July 21, 1936. E. N. JACOBI 2,047,966

LOCK

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Fig. 1.

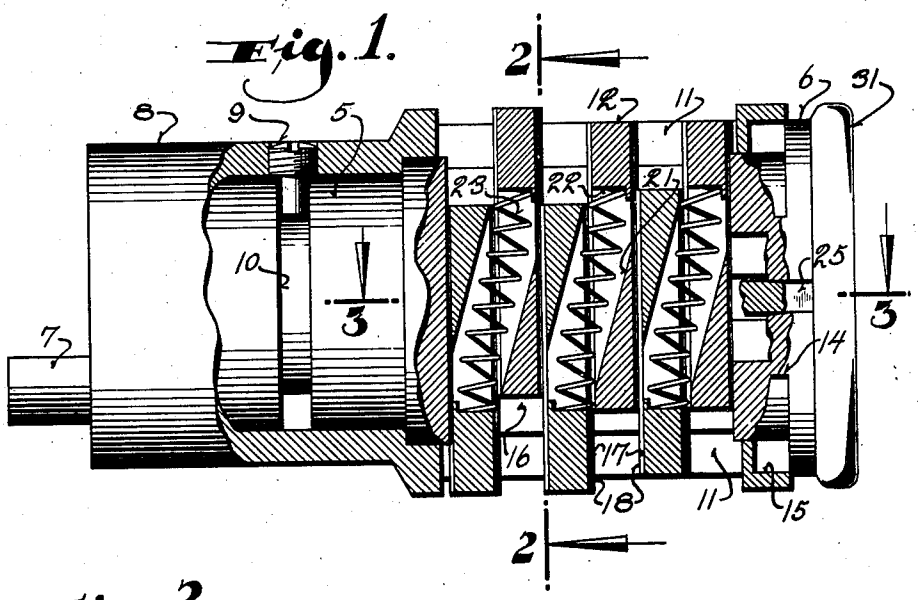
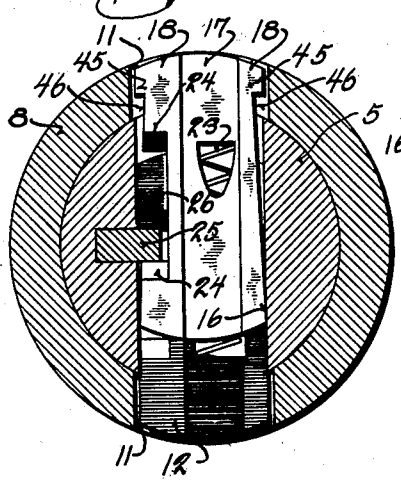
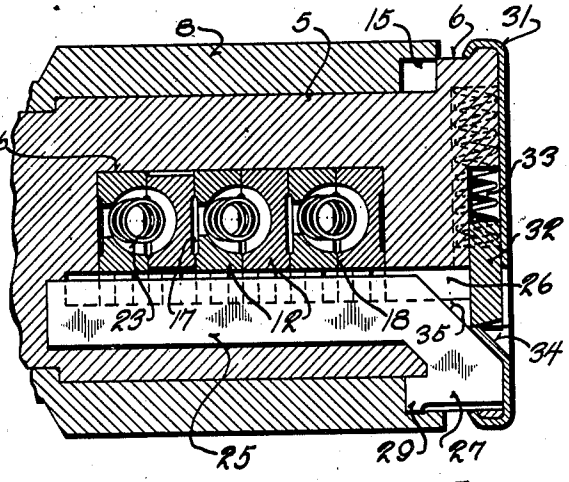


Fig. 2.





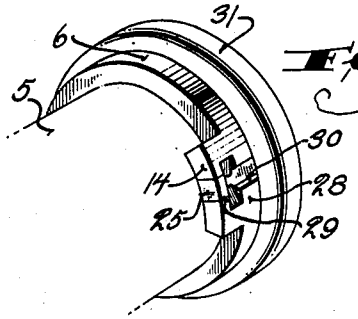


Fig. 4.

