the ejector to press the ejector in key ejecting direction, said key ejector yielding so as to be moved by key contact to a depressed position when the key is inserted into tumbler setting position, the improvement that comprises means for controlling pressures applied in ejecting direction to the key, and including means responsive to a rotating movement of the key plug to effect a relative movement between the key ejector and key.

8. The construction set forth in claim 7, in which there are means acting when the key plug rotates away

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from locked position to move the key ejector longitudinally beyond the depressed position to which it is moved by the key.

9. The construction set forth in claim 8, including means mounting the key ejector for longitudinal sliding in the key plug, and cam means acting between the lock cylinder and the ejector to effect the movement of said ejector beyond depressed position.

10. The construction set forth in claim 9, in which said cam means include coacting surfaces on the spring pressed ejector and the cylinder for pressing the key plug to its locked position.

11. In a lock having a cylinder and a key plug that is rotatable relatively to a locked position in a bore of said cylinder when a key is inserted into position in the keyway of the key plug, and a key ejector movable in the keyway and spring pressed for ejecting the key from the keyway, said key ejector yielding so as to be moved by key contact to a depressed position when the key is inserted in the keyway, the improvement that comprises an ejector guide channel formed in coextending relation to the keyway in the key plug and in communication with said keyway, a guide portion of the key ejector slidable in said guide channel, and a coil spring mounted in said

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key plug and acting between a portion of the key plug and said guide portion of the ejector in the channel so as to apply ejecting pressure while the ejector substantially moves along the length of the keyway.

12. The construction set forth in claim 11, including a cam part formed on the guide portion of the key ejector, a cam portion formed in a position on said cylinder to lie in juxtaposed relation to the cam part of the ejector when said ejector is moved to its depressed position, and said cam portion and cam part comprising surfaces co-acting to move the ejector beyond said depressed position when the key plug rotates away from locked position.

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