

FIG. 1

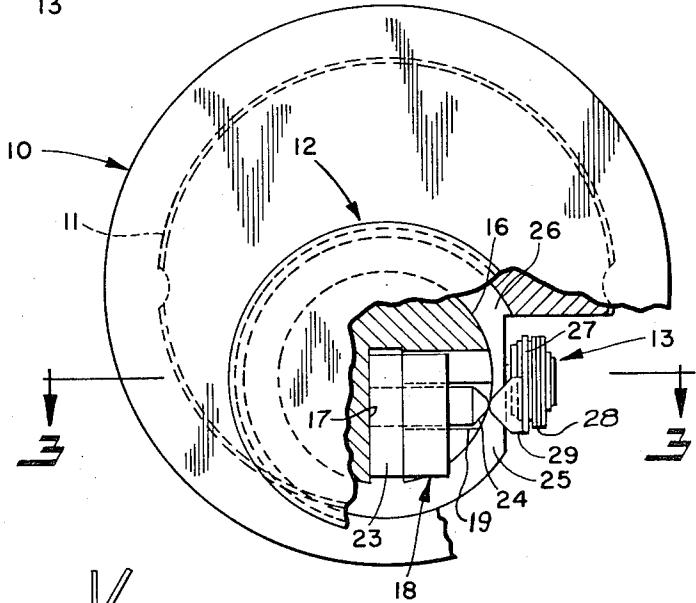


FIG. 2

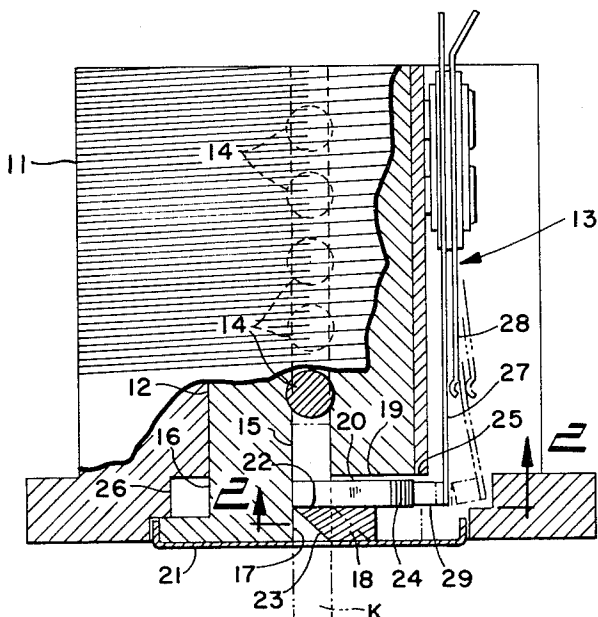


FIG. 3

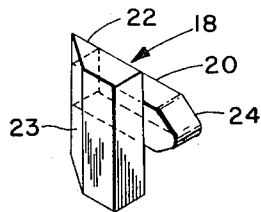
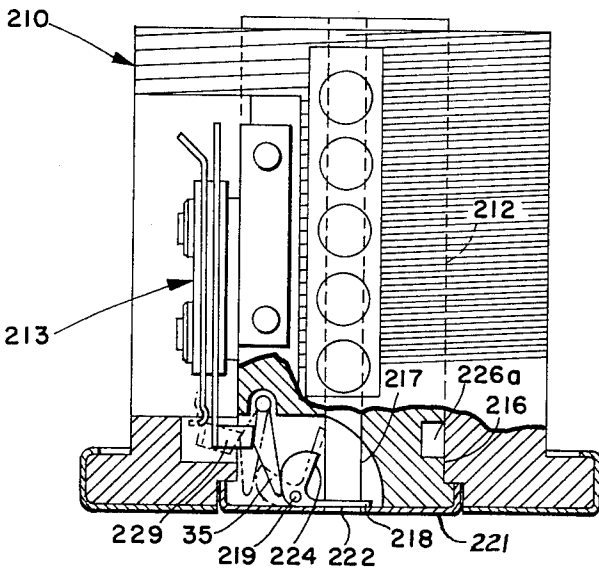
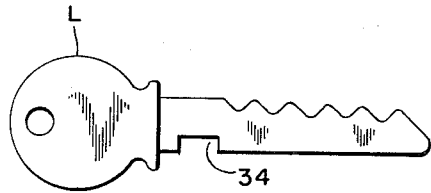
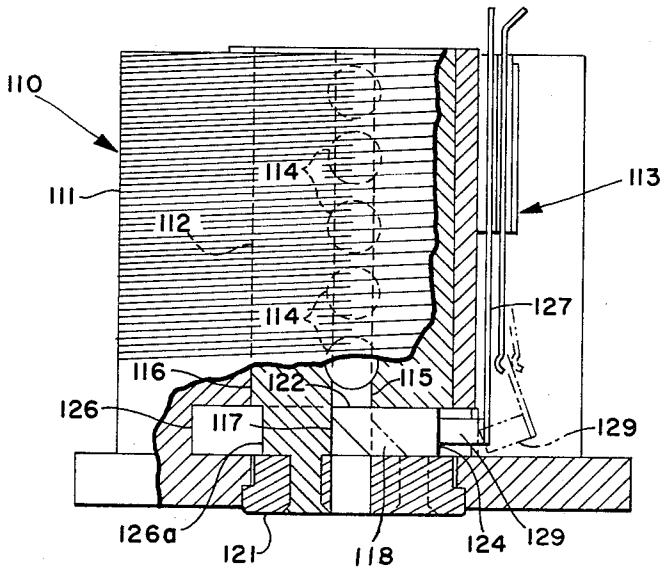
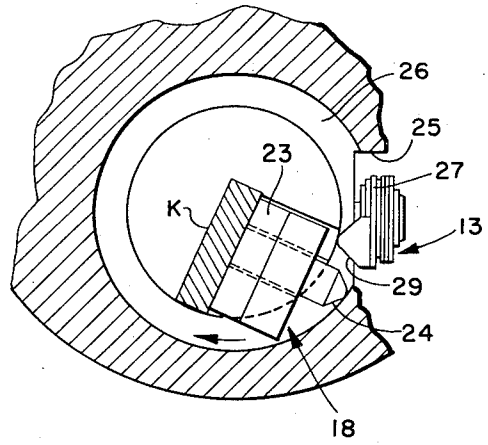
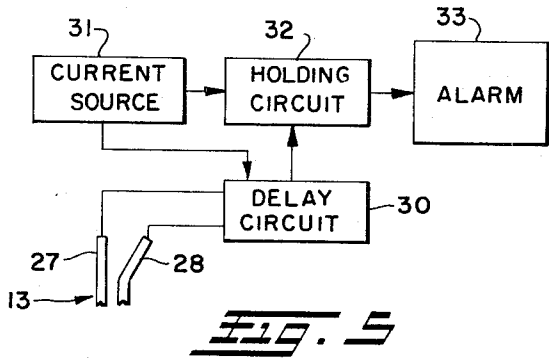


FIG. 4

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LOCK TUMBLER CYLINDER PICKING ALARM**BACKGROUND**

The prior art contains many examples of locks that are intended to actuate an electric alarm circuit when there is an attempt to pick the lock, or when a key is left in the lock. Those prior locks generally utilize a lock tumbler or a special part within the keyway of the lock to actuate the alarm circuit when moved by a key or instrument that is inserted into the keyway of the lock. There is a considerable demand today for locks of that kind, but the prior locks are not entirely effective for the purpose because in many cases a skilled person finds it possible to avoid or to minimize actuation of the alarm while proceeding to pick the lock tumblers. We now contribute by our invention a novel lock assembly offering an extremely effective alarm function that will be most difficult or impossible to circumvent when there is an attempt to pick the lock.

