Feb. 15, 1966 F. J. RUSSELL ETAL 3,234,768

KEY ACTUATED MECHANISM WITH TEMPORARY BALL TUMBLER

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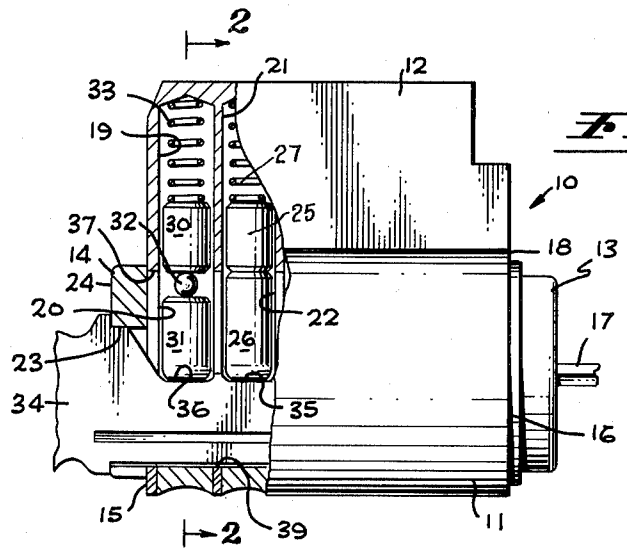



Fig. 1

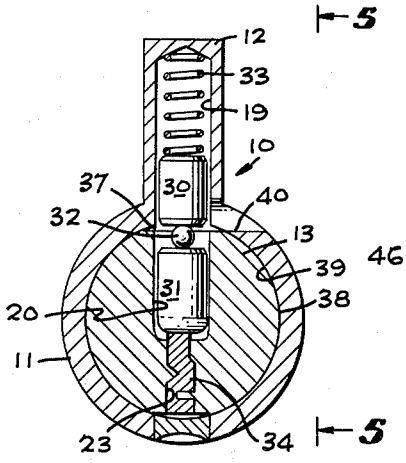



Fig. 2

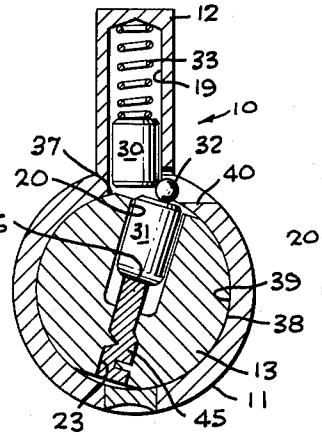



Fig. 3

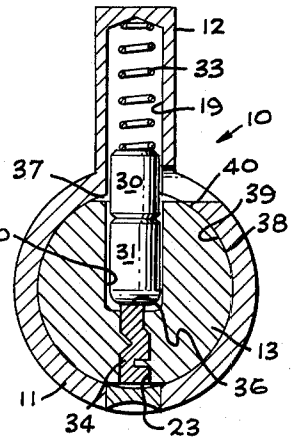



Fig. 4

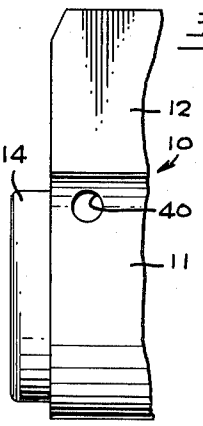



Fig. 5


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# KEY ACTUATED MECHANISM WITH TEMPORARY BALL TUMBLER

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The invention relates to locks and more particularly to improvements in tumbler lock cylinders of the type disclosed in co-pending application Serial Number 199,389, filed June 1, 1962, now Patent No. 3,175,379.

Tumbler lock cylinders are used to a great extent in door locks, night latches, padlocks, and many other types of locking devices, but those now in general use suffer the common disadvantage of having to be completely disassembled in order to change their pin tumbler combinations. This generally requires the services of a skilled locksmith; and in cases where it is necessary to change the combinations of a large number of lock cylinders, the task is both time consuming and expensive.

Some devices have already been devised for changing the keying of locks of the tumbler type which are especially advantageous in changing from construction key systems to owner key systems, but most of those heretofore available are to a degree objectionable because of operating in such fashion that a portion of the lock's structure is mutilated when a changeover is made. Others have the objection of making it necessary to provide costly auxiliary apparatus in the lock device useful only during the construction period, the structure moreover being such that portions of the added structure need to be carried permanently by the lock device at unwanted locations even though they are no longer useful. Others are susceptible to accidental unintentional changeover, and still others require a construction which reduces the security of the lock, especially after changeover. More recently, locks of this kind have been devised wherein portions of the mechanism or perhaps a tool receiving aperture is exposed to the face of the lock to the detriment of its appearance and also at a location where tampering is invited. Still others require the key to be rotated a considerable angular distance before an extra part can be ejected from the system, and these frequently depend upon gravity only to eject an extra tumbler, circumstances being such that if the ejection passage is relatively small, it may clog just sufficiently to prevent ejection of the tumbler and as a result render the lock useless until it can be taken apart and readjusted.

