Oct. 21, 1969 A. K. NIILOLA 3,473,356

BARREL-OPERATED LOCK

Filed June 28, 1967 2 Sheets-Sheet 1

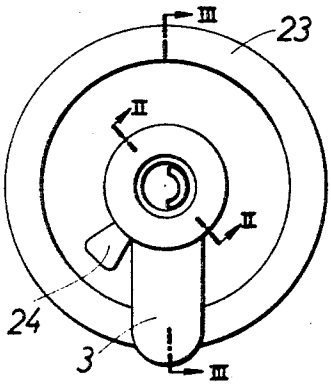


Fig.1

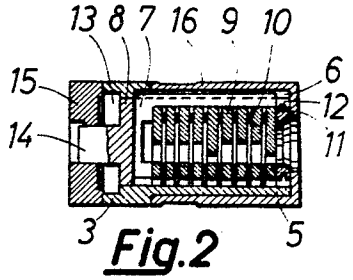


Fig.2

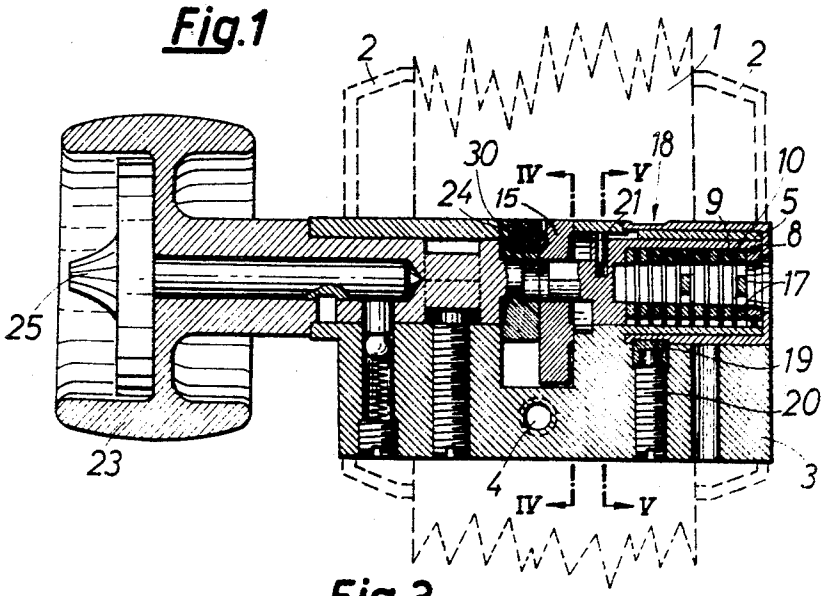


Fig.3

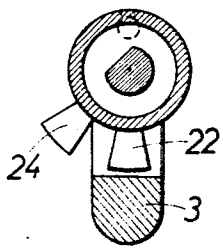


Fig.4

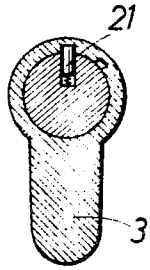


Fig.5

Oct. 21, 1969 A. K. NIILOLA 3,473,356

BARREL-OPERATED LOCK

Filed June 28, 1967 2 Sheets-Sheet 2

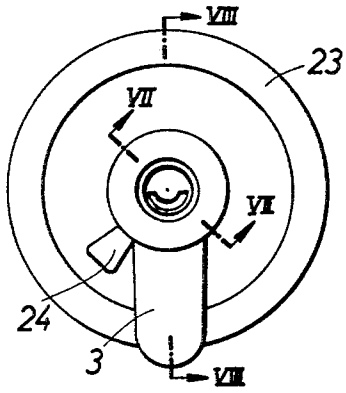


Fig.6

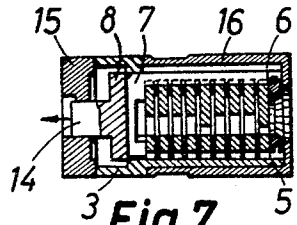


Fig.7

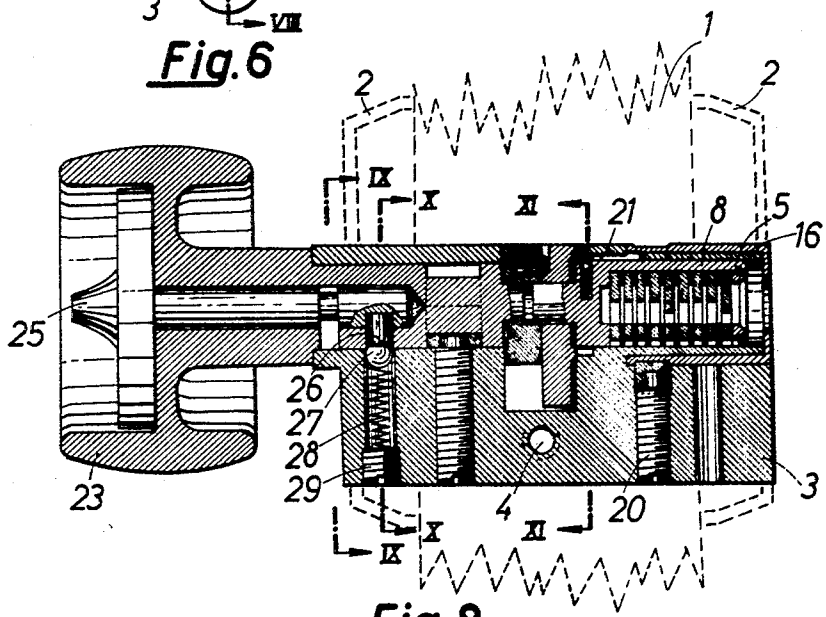


Fig.8

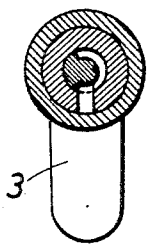


Fig.9

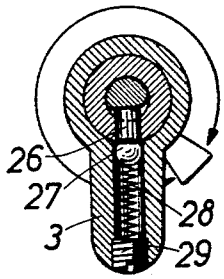


Fig.10

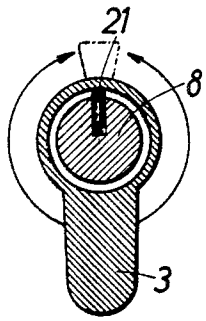


Fig.11

United States Patent Office 3,473,356 Patented Oct. 21, 1969

3,473,356

BARREL-OPERATED LOCK

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Claims priority, application Finland, Jan. 9, 1967, 35/67
Int. Cl. E05b 33/00, 15/14, 9/08
U.S. Cl. 70—360 9 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a barrel-operated lock comprising a lock body, a block barrel located in it, a blocking rail fitted into the block barrel groove and in the locking position also reaching into the lock body groove, as well as some disc type blocks in the block barrel, which blocks are turnable by key into an opening position, allowing the peripheral notches of the block discs to align with the blocking rail in the block barrel slit, thus permitting this rail to move away from the block barrel groove and into the groove formed by the peripheral notches. According to the invention blocks and spacers are enclosed between the bottom and the cover of the block barrel in such a way that a block barrel filled and closed accordingly can be handled and moved without producing any disorder in the block barrel assembly combination.

The invention is directed to a barrel-operated lock comprising a lock barrel housing into which the barrel and its locking combination are fixed. In the so-called "plug-barrel" system, also called the Yale system, the plugs (plug type blocks) are set in a position releasing the lock between the barrel and the lock body, when the key is inserted in the key hole. One of the advantages of this type of lock is that the lock barrel can be turned in both directions as many times as is required. Further, this means that the latch cam can be pushed several times to make the latch protrude sufficiently from the lock. At the moment this projection needs to be about 25 mm.

The intention of the invention is to make it possible to produce a barrel-operated lock with the above-mentioned advantage among other features.

One of the disadvantages of the block plug system is the few ways in which it can be combined. The so-called block disc system (Abloy) is better in this respect because the disc type blocks can be put in an opening position by turning the key, thus simultaneously putting the peripheral grooves of the blocking discs in alignment with the block rail in the slit on the blocking barrel wall and also with the groove on the lock body, which means that the rail enters the groove formed by the peripheral notches, which releases the block barrel from the lock body. The blocking can be depressed by continuing to turn the key, when the slanting edge of the lock housing groove forces the blocking rail out of the lock housing groove.