SUMMARY OF THE INVENTION

Our inventive concept will be well utilized in a lock cylinder assembly having a rather usual arrangement in which there is a key plug whose movements are controlled by a series of tumblers. A front portion of the key plug has an opening that forms an entrance through which a key will be inserted into a longitudinal keyway in the key plug to control the tumblers. We particularly equip the cylinder assembly with a keyway guard member that normally is in position extending across the keyway entrance opening on the front portion of the key plug, and that will move away from the position when a key or other instrument is inserted through the opening. We then equip the guard member with switch actuating means that will actuate an electric switch to offer an alarm signal when the guard member moves from its normal position across the entrance opening of the keyway.

The novel contribution of our invention will make it possible to construct a lock cylinder assembly that will offer an electric signal prior to control of any one of the lock tumblers by a picking instrument that may move into the keyway. This is of importance, because we believe that the full effect of a picking alarm cannot be achieved with certainty when a picking instrument first must be present in the keyway in order to actuate the alarm.

As a preferred feature, the guard member of our invention is a shutter that normally closes the keyway entrance opening, and that must move to actuate the switch so as to offer an alarm signal before an instrument can move toward the tumblers in the keyway.

So that there need be no actuation of an alarm when the proper key moves through the keyway entrance opening, the alarm circuit may comprise a time delay actuated by the alarm signal and withholding operation of an alarm for a time that is sufficient to permit use of the proper key.

As a further feature, the guard member or shutter will actuate the electric switch through means that enable the switch to move to unactuated position when a key moves the key plug in a release direction. Then there need be only a brief alarm signal incidental to use of a proper key, enabling the alarm circuit to have a time delay of a duration so short that merely a short alarm signal will operate the alarm, thus giving almost

immediate warning when a person prepares to pick the lock tumblers.

We have thus outlined rather broadly the more important features of our invention in order that the detailed description thereof that follows may be better understood, and in order that our contribution to the art may be better appreciated. There are, of course, additional features of our invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which our disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of our invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of our invention, in order to prevent the appropriation of our invention by those skilled in the art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings:

FIG. 1 shows a perspective view of a lock tumbler cylinder assembly utilizing our invention;

FIG. 2 shows a front end view partly in section on the broken line 2—2 in FIG. 3;

FIG. 3 shows a plan view partly in section on the line 3—3 in FIG. 2;

FIG. 4 shows a perspective view of the shutter for the keyway entrance opening;

FIG. 5 shows a block diagram of an alarm circuit connected to the switch of the cylinder assembly;

FIG. 6 shows parts of FIG. 2 but illustrates key operation of the key plug;

FIG. 7 shows a partly sectional plan view of a further form of the invention;

FIG. 8 shows a partly sectional plan view of a form in which there is a pivotal shutter and

FIG. 9 shows a key that may be utilized when desired.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to FIG. 1 of the drawings, our cylinder assembly is indicated generally by the numeral 10, and includes a cylinder 11, a key plug 12 mounted for rotation in a bore of cylinder 11, and an electric switch 13 mounted on a recessed outer portion of cylinder 11.

For purposes of disclosure, FIG. 3 shows the key plug 12 equipped with a rather usual series of pin tumblers 14 to which access may be had through a longitudinal keyway 15 in the key plug. The particular type of tumbler is not important to an understanding of the invention, and it is merely necessary here to know that tumblers 14 normally lock key plug 12 against rotation in cylinder 11 and should move to release position only by use of a proper key. Nevertheless, as with other types of tumblers, tumblers 14 may be vulnerable to a person who manipulates a picking instrument in the keyway 15, as will be understood.

