Aug. 6, 1968 F. J. RUSSELL ETAL 3,395,558

KEY-ACTUATED MECHANISM WITH EMERGENCY KEY

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Fig. 1

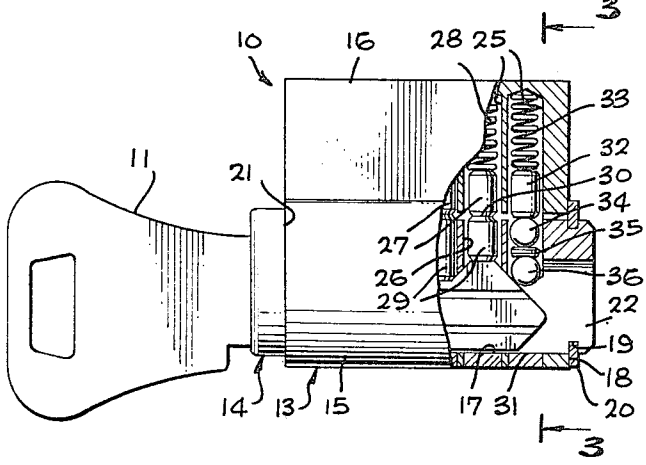


Fig. 2

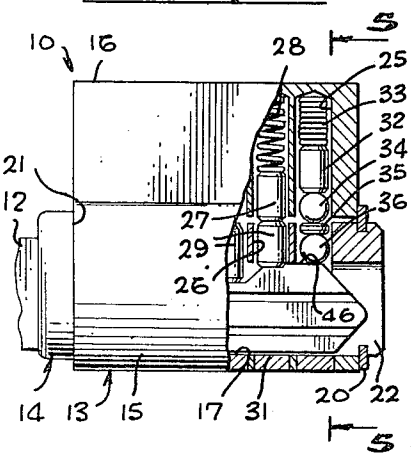


Fig. 3

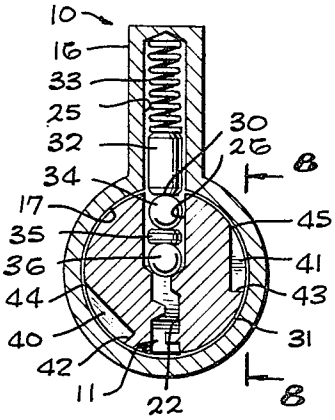


Fig. 4

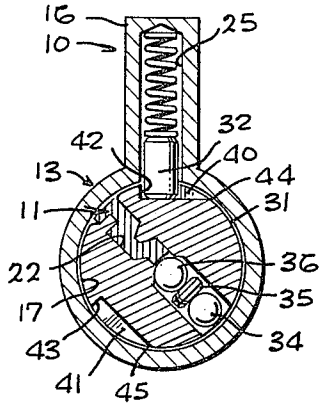


Fig. 5

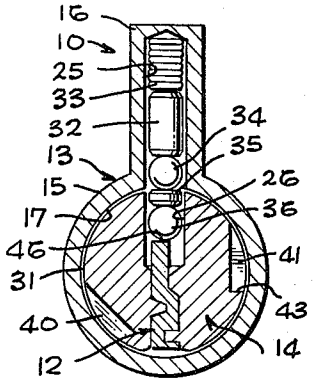


Fig. 6

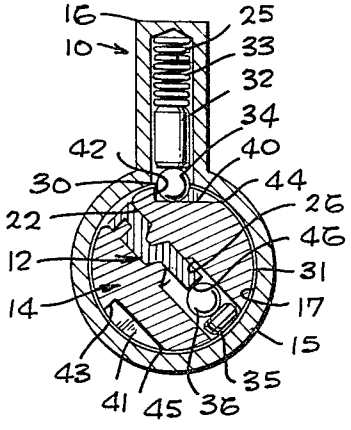


Fig. 7

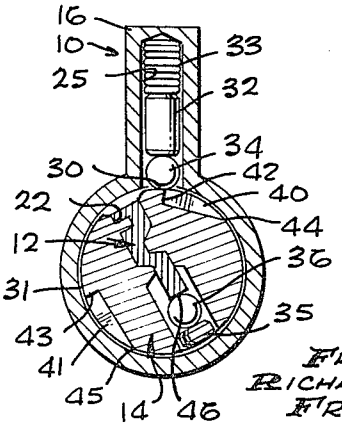
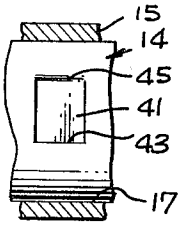