Fig. 3.

Inventor

Edward N. Jacobi

By Dewitt & Jones

Attorney

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Fig. 5.

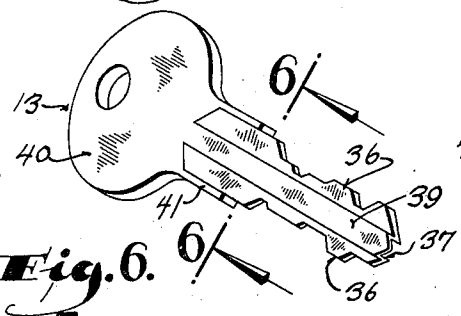


Fig. 12.

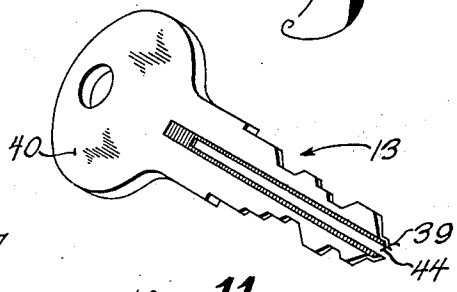


Fig. 6.

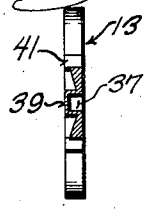


Fig. 11.

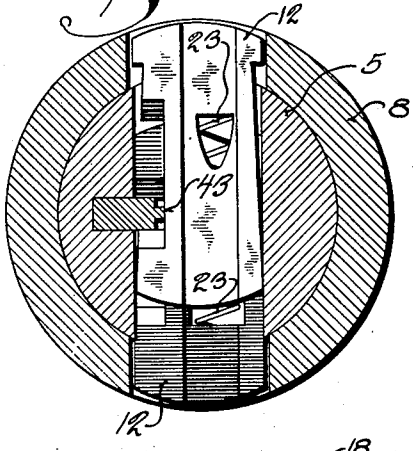
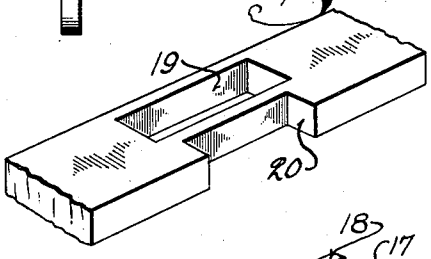


Fig. 7.



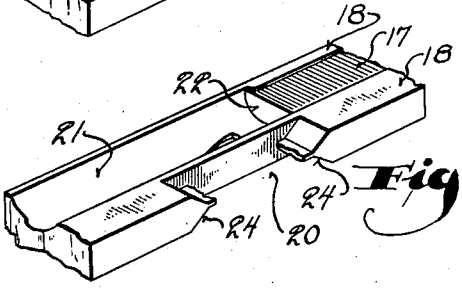


Fig. 8.

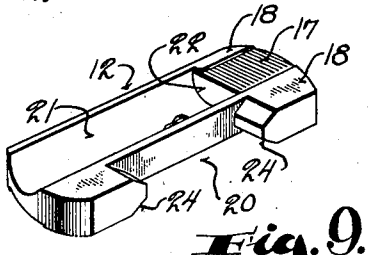


Fig. 9.

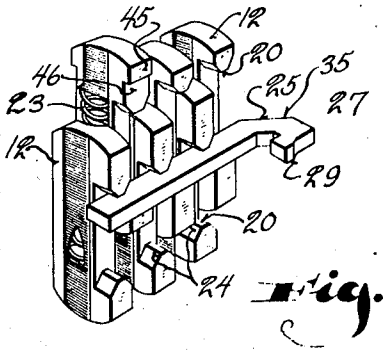


Fig. 10.

Inventor

Edward N. Jacobi

By Dallett & Jones.