It is therefore among the objects of the invention to provide a new and improved selective key lock system useful as a construction key lock system which is of such character that, even though a changeover has been made from one selected key lock system to another selected key lock system, the changeover will be such as to incur no radical change in what is otherwise a substantially standard lock construction.

Another object of the invention is to provide a new and improved tumbler lock cylinder, the combination of which may be changed by rotation of the key plug through less one hundred and eighty degrees and which is therefore well suited for use in those locking devices, particularly door locks, the mechanisms of which are designed to operate in less than one-quarter turn of the key plug.

Another object of the invention is to provide a new and improved lock cylinder which is so constructed that one or more of the tumblers initially provided therein may be permanently moved from operating position without disassembling the lock cylinder in order to change its tumbler combination.



A further object of the invention is to provide a lock cylinder wherein the pin tumbler combination may be permanently changed simply by use of a regular key provided for operating the lock cylinder.

A further object still of the invention is to provide a new and improved selective key lock system whereby the keying arrangement can be easily altered on the completion of some event such as completion of construction, the rekeying of the system being such that it is simple, positive, and inexpensive, and at the same time capable of making certain that only the user of an owner key can make the changeover from construction setting to owner setting.

To appreciate the need for a simple, effective rekeying system like that herein disclosed, it should be appreciated that one of the more practical uses for lock cylinders embodying the present invention is in the door locks of tract houses or of a large building. During the construction period, each of the contractors is usually given a temporary or construction key which will operate all of the lock cylinders of the installation, so that the contractor may enter locked premises at any time to perform his work. When the building has been completed, it is common practice to change the combinations of the various lock cylinders so that they can no longer be operated by the construction key, thus preventing entry by unauthorized or unscrupulous persons who might have gained possession of the construction key. Heretofore, it has been necessary to disassemble each lock cylinder in order to change its combination, but with the present invention, the combinations of the lock cylinders may be easily and quickly changed by a person possessed of an authorized key in a manner such that after the change, a construction key can no longer open the lock.

With the objects heretofore set forth in view the invention consists in the construction arrangement and combination of the various parts of the device whereby the objects contemplated are attained as hereinafter set forth, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view of the device partially broken away showing a temporary or construction key inserted therein.

FIGURE 2 is a cross sectional view taken on the line 2—2 of FIGURE 1 showing the temporary or construction key in place.

FIGURE 3 is a view similar to FIGURE 2 showing a permanent or owner key in position partially rotated as in rekeying.

FIGURE 4 is a view similar to FIGURE 2 showing the new position of the setting after rekeying and with the construction key in place.

FIGURE 5 is a fragmentary side elevational view of the left-hand end of the device as viewed in FIGURE 1 if it were not a cutaway.

In the device chosen for the purpose of illustration, there is shown a housing indicated generally by the reference character **10** having a cylindrical portion **11** and an integral radially extending casing **12** along one side, namely, the upper side as viewed in the figures of the drawing. Rotatably mounted in the cylindrical portion **11** of the housing **10** is a cylindrical key plug **13** having a flange **14** at the outer end overlying an outer face **15** of the cylindrical portion **11** and a retaining ring **16** fastened to the key plug **13** in the usual fashion overlying an inner face **18** of the housing **10** whereby the key plug **13** is secured rotatably in position. Following conventional practice, a spindle **17**, nonrotatably attached to the key plug **13** serves to carry operation of the key plug **13** to the customary lock parts (not shown).

At the outer end of the device is a first set of tumbler

holes 19 and 20, the tumbler hole 19 being in the casing 12 and the tumbler hole 20 being in the cylindrical portion 11. These tumbler holes are in alignment in one position of rotation of the key plug 13, namely, the position shown in FIGURES 1, 2, and 4 and when in alignment may be described as forming together a first tumbler bore. Inwardly from the first tumbler bore are additional tumbler bores spaced from each other in the usual fashion throughout the length of the housing 10, there being one tumbler bore shown for purposes of illustration consisting of a tumbler hole 21 in the casing 12 and a matching tumbler hole 22 in the key plug 13. The key plug 13 has an axially extending keyway 23 running the length of the key plug 13 inwardly from an outer end 24, the keyway 23 being in communication with each of the tumbler bores.

In each of the tumbler bores formed as described by the set of tumbler holes 21, 22 is a set of tumbler elements, namely, a driver tumbler element 25 and a driven tumbler element 26, the driver tumbler element 25 being normally spring pressed downwardly by means of a spring 27.

