June 22, 1965 F. J. RUSSELL ETAL 3,190,091

REMOVABLE CYLINDER SPINDLE RETAINING SHOULDER

Filed May 27, 1963

Fig. 1

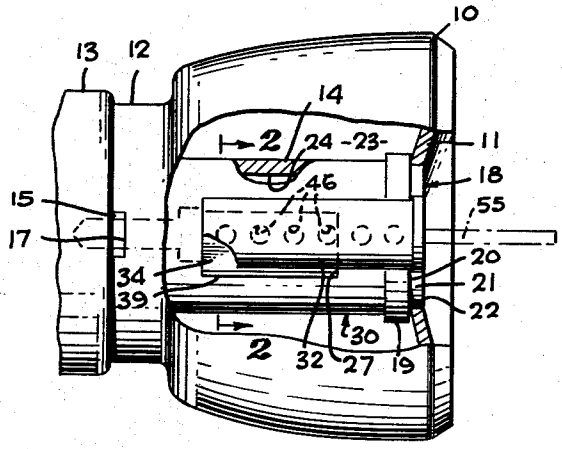
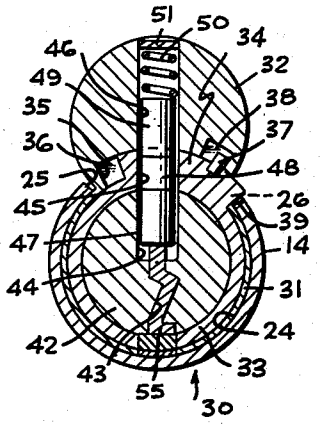


Fig. 2



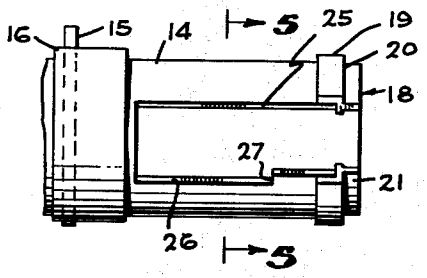


Fig. 4

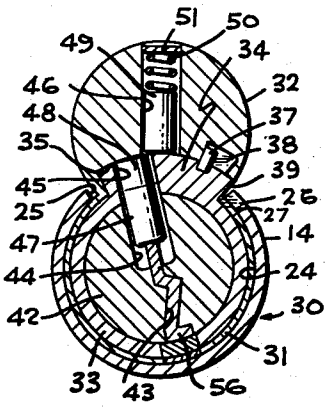


Fig. 3

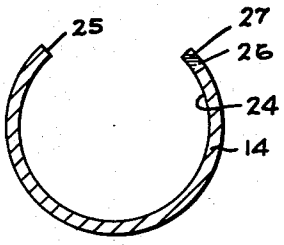


Fig. 5

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United States Patent Office 3,190,091 Patented June 22, 1965

3,190,091
REMOVABLE CYLINDER SPINDLE RETAINING SHOULDER

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Filed May 27, 1963, Ser. No. 283,388
3 Claims. (Cl. 70—224)

The invention relates to door locks and in particular a construction which permits removal of one key-operated mechanism or cylinder for re-keying or for replacement by another. The structure here disclosed is one which makes re-keying possible without need for additional parts or for any substantial manipulation of the lock components.

Many key-operated mechanism or cylinder removal expediencies exist, and these are possessed of sundry advantages and attendant disadvantages. Among the more common disadvantages is the need for either wholly or partially disassembling the lock in order to gain access to the interior, whereby to extract one key-operated mechanism or cylinder in order to replace it with another. Schemes which attempt to minimize the disassembly of the lock have sundry disadvantages such, for example, as structures not sufficiently secure, mechanisms difficult to operate, and devices which are often relatively expensive.

It is among the objects of the invention to provide a simple means for removably retaining a key-operated mechanism or cylinder assembly for a lock in the spindle of the lock.

Another object of the invention is to provide a new and improved simple means of making use of a configuration on the spindle of a lock so that it can be removably engaged by a portion of a key-operated mechanism or cylinder as a result of manipulation by a special key, thereby making it possible to easily remove the key-operated mechanism for replacement.

Still another object of the invention is to provide a new and improved interlock for a key-operated mechanism or cylinder assembly in a spindle by merely cutting a special configuration in the spindle wall, so as to cooperate with a movable cam in the cylinder assembly manipulated by a control key and which is incapable of being manipulated by an operator key.

Still further among the objects of the invention is to provide a new and improved relatively inexpensive and simply constructed expedient for removably attaching a cylinder assembly to position within a spindle without the need of supplying additional material or parts or of departing from standard construction in any substantial degree.

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 vertical elevational view of a lock handle partially broken away to show the cylinder assembly in position.

FIGURE 2 is a cross-sectional view taken on the line 2—2 of FIGURE 1 in the position of adjustment illustrated in FIGURE 1.