In our invention, the key plug 12 comprises a front portion 16 having an opening 17 that forms an entrance to the keyway 15, and mounting a shutter 18 that forms a guard member for the opening 17. The front portion 16 of the key plug is recessed to accept the shutter 18 at one side of the keyway entrance opening 17, and is

formed with a groove 19 engaging a rib 20 on the shutter so as to guide the shutter for sliding in a transverse direction relatively to the entrance opening 17. A scalp or cover member 21 is secured on the front portion 16 of the key plug, in effect forming an integral part of the front portion and holding the shutter 18 in assembled relation. The shutter 18 has an end portion 22 of a size substantially corresponding to the dimensional area of the keyway entrance opening 17, and closing that opening when shutter 18 is in a normal position. A tapered surface 23 on shutter 18 will enable a key K to slide the shutter from its normal position so that the key may pass into the keyway 15, as indicated in dot and dash lines in FIG. 3.

The rib 20 of the shutter 18 has a switch actuating part 24 that will move in a clearance space 25 in cylinder 11 when shutter 18 slides from its normal position closing the keyway entrance opening 17. The clearance space 25 is extended to form a circular inner groove 26 in cylinder 11. That groove 26 will offer clearance for rotation of the switch actuating part 24 of the shutter when key plug 12 rotates as shown in FIG. 6.

The switch 13 includes a contact spring arm 27 normally in open circuit relation to a contact arm 28, and having an actuating part 29 in opposed relation to the actuating part 24 on the shutter. The arrangement is such that spring arm 27 presses the shutter 18 to its normal position, and will yield so that the switch 13 will close a circuit when shutter 18 moves from its normal position, as shown by dot and dash lines in FIG. 3. Now when a key K rotates key plug 12, as shown in FIG. 6, the actuating part 29 on the spring arm 27 of the switch will move into clearance space 25 while the actuating part 24 moves in groove 26, so that switch 13 will be in open circuit unactuated position. Thereby the shutter 18 can effect an alarm signal that has a short duration, and the importance of this will appear as the description proceeds.

Referring now to FIG. 5 of the drawings, the numeral 30 indicates an electric time delay circuit connected to a current source 31, and controlled by an alarm input signal that will be applied when a circuit is completed through the contact arms 27, 28 of switch 13. We believe that it will be unnecessary to describe details of delay circuit 30 because those details will be within the skill of a person who is familiar with the electrical art. It is merely necessary to know here that the delay circuit 30 is a type having a time cycle running so long as there is an input signal, and cancelling the entire cycle when the input signal ceases. When switch 13 applies an input signal for a predetermined time, the time delay 30 will offer a signal that actuates a holding circuit 32 powered by the current source 31. Once actuated, holding circuit 32 will energize and maintain an alarm 33 energized.

To review the operation of the invention, it will be seen that the shutter 18 normally extends across and closes the keyway entrance opening 17, obstructing access to the keyway 15 so that shutter 18 must move from normal position before any one of the tumblers 14 can be moved by an instrument that may be inserted into the keyway, whether it be a proper key, an improper key, or a picking instrument. The movement of the shutter 18 will immediately actuate switch 13, starting the predetermined time cycle of time delay 30. That time cycle will have a predetermined duration that may be rather short because a key that moves the shutter

18, if a proper key, will be able to rotate the key plug 12 so that switch 13 very soon moves to unactuated position, cancelling the time cycle. Being of short duration, the time cycle will allow insufficient time to pick any one of the tumblers, should the instrument that is present in the keyway be a picking instrument, and the alarm 33 will be actuated. Should the instrument be a key but not a proper one, it cannot rotate the key plug 12 and therefore the alarm will be actuated if the person using the key does not soon recognize that it will not operate, or if he takes the time to attempt release by vibrating the key.

Thereby our invention will offer an alarm that will very effectively indicate an improper attempt to operate a lock cylinder. It is important to observe also that the invention will be utilized effectively in those cases in which it is desired that there be an alarm that operates when a key is improperly left in the keyway. Thus, a key remaining in the keyway 15 will hold switch 13 in actuated position, causing alarm 33 to operate unless the key is promptly withdrawn from the keyway. In such cases it may be preferred that the alarm 33 should cease operation when the key has been withdrawn, and therefore we do not wish to limit our invention by a holding circuit.