In the outermost tumbler bore made up of the tumbler hole 19 and tumbler hole 20 is a set of tumbler elements consisting initially of a driver tumbler element 30 in the tumbler hole 19, a driven tumbler element 31 in the tumbler hole 20 and a temporary tumbler element 32 positioned therebetween. A spring 33 acts against the driver tumbler element 30 to urge it into the position of engagement shown. The temporary tumbler element 32 is preferably in the form of a ball appreciably smaller in diameter than the diameter of the tumbler bore and the driver and driven tumbler element contained therein.

When the temporary tumbler element 32 is in position, the device may be said to be keyed for temporary or construction key operation. A temporary or construction key is indicated by the reference character 34. The construction key 34 has key cuts at such locations that, when inserted, all of the sets of tumblers contained in the device are lifted to release positions. Typical of this is a key cut 35 which serves the set of tumblers in holes 21, 22. An outermost key cut 36 serves the outermost set of tumbler holes 19, 20 and the corresponding set of tumbler elements 30, 31, and 32. In this instance, the level of the key cut 36 is such that the junction of the driver tumbler element 30 and the upper surface of the temporary tumbler element 32 coincide with a shear line 37 when the other sets of tumbler elements are in release position. The shear line 37 is defined by the peripheral surface 38 of the key plug 13 and a cylindrical chamber 39 in the cylindrical portion 11 of the housing 10 and in particular that portion of the common area of engagement where it intersects the tumbler bores.

A passage 40 extends through the cylindrical portion 11 and a part of the casing 12 at the shear line 37. In the chosen embodiment, the longitudinal axis of the passage 40 is substantially perpendicular to the axis of the tumbler bore defined by the tumbler holes 19 and 20. The diameter of the passage 40 is made greater than the diameter of the temporary tumbler element 32 and preferably substantially greater so that there is no impediment to the passage 40 of the temporary tumbler element 32 at the proper time.

When the device is being operated by construction keys like the key 34 and the key 34 inserted in position as shown in FIGURES 1 and 2, the sets of tumblers are all at release positions as heretofore described, as is also the temporary tumbler element 32 at its point of engagement with the driver tumbler element 30. When the construction key 34 is rotated thereby to rotate the key plug 13, the temporary tumbler element 32 will pass by the passage 40 without opportunity of entering the passage and will remain in place so long as the construction key 34 is used.

When it comes time to rekey the device, all that is necessary is to insert a permanent or owner key 45 into the keyway 23. The owner key 45 is provided with a key cut 46 substantially higher than the correspondingly located key cut 36 of the construction key 34. The key cut 46 raises the driven tumbler element 31 and the accompanying driver tumbler element 30 and temporary tumbler element 32 to positions where the junction of the upper surface of the driven tumbler element 31 and the surface of the temporary tumbler element 32 coincides with the shear line 37. The spring 33 merely yields sufficiently to permit this adjustment. Thereupon, when the owner key 45 is rotated, as it would be in unlocking the device, the temporary tumbler element 32 is forced outwardly through the passage 40. This ejecting of the temporary tumbler element 32 is positive and immediate. Ejection is aided materially by the angular disposition on adjacent faces of respectively the driver tumbler element 30 and driven tumbler element 31 and in addition is aided by pressure of the spring 33 which tends to accelerate ejection as the temporary tumbler element 32 goes out through the passage 40. It will moreover be of no materiality what the rotative position of the housing 10 may be when ejection takes place, since the forcible ejection for the reasons described is independent of any gravity action.

Subsequent to ejection of the temporary tumbler element 32 the driver tumbler element 30 and driven tumbler element 31 thereupon comprise a new set of tumbler elements having a different keying relationship than was the keying relationship when these last defined tumbler elements were combined with the temporary tumbler element 32. The new keying relationship is illustrated in FIGURE 4, where the driven tumbler element 31 is shown resting upon the key cut 36 of the construction key 34. In this relationship, the driver tumbler element 30 extends across the shear line 37 locking the key plug 13 and, as shown, the construction key 34 can no longer be employed to unlock the lock. From this point on, only the owner key 45 which has the higher key cut 46 will be capable of lifting the driven tumbler element 31 so that its junction with the driver tumbler 30 coincides with the shear line 37.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described the invention, what is claimed as new in support of Letters Patent is:

1. In a lock housing, a key plug rotatably mounted in said housing for movement between locking and unlocking positions, said key plug having a keyway therein, said housing and said key plug having a plurality of sets of tumbler holes therein which are alignable and form tumbler bores in communication with said keyway, a set of tumbler elements spring biased in a direction toward said keyway and movable in each said bore to release position wherein movement of said key plug to unlocking position is permitted, a first temporary key and a second permanent key insertable in said keyway and fitted for cooperation with said sets of tumbler elements, one of said sets of tumbler elements initially including a temporary tumbler element which is a ball and which is of such diameter that it will permit movement of said one set of tumbler elements to release position when either said temporary key or said permanent key is inserted into said keyway so that the key plug is operable by either of said keys, said housing having a passage through the wall thereof and communicating between the interior at a location adjacent the tumbler bore which has the temporary tumbler element therein and adjacent and in communication with the tumbler hole of the housing, said passage having a cross sec-

tional area greater than the cross sectional area of said temporary tumbler element, whereby the first time said permanent key is used to operate the key plug, said temporary tumbler element is moved to a position opposite the inside end of said passage and permanently ejected outwardly through said passage, thereby to provide a permanent new relationship of tumbler elements in said one bore responsive to the permanent key and not responsive to the temporary key.

2. In a lock a housing, a key plug rotatably mounted in said housing for movement between locking and unlocking positions, said key plug having a keyway therein, said housing and said key plug having a plurality of sets of tumbler holes therein which are alignable and form tumbler bores in communication with said keyway, a set of tumbler elements movable in each said bore to release position wherein movement of said key plug to unlocking position is permitted, a first temporary key and a second permanent key insertable in said keyway and fitted for cooperation with said sets of tumbler elements, one of said sets of tumbler elements being spring biased in a direction toward said keyway and initially including a temporary tumbler element which is a ball and which is of such diameter that it will permit movement of said one set of tumbler elements to release position when either said temporary key or said permanent key is inserted into said keyway so that the key plug is operable by either of said keys, said housing having a passage through the wall thereof and communicating between the interior at a location adjacent the tumbler bore which has the temporary tumbler element therein and adjacent and in the communication with the junction of the tumbler hole of the housing and corresponding tumbler hole of the key plug, said passage having a cross sectional area greater than the cross sectional area of said temporary tumbler element, whereby the first time said permanent key is used to operate the key plug, said temporary tumbler element is moved to a position opposite the inside end of said passage and permanently ejected outwardly through said passage upon rotation of said key plug, thereby to provide a permanent new relationship of tumbler elements in said one bore responsive to the permanent key and not responsive to the temporary key.

3. In a lock a housing, a key plug rotatably mounted in said housing for movement between locking and unlocking positions, said key plug having a keyway therein, said housing and said key plug having a plurality of sets of tumbler holes therein which are alignable and form tumbler bores in communication with said keyway, a set of tumbler elements spring biased in a direction toward said keyway and movable in each said bore to release position wherein movement of said key plug to unlocking position is permitted, a first temporary key and a second permanent key insertable in said keyway and fitted for cooperation with said sets of tumbler elements, one of said sets of tumbler elements initially including two permanent pin tumbler elements and a temporary ball tumbler element therebetween sized to permit movement of said one set of tumbler elements



to release position when either said temporary key or said permanent key is inserted into said keyway so that the key plug is operable by either of said keys, said housing having a passage through the wall thereof and communicating between the interior at a location adjacent the tumbler bore which has the temporary tumbler element therein and adjacent the junction of the tumbler hole of the housing and corresponding tumbler hole of the key plug and substantially coinciding with the location of the ball tumbler element when the permanent key is inserted, said passage having a cross sectional area greater than the cross sectional area of said temporary tumbler element, whereby the first time said permanent key is used to operate the key plug, said temporary tumbler element is moved to a position opposite the inside end of said passage and permanently ejected outwardly through said passage upon rotation of said key plug, thereby to provide a permanent new relationship of tumbler elements in said one bore responsive to the permanent key and not responsive to the temporary key.

4. A lock tumbler cylinder assembly including a cylinder housing, a key plug rotatable in the cylinder housing, said housing and said key plug having sets of tumbler holes in parallel alignment, a series of sets of movable tumblers in the holes of the cylinder housing and key plug for locking the key plug against rotation, said tumblers being spring biased in a direction toward said key plug and adapted to be moved by a key inserted through the front of the key plug, said tumblers allowing rotation of the key plug when the tumblers are in release position, one of said tumblers being an extra tumbler in one of the sets of tumblers, said extra tumbler being a ball which is of such diameter that it will allow rotation of said key plug when the remaining tumblers are in release position, said cylinder housing having a discharge hole therethrough of diameter greater than the diameter of said extra tumbler and in the same plane of rotation as said extra tumbler, said discharge hole being in communication with the respective bore of the cylinder housing at the end adjacent the key plug, said discharge hole being adapted to pass said extra tumbler when said key plug is in a rotated position which aligns the extra tumbler with the discharge hole.


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