One of the disadvantages of the disc barrel system is that the block barrel can only be turned backwards to the basic position of the key, which means that it lacks the advantage offered by the plug barrel system.

The intention of the invention is to make it possible to manufacture a lock which does not suffer from the disadvantages of disc barrel-operated locks, but still having the advantages of this system.

In accordance with the features discussed above, the intention is to make it possible to manufacture a block barrel-operated lock with the advantages of both systems but not their disadvantages.

A barrel-operated lock conforming with the invention

contains a number of plate-shaped blocks arranged so as to be turned inside the barrel by the key until the opening position is reached and the peripheral notches fit the rail in the barrel slit and are also engaged by the blocking rail end in the lock body groove. This forces the blocking rail out of its locking position, i.e. out of the groove in the lock housing, i.e. into an opening position in which the barrel can be turned both clockwise and counterclockwise without interference from the rail, for instance to establish a latch movement with regard to the lock body effected by the so-called "latch cam," which is turned when the barrel is rotated.

The characteristics of a lock conforming with the invention include the arrangement wherein the blocks and the eventual spacers are enclosed in the block barrel housing between the bottom and cover in a manner which makes it possible to handle and freely move the block barrel filled and closed as described above, without causing any disorder in the combination established in the block barrel.

Hence, the blocks and the block barrel form a combined production and spare part item, which can be manufactured separately for insertion in various locks, especially in order to afford the advantages mentioned hereinabove.

This assembly item, suited for mass production is also supplemented by the new feature of also having the blocking rail included in the barrel assembly.

Because the block barrel is closed at both ends, it is desirable to close it externally by means of a cover made of very hard quenched steel in order to provide protection against drilling.

Other features and advantages of the invention will become apparent from the description of an embodiment of the invention given with reference to the enclosed drawing.

In the drawing:

FIG. 1 is an end view of the face of a lock barrel inclusive of the latch releasing and advancing cams;

FIG. 2 is a longitudinal section taken along the center line of the lock barrel;

FIG. 3 is a vertical cross section of the lock inserted in a door;

FIG. 4 is a cross-section taken along line IV—IV in FIG. 3;

FIG. 5 is a cross-section taken along line V—V in FIG. 3;

FIGS. 6 and 7 correspond to FIGS. 1 and 2 with the blocks in an unlocked position;

FIG. 8 corresponds to FIG. 3 but with the block housing in its depressed position; and

FIGS. 9–11 are sections taken along lines IX—IX, X—X and XI—XI respectively, in FIG. 8.

FIGURE 3 shows a vertical cross-section of a door-inserted blocking plate barrel type lock, which can be opened and closed by key from the right side, and closed and opened with a means of the handle on its left side. The door **1** and the casing plates **2** on both sides thereof are indicated in broken lines. The profile of the lock body **3** is somewhat longer than the width of the casing. A cross-section of the lock body **3** is seen in FIG. 5. The lock body **3** has a cross-wise threaded hole **4** in which a screw is inserted to attach the lock body **3** to the door **1**. The attachment screw is not shown in the drawing.

FIG. 2 shows the upper right side part of the lock body **3**. The cylindrical part **5** is the lock housing and in the periphery thereof are axial grooves **6** for a blocking rail **7**. Inside the lock housing is a cylindrical block housing **8** containing blocks **9** and spacers **10** therebetween. The assembly consisting of the blocks and spacers

is held in the axial direction in the block housing by the bottom and face of the block housing.

When the lock is closed, as shown for instance in FIGURE 2, one end of the blocking rail **7** is in groove **6** of the lock housing **5**, and the other end in groove **12** on the block housing, which means that the block housing **8** cannot move with respect to the lock housing **5**.

When the correct key is inserted in the key hole, the blocks **9** can be turned, by means of the key, into the release position, and the notches on the periphery of the blocks take up positions on block rail **7**, which allows the rail to be pressed into the grooves formed by the notches. This situation is shown in FIG. 7.

The operational sequences occurring between the key, the blocks, and the blocking rail are already known from the Abloy lock. However, a lock conforming with the invention deviates in this respect from the known type in that the blocking rail **7** is forced into the groove formed by the notches of the blocks, by pushing the key inwards until the axial slant of the blocking rail touches the bottom of the lock housing slit, and the ring-shaped structure. With the A-lock, however, the key must be turned further in order to force the blocking rail into the groove formed by the peripheral notches on the block discs, which is one of the drawbacks mentioned in the introduction of this application.