FIG. 7 shows a further form of the invention, in which a cylinder assembly 110 comprises a shutter 118 for the keyway entrance opening 117, and held assembled by a relatively thick cover member 121. That cover member 121 is riveted in position forming an integral part of the front portion 116, and has an opening which forms a part of the entrance opening 117. The cylinder 111, switch 113, tumblers 114 and keyway 115 may be quite similar to those already described, and the shutter 118 is mounted to slide in a clearance space on the front portion 116 of the key plug 112.

The shutter 118 has an end portion 122 that closes entrance opening 117 in the normal position of the shutter, and an opposed end 124 of the shutter is formed to lie some distance inwardly from the peripheral surface of key plug 112. The end 124 of the shutter forms an actuating surface for moving a part 129 on switch arm 127 so as to actuate switch 113. The front portion 116 of the key plug is formed with a circular clearance groove 126a that enables switch arm 127 to move to unactuated position when key plug 112 rotates, and cylinder 111 has an inner groove 126 offering clearance for shutter 118.

FIG. 8 shows a form of the invention in which a cylinder assembly 210 has a shutter 218 that is mounted for pivotal movement. Shutter 218 has a portion 222 normally closing the keyway entrance opening 217 on a front portion 216 of key plug 212, and is mounted through pivot means 219 on the front portion 216. The shutter portion 222 normally rests against the inner surface of a scalp 221, and the shutter has a cam portion 224 coacting with the actuating lever 35 mounted on key plug 212. Switch 213 has an actuating part 229 extending normally within the periphery of key plug 12 and in opposed relation to lever 35. An instrument that may be inserted through the keyway entrance opening 217 will rotate the shutter 218, which then will act through lever 35 to actuate the switch 213. A circular groove 226a in the periphery of the front portion 216 of the key plug will enable switch 213 to move to unactuated position when key plug 212 rotates, as in the constructions already described.

In some instances where the invention is utilized, it may happen that the switch on the cylinder will be actuated during rotating movement of the key plug, due to a movement of the back of the key against the actuating part of the switch. Where that will happen, and will be objectionable, the keys to be used may be formed as shown in FIG. 9. Thus, the back edge of a key L will be cut to form a notch 34 that will be in aligned relation to a clearance groove, as for example the groove 126a in FIG. 7, so that the key when rotating will not engage the actuating part of the switch.

We believe that the construction and operation of our novel lock tumbler cylinder assembly now will be clear, and that the advantages of the assembly will be understood. Our cylinder will offer an alarm signal at the moment when any key or other instrument moves through the entrance opening of a keyway and before the key or instrument can engage any one of the tumblers in the cylinder. In effect, the mere presence of an instrument in the keyway will cause an alarm signal. Thereby we enable an alarm to operate with certainty to indicate an attempt to pick the lock tumbler, and before the attempt can succeed. Nevertheless, the alarm signal need not operate an alarm should the instrument be a proper key. It is believed, therefore, that the very considerable value of our invention will be fully appreciated by those skilled in the art.

We claim:

1. In a lock tumbler cylinder assembly having a key plug that is mounted for movement in a bore of a cylinder, a front portion of the key plug having an opening that forms an entrance to a longitudinal keyway in the key plug, and a series of plug locking tumblers in position rearwardly of the front portion on the key plug and controlled by a key that may be inserted through the keyway entrance opening into the keyway, the improvement that comprises a movable keyway guard member extending across said keyway to substantially cover the entire opening of said keyway in a first position and being movable by the insertion of said key to a second position away from said keyway to provide access to said keyway for said key, said guard member normally being spring pressed to said first position extending across said keyway entrance opening, means mounting said guard member to yield from said first position to said second position in a direction transverse to said entrance opening on the cylinder assembly when an instrument is inserted through said opening into the keyway, an electric switch mounted on an outer portion of the cylinder, and actuating means through which said guard member acts when yielding to actuate said switch for offering an electric alarm signal prior to control of any one of the tumblers by said instrument that may be inserted into the keyway.

