United States Patent [19]

Fish

[11] **3,837,194**

[45] **Sept. 24, 1974**

[54] **PIN TUMBLER LOCK**

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[22] Filed: **Jan. 4, 1973**

[21] Appl. No.: **320,869**

[52] **U.S. Cl.** **70/276,** 70/413
[51] **Int. Cl.** **E05b 47/00**
[58] **Field of Search** ..... 70/276, 413, 364 A, 373

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[57] **ABSTRACT**

A lock mechanism having a cylinder normally held against rotation to an unlocking position by two sets of pin tumblers disposed at opposite sides of the cylinder axis. One set is of the conventional type comprising a number of pin tumblers and drivers therefor actuatable to cylinder releasing positions by the bitting on one edge of a key inserted into a keyway in the cylinder. The other set of tumblers is comprised of a number of magnets arranged in a row lengthwise along the other edge of a key in the keyway, and repelled to cylinder releasing positions by magnet members on the key.

3 Claims, 4 Drawing Figures

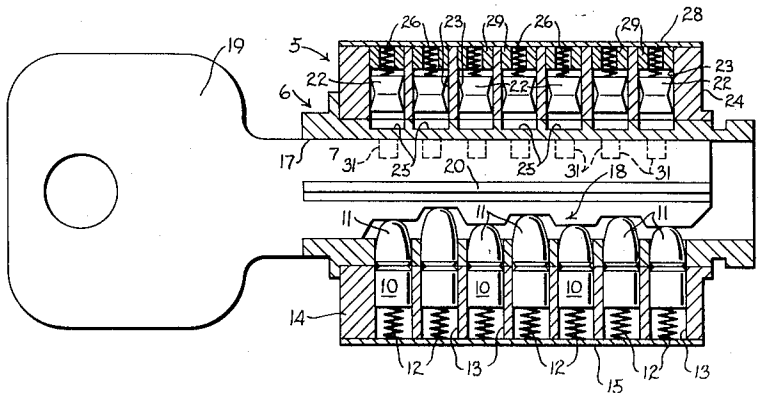


FIG. 4.

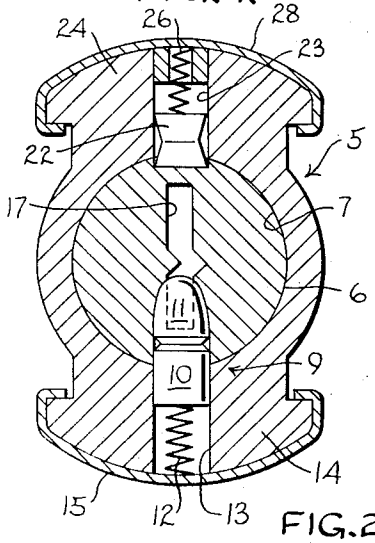


FIG. 1.

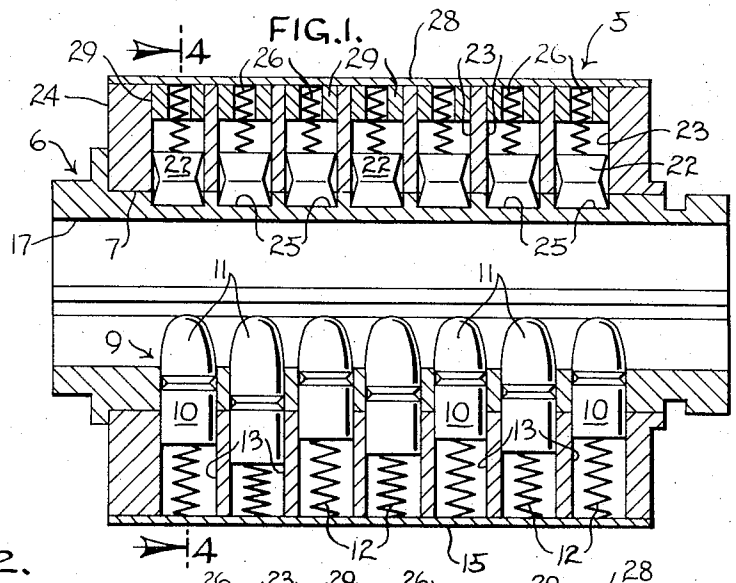


FIG. 2.