Attorneys.

Patented July 21, 1936

2,047,966

UNITED STATES PATENT OFFICE

2,047,966

LOCK

Edward N. Jacobi, Milwaukee, Wis., assignor to Briggs & Stratton Corporation, Milwaukee, Wis., a corporation of Delaware

Application November 3, 1933, Serial No. 696,467

18 Claims. (Cl. 70—46)

This invention relates to certain new and useful improvements in locks and refers more particularly to key controlled tumbler locks.

It is a general object of this invention to provide a lock having greater security against unauthorized opening either by picking or decoding, then locks heretofore in use.

Another object of this invention is to provide a lock in which the tumblers project in opposite directions to insure greater security against forced opening and in which the tumblers are arranged in pairs with a single spring for each pair.

Another object of this invention is to provide protection against destruction of the lock by drilling out the tumblers.

Another object of this invention is to utilize the means affording protection against drilling for guiding the key into proper engagement with the tumblers and for limiting the movement of the tumblers by their urging springs.

Another object of this invention is to position the key guiding and tumbler stopping rib so as to divide the keyway into substantially separated chambers of such restricted size that operation of a picking tool therein is extremely difficult if not entirely impossible.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated two complete examples of the physical embodiment of my invention constructed according to the best modes I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view partly in side elevation and partly in section of a lock embodying this invention;

Figure 2 is a cross section view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a transverse section view taken through Figure 1 on the plane of the line 3—3;

Figure 4 is a perspective view illustrating a detail of the lock cylinder construction;

Figure 5 is a perspective view of the key employed in the lock shown in Figure 1;

Figure 6 is a detail section view through the key taken on the plane of the line 6—6 of Figure 5;

Figures 7, 8 and 9 are perspective views showing various stages in the formation of the tumblers;

Figure 10 is a perspective view of all of the tumblers assembled with the key guide;

Figure 11 is a cross section view similar to Figure 2, but illustrating a slightly modified form of this invention; and

Figure 12 is a perspective view of the key employed in the embodiment shown in Figure 11.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates the cylinder of the lock, which, as is customary, is preferably formed as a die-casting and has an enlarged head 6 and an eccentric latch actuating cam 7 projecting from its inner end. The cylinder is rotatably mounted in a casing or mounting member 8 in which it is retained by a screw 9 having its inner projected end disposed in an annular groove 10 formed in the inner end portion of the cylinder.

At diametrically opposite portions, the casing or mounting member is slotted as at 11 to receive the ends of tumblers 12 carried by the lock cylinder. The tumblers are retractable by a proper key 13 in the customary manner to free the cylinder for rotation, the limits of which are defined by the engagement of either end of a rearward projection 14 extending back from the enlarged head 6, with suitable abutments (not shown) closing a portion of an annular channel 15 in the mouth of the casing.

The tumblers in the present instance are arranged to project oppositely, that is, adjacent tumblers are spring urged to project in opposite directions. In the present instance, there are six tumblers arranged in three sets or pairs with a single spring for the two tumblers of each set or pair. Together, the tumblers fill the tumbler receiving chamber 16, which extends transversely through the cylinder, so that the adjacent faces of the tumblers are in sliding engagement.

To facilitate relative movement between the respective tumblers, their opposite faces are centrally and longitudinally relieved or cut down as at 17 to leave two narrow guide tracks 18 which form the only areas of contact between the tumblers.

As illustrated in Figures 7, 8 and 9, the tumblers are formed from rectangular bar stock and are first pierced with a rectangular opening 19 and a rectangular notch or recess 20 at one side. The

pierced blank is then swaged to form the depressions 17 and to form a slanting round bottomed groove 21 opening to one face of the tumbler. During the formation of the groove 21, a substantial portion of the rectangular opening 19 is closed. The groove 21 which is deepest at its closed end 22, forms a pocket which cooperates with a similar pocket formed in an adjacent tumbler (in the completed lock assembly) to enclose a spring 23, which yieldably projects the two tumblers in opposite directions.