2. In a lock tumbler cylinder assembly having a key plug that is mounted for movement in a bore of a cylinder, a front portion of the key plug having an opening that forms an entrance to a longitudinal keyway in the key plug, and a series of plug locking tumblers in position rearwardly of the front portion on the key plug and controlled by a key that may be inserted through the keyway entrance opening into the keyway, the improvement that comprises a keyway guard member normally spring pressed to a position extending across said keyway entrance opening, means mounting said guard member to yield in a direction transverse to said entrance opening on the cylinder assembly when an in-

strument is inserted through said opening into the keyway, an electric switch mounted on an outer portion of the cylinder, and actuating means through which said guard member acts when yielding to actuate said switch for offering an electric alarm signal prior to control of any one of the tumblers by an instrument that may move into the keyway, said guard member being a shutter mounted on said front portion of the key plug and comprising a portion that has a size substantially corresponding to the dimensional area of the keyway entrance opening and closing said opening when the shutter is in its position extending across said opening.

3. The invention set forth in claim 2 in which the switch actuating means comprise portions mounted on said key plug and said cylinder and coacting to actuate the switch upon yielding movement of said shutter from a position closing the keyway entrance to a position opening the keyway entrance.

4. The invention set forth in claim 1 in which the switch actuating means comprise portions mounted on said key plug and said cylinder and coacting to actuate the switch upon yielding movement of said guard member from said first position extending across the keyway entrance to said second position opening the keyway entrance.

5. The construction set forth in claim 4, in which the front portion of the key plug has means mounting one of said coacting portions of the switch actuating means to move with the key plug and out of coacting relationship to another of those portions when the key plug moves in the cylinder bore.

6. The invention set forth in claim 5, there being clearance spaces accepting said coacting portions of the switch actuating means on the key plug and cylinder, and one of said clearance spaces having an extended portion accepting one of said coacting portions so as to enable the switch to move to unactuated position when those portions move out of coacting relationship.

7. The construction set forth in claim 6, in combination with an electric alarm circuit connected to said switch and including a time delay effecting operation of an alarm device when said switch maintains an offered alarm signal for a predetermined period of time, so that an instrument that moves through the keyway entrance opening without rotating the key plug in said predetermined period of time will cause the alarm device to operate while a key that rotates the key plug within said predetermined period of time need not cause said device to operate.

8. The invention set forth in claim 6 in which said guard member is a shutter comprising a portion that has a size substantially corresponding to the dimensional area of the keyway entrance opening and closing said opening when the shutter is in its position extending across said opening.

9. The invention set forth in claim 2 in which the front portion of the key plug has a groove in which said shutter is assembled, and a cover portion retaining said shutter for sliding relative to its entrance closing position in said groove of the front portion.

10. The invention set forth in claim 9 in which a surface on said shutter forms a portion of the switch actuating means, and said switch having a spring arm against which said surface presses to actuate the switch upon yielding movement of said shutter from its position closing the keyway entrance opening.

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11. The invention set forth in claim 2, wherein said means mounting said guard member includes means mounting said shutter for pivotal movement relative to its position closing the entrance opening on the front portion of the key plug, and further including a cover portion overlying said shutter on said front portion.

12. The invention set forth in claim 11 in which said

switch actuating means comprise a cam surface on said shutter, and said switch having a spring arm moved by pressure applied through said cam surface to actuate the switch upon pivotal movement of said shutter from position closing the keyway entrance opening.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,797,004 Dated March 12, 1974

Inventor(s) Dan C. Muessel et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 20, "Description of the Preferred Embodiments" should read -- BRIEF DESCRIPTION OF THE DRAWINGS --.

Signed and sealed this 18th day of June 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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