Fig. 8



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KEY-ACTUATED MECHANISM WITH EMERGENCY KEY

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ABSTRACT OF THE DISCLOSURE

The invention is embodied in a pin tumbler lock in which a multiple number of pin tumblers are located in one set of axially aligned pin tumbler chambers having parts respectively in a pin tumbler housing and a rotating cylinder plug containing a keyway. On the circumference of the rotatable cylinder plug is a recess having a breadth at least as great as the pin tumbler chamber in the pin tumbler housing, and correspondingly at least as great as the maximum breadth of a cylindrical drive tumbler, the recess forming a shoulder which blocks rotation of the cylinder plug when the slot is in alignment with the set of pin tumbler chambers and the drive tumbler. The tumblers are responsive to operation by a special key capable of shifting the multiple number of tumblers to a position wherein a special camming tumbler falls into engagement with the shoulder and is capable of riding over the shoulder, thereby to permit unrestricted rotation of the cylinder plug.

The invention relates to door locks and in particular a key-actuated mechanism subject to operation by two different keys. The mechanism is more appropriately one which finds considerable use in locks for public accommodations where a key may frequently change hands.

A particular type of installation where some special keying feature is found advantageous is a hotel or motel where a key is given out to a different occupant each time a room is rented. Many times, keys are not reutrned. Also, keys in the hands of casual occupants can easily be duplicated for future, unauthorized use. When the occupant is in a room, it is often desirable to lock the door from the inside so that no one, not even with a proper key, can unlock the door. At the same time, however, it is necessary that management be capable of unlocking the door, as, for example, for emergency purposes.

In certain locks, the mechanism is such that a single key, when inserted in the keyway to turn the key-actuated cylinder, operates two different latch devices, one a bolt, for convenience being termed a dead bolt, and the other being the latch bolt normally holding the door in closed position. In certain locks of this kind, when the dead bolt is extended to locked or extended position, it is necessary to rotate the key 360 degrees to release or retract it. The key, however, need be rotated no more than a fraction of a 360 degree rotation in order to retract the latch bolt. From the outside, therefore, when the door is merely closed and the latch bolt extended, the door can be unlocked by rotating the key only a fraction of 360 degrees. Should the dead bolt be extended, however, the key would need to be rotated 360 degrees to release it. Hence, when the occupant is in the room, with the dead bolt extended to locked position, some means is needed to prevent an unauthorized person with an identical key from unlocking the door from the outside.

It is therefore among the objects of the invention to provide a new and improved key-actuated mechanism

which allows a dead bolt to be extended to locked position from the inside, but which will bar unlocking of the dead bolt from the outside.

Another object of the invention is to provide a new and improved key-actuated mechanism which, while permitting a dead bolt to be extended to locked position and thereby barring unlocking from the outside, at the same time is capable of being unlocked for emergency purposes by employment of a special key.

Still another object of the invention is to provide a new and improved key-actuated mechanism which is capable of being operated from one side throughout 360 degrees, but not throughout the same rotational extent on the other side, and which is of substantially conventional size and shape, which employs keys of customary shape and size, which is simple and positive in its action, which is rugged and capable of long periods of use without servicing, and which does not add materially to the initial cost of the device.

The objects also include the provision of a key-actuated mechanism of the type described which, once set, cannot be easily forced or picked.

With these and other objects 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 partially broken away showing the key-actuated mechanism when subject to operation by a relatively short conventional key.

FIGURE 2 is a side elevational view partially broken away similar to FIGURE 1, but showing the position of parts when subject to operation by a special key.