Because the blocking rail of locks conforming with the invention is opened by pushing the key barrel in axially, a space **13** has been provided between the rear side of the lock housing and the block housing bottom. When the block housing **8** has been pressed in so far, the blocking rail has, because of its slanting shape, entered the groove formed by the peripheral notches on the blocks, and the block housing is thus released to rotate. This effect is not produced if the wrong key is used, because in a way familiar from the Abloy system, one of the blocking discs is not correctly aligned, i.e. the indentation of one of the block discs is not at the blocking rail.

When the block housing is in its innermost position, it can be turned in both directions as many times as is required, which cannot be done with an Abloy type of lock. In the case described in the drawing, the oblong plug **14** protruding from the rear end of the block housing penetrates into the oblong hole on the spring-loaded latch cam **15** when the block housing is turned, and the latch cam then pushes the latch with each turn, which means that an endless advancing, i.e. locking and return movement can be produced.

FIGURES 3 and 8 show that the lock body protrudes from the door. The profile shape of the lock body corresponds to the well-known profile of the Yale lock body, which means that locks corresponding to the invention can be made using a Yale body. If it is considered that the use of a readily available lock housing is not attractive enough, there is nothing preventing the application of the construction concerned to other suitable shaped lock housings.

A disadvantage of available lock body profiles is that they can easily be destroyed by drilling as all of them are made of brass. The disadvantage mentioned has been coped with in locks conforming with the invention by applying a cap **16** of steel quenched to glass hardness to cover the lock barrel and its face. A circular slit is provided for this purpose, in the cap skirt between the block barrel and the cylindrical lock body excavation shown in FIG. 9.

The protection cap **16** effectively prevents any tampering with the lock. The effectiveness has been improved further by placing a glass-hard quenched plate **17** over the blocks **9**.

The protection cap **16** is kept in place by forming a ring shaped groove **18** on its skirt, which (FIGS. 3 and 8) guides the cup head **19** against the guide by the attachment screw **20**. As shown in FIGS. 3 and 8, the screw **20** cannot be tampered with as long as the lock is fitted in the door **1**. The cup head **19** is also "hidden" and it

grips the cap **16** sufficiently strongly to prevent the protection cap **16** from being forcibly removed.

It has been pointed out above that the blocks **9** and spacers **10** form a kind of packing held between the bottom and the cover of the block housing. Replacement of the locking elements can thus be effected quickly and easily. Block "packs" can be kept in store as spares, which has not been possible earlier.

The semi-circular shape of the key-hole used in some models is very well illustrated in FIG. 1. The cross-sectional area of the key is of a corresponding size.

When the key is inserted in the keyhole, the key can be turned in a clock-wise direction through an angle of about 90°, when the blocks are turned into their opening positions. Subsequently, the key can be pressed in thus forcing the complete block barrel inwards. The length of this transition is arbitrary. In a lock conforming with the Finnish Patent No. 33,836, the transition is controversely completely limited, and must not exceed the thickness of the block disc. For comparison purposes it must be verified that in a lock conforming with the invention, a transition of 4 mm. has been considered favorable in practice. A transition as large as this cannot in practice be produced with a lock conforming with the Finnish Patent No. 33,836 due to the fact that the transition is less than a quarter the value mentioned, the block disc thickness being 1 mm.

It should also be stressed that the block barrel can only be pressed in when the blocks are in the opening position, which in practice means that the correct key must be in the key hole, and turned 90° clock-wise. From this position the opening position of the latch rail **7** is produced by pressing in the block barrel. In this position, plug **21** has moved to the ring-shaped enlargement (FIG. 8) at the rear end of the lock housing. The plug **21** is spring-loaded and a comparison of FIGURES 5 and 11 shows the function of plug **21**. When the block barrel is in its outer position, FIG. 3, the plug **21** is in an axial ring groove, FIG. 11. This arrangement makes it possible for the axial transition movement of the block barrel to be accurately performed at a distinct angle. This means that the task to be carried out by the block barrel, for instance the latch movement, is carried out in a definitive manner. Furthermore, the procedures can be made more effective by installing an audible or palpible signal which is transmitted when the key is at the correct angle.