During the swaging operation, the opposite ends of the rectangular recess 20 are pinched to a substantially V-shaped formation as at 24. Following the swaging operation, the ends of the tumblers are trimmed and the flashing produced by the pinching of the ends 24 is cut away to produce the completed tumbler as illustrated in Figure 9.

The recesses 20 provide the keyways of the tumblers, and as will be readily apparent, the V-shaped ends 24 facilitate the passage of the key through the recesses.

To retain the tumblers assembled with the lock cylinder, a metal strip 25 is embedded in the cylinder with its inner edge portion projecting from one side wall of the tumbler chamber 16 into the space formed by the aligned tumbler keyways. The strip or bar 25 limits the outward projection of the tumblers by the springs to hold the same assembled with the cylinder and also provides a guide for the key 13, being engaged by the key throughout the entire length of the key blade.

The front end of the strip or bar 25 projects out through the keyway 26 and is laterally offset as at 27 so that its outer edge breaks through the cylindrical surface of a reduced collar portion 28 on the rear of the head 6 and the outer curved wall of the lug or projection 14, which forms a continuation of the portion 28.

As clearly shown in Figures 3 and 10, this outer edge portion of the laterally offset end 27 has a hook 29 at its inner end, and directly ahead of the hook, the opposite sides of the slot 30, in which the offset end 27 of the bar is received, are swaged over the outer edge of the offset end to secure the bar against outward longitudinal movement.

The guide strip or bar is further held against removal from the cylinder by a finishing cap 31 clinched over the head of the cylinder. This cap is preferably of hardened sheet metal and besides providing a neat external finish for the exposed end of the lock cylinder, also retains a slidable keyway shutter 32 in place. The keyway shutter 32 is yieldably urged to its closed position by a spring 33 and is adapted to be opened by the insertion of the key, being moved to one side against the action of its spring by the effect of the inclined depression 34 at the mouth of the keyway.

The inclined depression 34, which is formed by pressing inwardly a portion of the cap adjacent the mouth of the keyway, also extends down over the inclined inner edge 35 of the key guiding rib as clearly shown in Figure 3. The inclination of the edge 35 serves to guide the key into proper position in the keyway.

By forming the key guiding rib of hardened metal, effective protection is afforded against destruction of the lock by drilling down into the tumblers.

As illustrated in Figure 10, the location of the keyways or recesses 20 and consequently the position of their ends 24 with respect to the length of the tumblers, varies in the different tumblers in accordance with combination of the lock and the contour of the opposite edges 36 of the key blade. The range of movement of the tumbler is such that those requiring a maximum lift, move more than twice the distance of those having a minimum lift, so that a tool narrow enough to lift the low tumblers cannot serve to lift the high tumblers.

The key 13 has a groove 37 extending longitudinally down one side of its blade to engage the guide bar 25. The depth of this groove, as seen from Figure 6 is greater than the major thickness of the blade. Above and beneath the groove, the cross section of the key blade is taperingly enlarged so that the two tumbler engaging edges are thicker than the portions adjacent the groove 37. The wall 39 of the groove forms in effect a ridge extending longitudinally along the side of the key opposite the groove, and it is observed that the rear face of the this wall lies in the plane of the adjacent face of the handle portion 40.

On the opposite face of the key, the sides of the blade are likewise flush with the adjacent face of the handle portion 40, and as the major thickness of the blade is less than the depth of the groove 37, it follows that the handle is of greater thickness than any portion of the blade. The shank 41 of the key is also of greater width than the blade proper. This provides greater strength and produces a key of novel construction.

It is noted that the bottom wall 39 of the groove 37 is comparatively thin. Consequently, the space left between the inner edge of the bar or key guiding rib 25 and the adjacent sides of the tumbler keyways may be comparatively slight so that the key guiding rib practically divides the keyway into two separated chambers. This fact materially minimizes the possibility of picking the lock as the restriction of the space within the keyway is such that it is impossible to operate a picking tool.