FIGURE 3 is a cross-sectional view taken on the line 3—3 of FIGURE 1.

FIGURE 4 is a cross-sectional view similar to FIGURE 3, but showing the relative position of parts when operated by the conventional key.

FIGURE 5 is a cross-sectional view similar to FIGURES 3 and 4, but taken on the line 5—5 of FIGURE 2.

FIGURE 6 is a cross-sectional view similar to FIGURE 5 showing the position of parts when rotated to one position by the special key.

FIGURE 7 is a cross-sectional view similar to FIGURES 5 and 6 showing the position of parts when rotated slightly further by use of the special key.

FIGURE 8 is a fragmentary longitudinal sectional view taken on the lines 8—8 of FIGURE 3.

In an embodiment of the type chosen for the purpose of illustration, there is shown only the key-actuated mechanism indicated generally by the reference character **10** and two keys, namely a short conventional key **11** and a long special key **12**. The mechanism **10** consists mainly of a housing **13** and a cylinder plug **14**. The housing **13** in turn consists of two portions, namely a cylindrical portion **15** which accepts the cylinder plug **14** and a portion **16** of rectangular cross-sectional shape for certain of the tumblers. The cylindrical portion **15** has a longitudinal axial bore **17**, slightly shorter than the length of the cylinder plug **14**, so that when the cylinder plug **14** is in place, as shown in FIGURES 1 and 2, it extends slightly beyond an inside end **18** to provide for an annular recess **19** adapted to receive a snap ring **20** which, acting together with a shoulder **21**, serves to secure the cylinder plug **14** rotatably within the cylindrical portion **15**. A keyway **22** extends throughout the length of the cylinder plug **14**.

Following substantially conventional practice, the mechanism **10** is provided with a series of axially spaced sets of pin chambers. Each set of pin chambers consists of

two separate chambers, namely a chamber **25** in the portion **16** of the housing **13** and a chamber **26** in the cylinder plug **14**. In the position of parts of FIGURES 1, 2, 3, and 5 the chambers of each set are in alignment. All of the chambers **26** communicate with the keyways **22**, but the depth of the drilled hole which forms the chambers **26** is controlled, so that balls or tumblers, as the case may be, cannot fall into the keyway **22** beyond a certain selected position. For all of those sets of chambers, except the innermost set, there are provided drive tumblers **27** driven by a spring **28** and driven tumblers **29**. In the position of parts of FIGURES 1, 2, 3, and 5, the point of contact between drive tumblers **27** and drive tumblers **29** is at a shear line **30** which is coincident with the circumferental engagement between the bore **17** and an exterior circumference **31** of the cylinder plug **14**.

In the embodiment of the invention herein described, the innermost set of chambers is provided with a different tumbler arrangement than is provided in the others. A drive tumbler **32** in the chamber **25** is driven by a spring **33**. In the chamber **26** is an outer spherical ball **34**, a relatively thin separating tumbler **35**, and an inner spherical ball **36**. In the position of parts of FIGURES 1 and 3, the outer spherical ball **34** engages the drive tumbler **32** at the shear line **30**.

In rotational alignment with the innermost set of chambers containing the special tumblers and balls just described, there are provided two recesses **40** and **41** extending inwardly from the exterior circumference **31** of the cylinder plug **14**. The recess **40** provides a rotationally facing shoulder **42** and the recess **41** a rotationally facing shoulder **43**. As is clear from FIGURE 3, the shoulders **42** and **43** face rotationally in opposite directions. The shoulders **42** and **43** are adapted to stop against the drive tumbler **32**, as shown in FIGURE 4, but to ride over the outer spherical ball **34**, as shown in FIGURE 7. The recesses **40** and **41** and consequently the shoulders **42** and **43** can be located at any desired positions throughout the exterior circumference **31**, as occasion may require.