FIGURE 3 is a cross-sectional view similar to FIGURE 2, showing the cylinder assembly in release adjustment.

FIGURE 4 is a longitudinal elevational view of the spindle with the cylinder assembly removed.

FIGURE 5 is a cross-sectional view taken on the line 5—5 of FIGURE 4.

In an embodiment of the invention disclosed herein

primarily for the purpose of illustration, there is shown necessary portions of a lock assembly for a door comprising an operating member here taking the form of a knob 10 having a face portion 11 and a shank 12. A portion only of a mounting member 13 is shown, this being the customary stationary portion of a lockset which is attached to one face of a door and which customarily comprises in part a knob neck bearing or spindle bearing. The spindle 14 extends outwardly through the mounting member 13 and is rotatively retained thereby. At the inner portion of the spindle, as shown in FIGURES 1 and 4 by way of example, there is provided a detent 15 extending through appropriate recesses (not shown) in the spindle and spring-pressed to the position shown in FIGURE 4 by an arcuate leaf spring 16, following substantially conventional practice. An opening 17 in the shank 12 of the knob 10 is adapted to receive the detent 15, after first being depressed while the shank 12 is being applied and then permitted to spring outwardly by action of the leaf spring 16.

At the outer end of the spindle 14 is a split collar indicated generally by the reference character 18. The collar has an inner flange 19 adapted to fit over the outer end of the spindle 14 and to present an annular shoulder 20 in an outwardly facing direction. A short cylindrical protrusion 21 extends outwardly through a central hole 22 in the face portion 11 in the assembled condition shown in FIGURE 1. A space or chamber 23 inside of the knob 10 surrounds the spindle section which is contained within the knob 10 when in assembled position.

As clearly shown, especially in FIGURES 4 and 5, the spindle 14 is a tubular spindle having a cylindrical bore 24 therethrough open at the outer end. On one side of the spindle 14 is an axially extending slot 25 which is open at the outer end. On one side of the slot 25 is a cutout portion or recess 26 which has a length less than the length of the slot 25 and which forms an inwardly facing retaining shoulder 27.

A key-operated mechanism, indicated generally by the reference character 30, is shown mounted in position in FIGURE 1. Characteristic details are shown in FIGURES 2 and 3. The key-operated mechanism comprises a cylinder casing 31, which is substantially cylindrical in shape, and which has attached along one side, in an axially extending direction, a pin tumbler housing 32.

Rotatively mounted within the cylinder casing 31 is a substantially cylindrical cam member 33, the degree of rotation, however, being substantially limited by structure attached thereto, namely, a cam 34. The cam 34 extends for only a portion of the length of the cylinder casing 31 and pin tumbler housing 32 as clearly shown by the broken lines in FIGURE 1. As shown advantageously in FIGURES 2 and 3, the cam 34 is arcuate in cross-section and is received in an arcuate recess 35 in the pin tumbler housing 32. The arcuate recess 35 has a closed end 36, the other end being open. A pin 37 extending outwardly from the cam 34 is received in a pocket 38 slightly wider than the diameter of the pin 37. The fit of the pin 37 in the pocket 38 permits a limited arcuate movement of the cam member 33 and cam 34, determined by the clearance between the pin 37 and the pocket 38, as shown by a comparison of FIGURE 2 with FIGURE 3.

As shown in FIGURES 1 and 2, a side edge 39 of the cam 34 projects into the recess 26 at the side of the slot 25 in the spindle 14. In this position, the pin 37 is at the outermost wall of the pocket 38. Withdrawn position is shown in FIGURE 3, where the pin 37 is at the opposite side of the pocket 38, and the side edge 39 of the cam 34 is substantially flush with the arcuate exterior of the pin tumbler housing 32. In this position, the cam and its side edge 39 are withdrawn entirely from the recess 26.

Rotatively mounted in the pin tumbler housing **32** is a key plug **42**. The key plug **42** has a keyway **43** of conventional type extending centrally through the key plug **42**. Along the key plug **42** and the keyway **43** is a series of pin tumbler holes like the pin tumbler hole **44** shown in FIGURES 2 and 3, and in the cam **34** is a similar series of pin tumbler holes like the pin tumbler hole **45**. As shown, the pin tumbler hole **45** is in axial alignment with the pin tumbler hole **44**.

Similarly in the pin tumbler housing **32** is a series of pin tumbler holes like the pin tumbler hole **46**. When the pin tumbler holes **44**, **45** and **46** are in axial alignment as shown in FIGURE 2, they form a pin tumbler bore for a series of pin tumblers identified by the reference characters **47**, **48** and **49**. The pin tumblers are impressed inwardly by a spring **50** held in position in the pin tumbler hole **46** by a cap **51**.