If desired, the inner edge of the key guiding rib may be provided with an additional longitudinal fin 43, as shown in Figure 11, to extend across the entire keyway and contact the tumblers. In this modification, the partition produced by the key guiding rib actually and completely divides the keyway into two separated chambers. The key used in this modification is illustrated in Figure 12, and except for the fact that the bottom wall 39 of the groove 37 is slotted as at 44, is identical to that illustrated in Figure 5.

If desired, one or more of the tumblers may be provided with hooked ends 45 (see Figures 2 and 11). In the present instance, only one of the tumblers is provided with such hooked ends and as shown, the sides of this tumbler beneath the hooked ends are inclined as at 46 to allow the tumbler to rock during forced turning of the cylinder so that one or the other of its hooks 45 will engage over the adjacent edge of the tumbler receiving chamber in the cylinder and thus effectively preclude retraction of the tumbler to its retracted position.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art, that this invention affords a novel, sturdy lock, which has maximum protection against picking or decoding at least with any known instrument or method.

What I claim as my invention is:

1. In a lock, a lock cylinder having a keyway,

a plurality of key operable tumblers slidable transversely in the lock cylinder, spring means to project said tumblers outwardly of the lock cylinder, and a key guiding rib projecting into the keyway from one side wall thereof and extending throughout the length of the keyway to be engageable with the tumblers to limit their outward projection.

2. In a lock, a lock cylinder having a keyway, a plurality of key operable tumblers slidable transversely in the lock cylinder, abutments on the tumblers, spring means to project said tumblers outwardly of the lock cylinder, and a hardened metal strip carried by one side wall of the keyway in the lock cylinder and having a part lying in the path of the abutments on the tumblers to limit their outward projection, said strip being so positioned as to render it difficult to destroy the lock by drilling.

3. In a lock, a lock cylinder having a keyway, a plurality of key operable tumblers slidable transversely in the lock cylinder with portions thereof crossing the keyway, spring means to project said tumblers outwardly of the lock cylinder, and a key guiding rib extending down the keyway and projecting from one side wall of the keyway with a portion thereof lying in the path of said portions of the tumblers which cross the keyway to be engageable by said portions and thus limit their outward projection.

4. In a lock, a lock cylinder having a keyway, a plurality of key operable tumblers slidable transversely in the lock cylinder with portions thereof crossing the keyway, said portions of the tumblers being provided with keyways, spring means to project said tumblers outwardly of the lock cylinder, and a key guiding rib carried by one side of the keyway and lying in position to be engaged by the key engaging edges of the tumbler keyways and thus limit the outward projection of the tumblers.

5. In a lock, a lock cylinder having a keyway, a metal strip embedded in one side wall of the keyway and anchored at one end against transverse displacement and protruding into the keyway to divide the keyway into substantially separated chambers, said protruding portion of the strip being exposed on three sides to have a direct sliding engagement with the sides and bottom of a groove in the side of a key insertable into the keyway.

6. In a lock, a lock cylinder having a keyway, a plurality of tumblers slidable transversely in the cylinder, said tumblers having keyways in line with the keyway in the lock cylinder, and a metal strip embedded in one side wall of the keyway and projecting into the keyway of the cylinder to guide a key for proper engagement with the keyways of the tumblers, said key guiding strip dividing the keyway substantially into separated chambers and being engageable by certain edges of the tumbler keyways so that the tumblers are retained assembled with the cylinder by said strip.

7. In a lock, a lock cylinder having a transverse tumbler receiving chamber therein, a plurality of tumblers disposed in said chamber, said tumblers having notches cut in one longitudinal edge to provide keyways, and a rib carried by the cylinder and projecting from one side wall of the tumbler receiving chamber to be disposed in the keyways of the tumblers to retain the tumblers assembled with the lock cylinder.