In operation, with the relative position of the parts as shown in FIGURES 1 and 3, the short conventional key **11** is inserted to the limit of its position. This is a substantially conventional arrangement of parts, in that the key is so shaped as to lift all of the driven tumblers **29** to positions where their tops at the junction with the drive tumblers **27** are at the shear line **30**, permitting the cylinder plug **14** to be rotated within the cylindrical portion **15**. Upon rotation in a clockwise direction, as viewed in FIGURES 3 and 4, the recess **40** is moved into alignment with the chamber **25** and the drive tumbler **32**. When this happens, the drive tumbler **32** is pushed into the recess **40** by the spring **33** and the shoulder **42** then engages against the drive tumbler **32**, preventing further clockwise rotation of the cylinder plug **14**. The cylinder plug **14** can, however, be rotated in a reverse or counterclockwise direction. When this is done, the drive tumbler **32** is merely cammed outwardly against tension of the spring **33** as the bottom of the recess **40** moves against it until it rides over a corner **44** and then rides upon the exterior circumference **31** of the cylinder plug **14**. On those occasions where two recesses are provided, as described herein, upon continued counterclockwise rotation of the cylinder plug **14**, the recess **41** will ultimately be moved into alignment with the chamber **25** and the drive tumbler **32**. When this occurs, the drive tumbler **32** will be again spring urged, this time into the recess **41**, until it comes into blocking engagement with the shoulder **43**. When this happens, rotation of the cylinder plug **14** is blocked against further counterclockwise rotation. As previously described, however, when the cylinder plug **14** is rotated clockwise from this position, the drive tumbler **32** can be cammed outwardly against tension of the spring **33** by the bottom of the recess **41** until it rides over a corner **45** and then around the exterior circumference **31** of the cylinder plug **14**.

When it becomes needful to rotate the cylinder plug **14** a greater angular distance, as, for example, a full 360-degree turn, the special key **12** is inserted into the position illustrated in FIGURES 2 and 5. The long special key **12** has a bit **46** of such height that it engages the inner spherical ball **36** and moves it outwardly. The inner spherical ball **36**, moving against the separating tumbler **35**, shifts the outer spherical ball **34** outwardly against the drive tumbler **32** and the tension of spring **33** to a position where engagement between the outer spherical ball **34** and the separating tumbler **35** is at the shear line **30**, as shown advantageously in FIGURE 5.

In this relationship of parts, the cylinder plug **14** can be rotated clockwise, for example as viewed in FIGURES 5 and 6, to the position of FIGURE 6 where the recess **40** is moved into alignment with the chamber **25** and hence the outer spherical ball **34**. The outer spherical ball **34** will then be pressed by action of the spring **33** into the recess **40** to a position of engagement with the shoulder **42**. As clockwise rotation of the cylinder plug **14** continues, the outer spherical ball **34** is cammed outwardly over the outer edge of the shoulder **42** against the drive tumbler **32** and tension of the spring **33** permits uninterrupted, continuous clockwise rotation of the cylinder plug **14**.

Similarly, for reverse rotation, namely counterclockwise rotation of the cylinder plug **14** for the position of parts of FIGURES 2, 5, 6, and 7, when the ball **34** is pushed into the recess **41** and the shoulder **43** moved into engagement with it, the outer spherical ball **34** will again be cammed outwardly against the drive tumbler **32** and tension of the spring **33**, thus permitting uninterrupted continuous counterclockwise rotation. To return all parts to the adjustment of FIGURES 1 and 2, it is necessary only to remove the long special key **12**. Hence it will be apparent that the key-actuated mechanism **10** can be operated at any time by the long special key **12** and can be immediately reset for limited operation by the short conventional key **11** merely by the interchange of one key for the other. It will further also be clear that there need be very little change in what is understood to be substantially pin tumbler lock construction other than the provision of one or more recesses in the exterior circumference of the cylinder plug and the employment of a special tumbler arrangement in one of the sets of chambers, the construction needing no alteration in substantially conventional dimensions and proportions of the mechanism as a whole.

The arrangement of one or more shoulders **42**, **43** of the cylinder plug engageable with a drive tumbler **32** in the housing may be resorted to with the cooperation of a conventional tumbler like driven tumbler **29** when there only is the need to limit the rotation of the cylinder plug and no need to alternately rotate the cylinder plug beyond the shoulders **42**, **43** positions.