When the key and the block barrel have been pressed in, FIG. 8, the required setting can be made, for instance the turning of the spring-loaded latch cam **15** which moves the latch. According to the preliminary design, the latch protrudes about 12 mm. after the first turn, and again 12 mm. after the second one. Two turns to the rear will return the latch to its inside position.

All the functions discussed above are initiated by the key from the key barrel side. If no other functions are required, only this half of the lock body is used. However, the following combinations are easy to produce with a lock conforming with the invention:

Left:	Right
Key	Closed.
Closed	Key.
Key	Key.
Press button	Key (drwg. case).
Key	Press button.
Press button	Press button.

in addition to which several other special applications can be made.

The press button used in the drawings is shown as a round knob **23** which engages a separate latch cam **24**, which in turn operates the lock latch. The latch cams **15** and **24** are mutually spring-loaded by the spring mechanism **30** carried in latch cam **24** as shown in FIG. 3. The knob **23** can be locked in position by means of the internal knob **25**, hence providing a protection on the inner side

of the door, for instance, against attempts to open it through the letter box.

When the knob **25** is turned out of the position shown in FIG. 10, the pin **26** decends and locks the movement of the handle **23**. The position described in the in FIG. 10, the pin **26** descends and locks the move- **27** is loaded by the spring **28**, supported at its lower end by a threaded plug **29**. A spring-loaded pin **30** provided with balls at both ends is between the latch cams **22** and **24**.

The invention is naturally not limited to the above presentation and the descriptions given in the enclosed drawings.

Blocks and spacers conforming with the invention and block barrels supplemented by blocking rails can also be used in other lock types. It is essential that the block barrels can be handled freely both inside and outside the lock without disarranging the packing. This also applies to the axial movement inside the lock resulting in the locking of the block rail in its opening position in which it can be arbitrarily turned until at a certain angle the block barrel is drawn out into its surface position.

I claim:

1. A barrel-operated lock comprising a lock body, a block barrel reciprocally supported in said body for axial displacement between normal and depressed positions, said barrel being rotatable in said body for movement between unlocking and locking positions, said lock body and block barrel having respective grooves therein, a blocking rail disposed in part in said grooves in the block barrel and in the lock body to lock the same against relative rotation with said barrel in normal position and in locking position in the body, a plurality of disc blocks in said block body, said disc blocks having peripheral notches and being turnable by a key to align said notches in a position for receiving the blocking rail, said blocking rail having means engageable with said lock body to be urged thereby into the aligned notches upon axial displacement of the block barrel to said depressed position and thereby be removed from the groove in the lock body to enable the barrel to be rotated to unlocking position, said block barrel having a bottom and a removable cover for retaining and holding the disc blocks in the barrel between the bottom and cover, as an assembly which can be handled and moved without disturbing the disc blocks in the barrel.

2. A barrel-operated lock according to claim **1** wherein at least one of the cover and bottom of the block barrel are made of hard quenched steel to provide protection against drilling the lock.

3. A barrel-operated lock according to claim **1** wherein said blocking rail extends between the cover and the bottom of the block barrel.

4. A barrel-operated lock according to claim **1** wherein said blocking rail means includes a protruding portion having at least one axially slanting surface, which contacts the lock body as the block barrel is moved to said depressed position whereby the blocking rail is urged into the aligned notches in the disc blocks.

5. A barrel-operated lock according to claim **4** wherein the angle of the axially slanting surface of the blocking rail is 45–55° relative to the axis of the block barrel.

6. A barrel-operated lock according to claim **5** comprising a cylindrical outer sheathing in said lock body and encircling said barrel.

7. A barrel-operated lock according to claim **6** wherein said lock body has an internal ring shaped projection, which contacts said slanting surface of said blocking rail.

8. A barrel-operated lock according to claim **7** wherein said barrel has a radial groove therein, and a separate spring-loading plug in said groove which allows axial movement of the block barrel with respect to the lock body only when the disc blocks have been turned to align the notches therein.

9. A barrel-operated lock according to claim **6** comprising a sleeve and a bottom plate of hardened steel covering the block barrel.

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U.S. Cl. X.R.

70—370, 380, 417, 421