When the device is in the adjustment shown in FIGURES 1 and 2, the key plug **42**, and accordingly the door lock, is capable of being locked and unlocked by means of an operator key **55**. It will be noted that the operator key **55** is so cut that it is capable of lifting pin tumblers **47** so that they coincide with the shear line existing between the exterior of the key plug **42** and the interior of the cam **34**. Hence, the key plug **42** is free to turn about its axis within the cam member **33** and correspondingly within the cylinder casing **31**. In this adjustment, the pin tumbler **49**, however, extends downwardly across the shear line formed between the arcuate exterior of the cam **34** and the corresponding arcuate interior wall of the recess **35**. Therefore, the cam member remains in the position shown in FIGURE 2 relative to the remaining portions of the device, which means that the side edge **39** remains in the recess **26** and cannot be rotated to a position out of the recess by operation of the operator key **55**. Therefore, the whole key-operated mechanism **30** remains in proper position within the spindle **14** and knob **10**, but more particularly remains in position by reason of the fact that the cam **34** engages against the inwardly facing retaining shoulder **27** at the outer end of the recess **26**. Hence, the key-operated mechanism **30** is actually fastened to the spindle **14** entirely independently of the knob **10**.

When it becomes advisable to remove the entire key-operated mechanism **30**, use is made of a control key **56**, shown in operation in FIGURE 3. The control key **56** is so cut that the pin tumbler **48** is moved outwardly against the pin tumbler **49** until the break between the pin tumbler **48** and pin tumbler **49** coincides with the shear line formed between the arcuate exterior of the cam **34** and the arcuate interior of the recess **35**. By the same key setting, the pin tumbler **47** is moved upwardly so that it crosses the shear line formed between the exterior of the key plug **42** and the interior of the cam member **33**. Accordingly, the key plug **42** and cam member **33** are keyed together so that they rotate as a unit when the control key **56** is rotated, thereby permitting the cam **34** to rotate from the position of FIGURE 2 to the position of FIGURE 3. This rotation is limited, as previously described, by the pin **37** in the pocket **38**, but rotation is sufficient to withdraw the side edge **39** of the cam **34** from its position of retention by the shoulder **27**.

However, by forming the central hole **22** in the face portion **11** of the knob **10** with a cross-section corresponding to the combined cross-sectional shape of the cylinder casing **31** and pin tumbler housing **32**, the entire key-operated mechanism **30** can then be withdrawn outwardly with respect to the spindle **14** and knob **10** without any need for removing the knob **10** from the spindle **14** and actually, therefore, without disassembling any other portion of the lock. When the key-operated mechanism **30** is to be replaced in the lock, the operations above-described are reversed. The control key **56** is inserted and the cam **34** is withdrawn. The combined cylinder casing **31** and pin tumbler housing **32** is then reinserted through the central hole **22** of the face portion **11** and into the outer end of the spindle **14** to the position shown in FIGURE 1. Thereafter, the cam **34** is rotated from the position of FIGURE 3 to the position of FIGURE 2 by use of the control key **56**, and the control key **56** then is withdrawn. The key-operated mechanism **30** then remains locked in place, as has been previously described.

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

1. In a lock, a spindle having a bore therein and a retaining shoulder on the spindle, a key-operated mechanism having a portion thereof located in said bore and a portion extending through the wall of said spindle adjacent said shoulder, cam means operably associated with said key-operated mechanism and responsive to operation by a control key and not responsive to operation by an operator key, said cam means being extendable into engagement with said shoulder whereby to retain said key-operated mechanism in engagement with said spindle during manipulation of said key-operated mechanism by said operator key.

2. In a lock, a mounting member, a spindle rotatably mounted in the mounting member, said spindle having a bore therein, means forming a slot in the wall of said spindle in communication with said bore and a retaining shoulder on the spindle adjacent said slot, a key-operated mechanism having a portion thereof located in said bore and portion extending through the slot adjacent said shoulder, cam means operably associated with said key-operated mechanism and a set of tumblers in said key-operated mechanism responsive to operation by a control key and not responsive to operation by an operator key, said cam means being extendable into engagement with said shoulder whereby to retain said key-operated mechanism in engagement with said spindle during manipulation of said key-operated mechanism by said operator key.

3. In a lock, a mounting member, a tubular spindle having an open outer end and rotatably mounted in said mounting member, said spindle having an axially extending slot open at said outer end and a recess at the side of said slot forming an inwardly facing retaining shoulder, a cylinder casing having a pin tumbler housing on one side, said cylinder casing being mounted in said spindle with the housing received in said slot, a cam member havng a rotatable mounting in said casing and a key plug rotatably mounted in said cam member, said cylinder casing having a clearance in alignment with the recess in the spindle, and a cam on said cam member in alignment with said clearance and extendable into said clearance and into the recess whereby to engage said shoulder, said cam means including a set of tumblers movable by a control key to release position for said cam member and a set of tumblers movable by an operator key to release position for said key plug and blocking position for said cam member, whereby said cylinder casing remains anchored in position in said spindle when said key plug is manipulated to locking and unlocking positions.

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