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 key-actuated mechanism, a housing having a cylindrical bore, a cylinder plug rotatably mounted in said bore and forming a shear line therebetween, a keyway in said plug, a plurality of axially spaced sets of chambers for the accommodation of spring-loaded tumblers intersecting said keyway and with interconnecting chambers of each set respectively in said plug and said housing, at least one of said sets of chambers having a spring-loaded drive tumbler in the chamber of the housing

and a camming tumbler in the chamber of the cylinder plug, said camming tumbler and said drive tumbler being in spring-pressed engagement, said cylinder plug having rotationally facing shoulder in rotational alignment with said one set of chambers, said camming tumbler having one position wherein said engagement with said drive tumbler is at the shear line, said drive tumbler being movable into engagement with said shoulder upon rotation of said shoulder into substantial alignment with said drive tumbler whereby to block continuous rotation of said plug, said camming tumbler having another position wherein a side of said camming tumbler opposite said drive tumbler is at the shear line, said camming tumbler having means to enable the camming tumbler to ride over said shoulder and enable uninterrupted rotation of said cylinder plug.

2. In a key-actuated mechanism, a housing having a cylindrical bore, a cylinder plug rotatably mounted in said bore and forming a shear line therebetween, a keyway in said plug, a plurality of axially spaced sets of tumbler chambers for the accommodation of spring-loaded tumblers intersecting said keyway and with interconnecting chambers of each set respectively in said plug and said housing, at least one of said sets of chambers having a spring-loaded drive tumbler in the chamber of the housing and a camming tumbler in the chamber of the cylinder plug, said camming tumbler and said drive tumbler being in spring-pressed engagement, said cylinder plug having a circumferential surface and a recess of breadth at least as great as the maximum breadth of said camming tumbler forming a rotationally facing shoulder in said circumferential surface in rotational alignment with said one set of chambers, said camming tumbler having one position wherein said engagement with said drive tumbler is at the shear line, said drive tumbler being movable into said recess and into engagement with said shoulder upon rotation of said shoulder into substantial alignment with said drive tumbler whereby to block continued rotation of said plug, and means receivable in said keyway adapted to move said drive tumbler out of engagement with said shoulder to release said cylinder plug for continued rotation, said camming tumbler having another position wherein a side of said camming tumbler opposite said drive tumbler is at the shear line whereby to enable said camming tumbler to cooperate with said shoulder to permit uninterrupted rotation of said cylinder plug.

3. In a key-actuated mechanism, a housing having a cylindrical bore, a cylinder plug rotatably mounted in said bore and forming a shear line therebetween, a keyway in said plug, a plurality of axially spaced sets of chambers for the accommodation of spring-loaded tumblers intersecting said keyway and with interconnecting chambers of each set respectively in said plug and said housing, at least one of said sets of pin chambers having a spring-loaded cylindrical drive tumbler in the chamber in the housing, said drive tumbler being of one continuous diameter from one extremity to the other, and a spherical ball in the chamber of the cylinder plug, said ball and said drive tumbler being in spring-pressed engagement, said cylinder plug having a circumferential surface and a recess having a breadth at least as great as the breadth of said chamber in the housing and at least as great as the maximum breadth of said drive tumbler, said recess forming a rotationally facing shoulder in said circumferential surface in rotational alignment with said one set of chambers, said ball having one position wherein said engagement with said drive tumbler is at the shear line, said drive tumbler being movable into said recess and into engagement with said shoulder upon rotation of said shoulder into substantial alignment with said drive tumbler by employment of a conventional key, whereby to block continued rotation of said plug, and a special key adapted to fit in said keyway, a bit on said special key in transverse alignment with said one set of chambers when the special key is fully inserted, said bit when in lifting engagement with said ball having a height adapted to move said ball outwardly to a position wherein the adjacent edge of the ball is at said shear line whereby, upon continued rotation of the plug, said ball rides over said shoulder to allow 360 degree rotation of said plug.

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