8. In a lock, a lock cylinder having a transverse tumbler receiving chamber, a plurality of tumblers disposed in said chamber, said tumblers having keyways cut into one side edge thereof, spring means to yieldably project the tumblers from the cylinder, and a rib carried by the cylinder and projecting from one side wall of the tumbler receiving chamber to project into the keyways of the tumblers, whereby certain edges of said tumbler keyways strike the rib to limit the projection of the tumblers by the spring means.

9. In a lock, a lock cylinder having a key opening opening into a transverse tumbler receiving chamber, a plurality of tumblers disposed in said chamber, said tumblers being cut away at one side edge to form keyways in line with the cylinder key opening, spring means to yieldably project the tumblers from the cylinder, and a metal strip carried by the lock cylinder and extending down the key opening with a part projecting into the keyways of the tumblers so that certain edges of the tumbler keyways are engageable with the strip to limit their projection by the spring means, said strip also forming a guide for a key and restricting the space in the key opening to render picking of the lock more difficult.

10. In a lock, a lock cylinder, a plurality of tumblers carried by the lock cylinder, abutments on the side edges of the tumblers, spring means supported entirely by the tumblers and disposed substantially on a plane passing centrally through all of the tumblers to yieldably project the tumblers from the cylinder, and means carried by the cylinder and engageable with the abutments on the side edges of the tumblers to limit their projection by said spring means.

11. In a lock, a lock cylinder, a plurality of tumblers disposed in the lock cylinder, said tumblers being arranged in pairs, the tumblers of each pair having complementary recesses to form spring receiving chambers inclined with respect to the meeting faces of the tumblers, and springs disposed in said chambers with one end thereof bearing against one end of one of the recesses and its other end bearing against the opposite end of the other recess.

12. In a lock of the character described, a plate tumbler having a keyway opening to one of its longitudinal side edges, and a spring receiving recess opening to one face of the tumbler and substantially centrally disposed with respect to the width of the tumbler.

13. In a lock, a lock cylinder having a keyway provided with a slot in one side wall thereof, a plurality of tumblers carried by the lock cylinder, and a metal strip extending down the keyway and set in said slot, said strip being inserted from the front end of the lock cylinder and having its outer end shaped to guide a key into proper position in the keyway and forming a support for the key throughout the length of the keyway, said strip also engaging the tumblers to retain the same assembled with the lock cylinder.

14. A plate type tumbler for locks comprising, a substantially flat bar having an open recess at one side edge portion to provide a keyway, and having a substantially round bottomed groove in one face to provide a spring receiving pocket, said groove being closed at one end to afford a seat for the end of a spring disposed in said groove.

15. A plate type tumbler for locks comprising a substantially flat bar having a substantially round bottomed groove opening to one face thereof, said groove having an increasing depth from one end portion to the other with its deepest end abruptly closed to afford a support for the end of

a spring disposed in the groove, and said bar having an open recess to one side of the groove to afford a keyway.

16. A plate type tumbler for locks comprising, a substantially flat bar having a spring pocket opening to one face thereof and provided by an open grcove, the depth of which increases from one end to the other and the deepest end being closed by an abrupt wall.

17. A plate type tumbler for locks comprising, a substantially rectangular body having a keyway opening to one side edge and having its opposite side edges inclined from one end of the body to a point adjacent the opposite end to give the body a taperingly reduced width and to form abrupt shoulders adjacent said second mentioned end of the body.

18. A plate type tumbler for locks comprising a substantially rectangular body having a spring receiving pocket opening to one face thereof, said pocket having one end closed by an abrupt wall which serves as a rest for the end of a spring received in the pocket, one side edge portion of the body being notched to provide a keyway, and both side edges being inclined with respect to the major axis of the body from one end portion of the body to a point adjacent the opposite end so as to produce abrupt overhanging shoulders adjacent said second mentioned end.

EDWARD N. JACOBI.