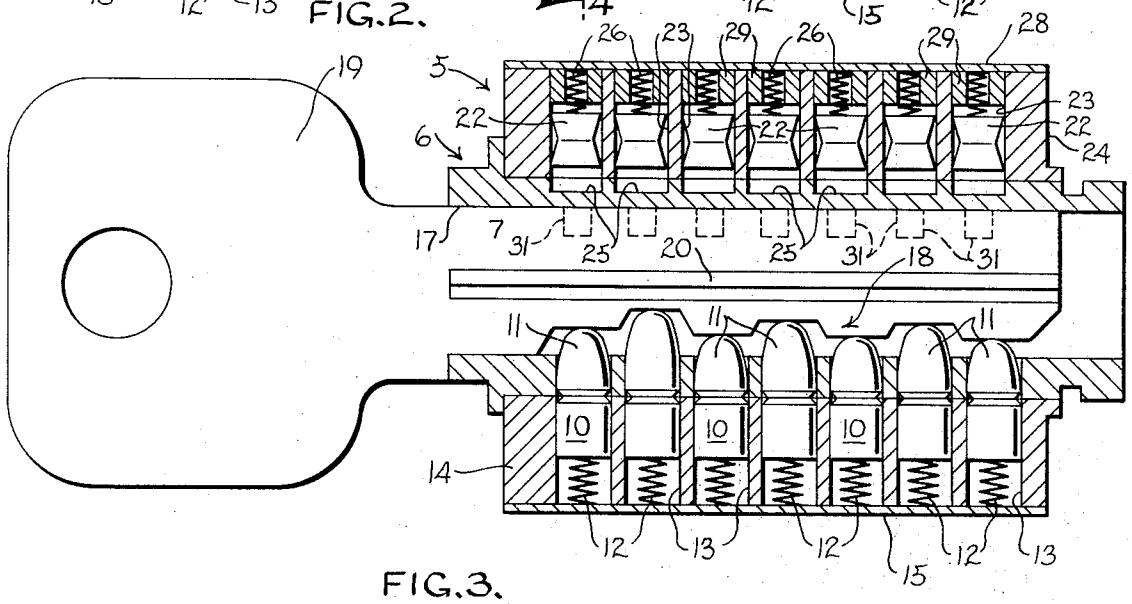
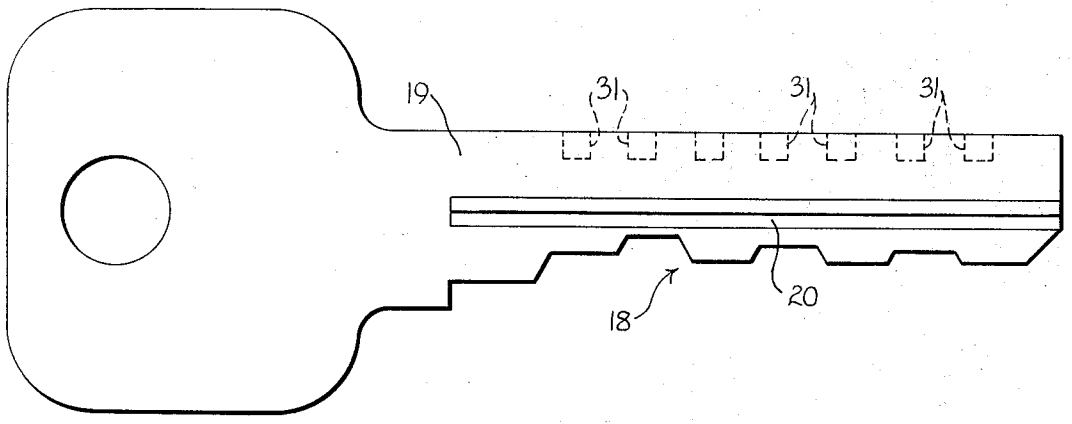


FIG. 3.



PIN TUMBLER LOCK

This invention relates to lock mechanisms and has more particular reference to cylinder locks of the type having pin tumblers which hold the cylinder against unlocking rotation except upon insertion of a proper key into a keyway in the cylinder.

The primary objective of the invention resides in the provision of a pin tumbler lock mechanism with auxiliary tumbler means for its cylinder to substantially improve the security afforded by the mechanism when subjected to picking or forcing.

More specifically, it is a purpose of the invention to provide a cylinder type lock mechanism with a first set of more or less conventional key operable pin tumblers located at one side of the cylinder axis, and to incorporate in said mechanism a second set of driverless pin-like tumblers located at the opposite side of the cylinder axis and comprising a number of magnets which can be repelled to cylinder releasing positions by magnet members on a proper key inserted into the cylinder.

With these observations and objectives in mind, the manner in which the invention achieves its purpose will be appreciated from the following description and the accompanying drawing, which exemplify the invention, it being understood that changes may be made in the specific apparatus disclosed herein without departing from the essentials of the invention set forth in the appended claims.

The accompanying drawing illustrates one complete example of an embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

FIG. 1 is a longitudinal sectional view through a lock mechanism embodying this invention, showing the cylinder thereof in its locking position;

FIG. 2 is a similar view showing the cylinder in the same position but with a proper key inserted thereinto;

FIG. 3 is a side elevation of the key per se; and

FIG. 4 is a cross sectional view taken through FIG. 1 on the plane of the line 4—4.

Referring now particularly to the accompanying drawing, the numeral 5 generally designates the body of the lock mechanism, while the numeral 6 designates a cylinder which is rotatably received in a bore 7 in the body.

The cylinder is normally held against rotation to an unlocking position, from the locking position of rotation thereof seen in FIG. 1, by tumbler means 9 which can comprise a number of conventional pin tumblers 10 and drivers 11, one for each pin tumbler. The tumblers 10 are urged by springs 12 to operative positions seen in FIG. 1, at which they extend across the shear line between the cylinder and the wall of the bore in which the cylinder is mounted, to prevent rotary motion of the cylinder.

The tumblers are slidably mounted in radial holes 13 formed in an axially extending tumbler enlargement 14 on the exterior of the body, at one side thereof. The springs 12 for the tumblers are confined between their outer ends and a retaining clip 15 clinched over the enlargement 14 in position to close the outer ends of the holes 13.

The drivers 11 are carried by the cylinder 6, in radial holes that register with the tumbler receiving holes 13 and receive inner end portions of the tumblers in the locking position of the cylinder. As is customary in pin tumbler locks, the tumbler springs act through the tumblers to yieldingly hold the drivers in their innermost positions at which they bottom in their respective holes and thus define the operative positions of the tumblers.

The drivers, of course, project into an elongated substantially narrow keyway 17 in the cylinder, opening to its front, for engagement by the bitting 18 on one edge of a key 19. When the key is inserted into the keyway, the bitting thereon actuates the drivers to positions at which their respective tumblers are retracted from the driver holes in the cylinder, and the latter is released for unlocking rotation. As seen in FIG. 2, the retracted positions of the tumblers are those at which their inner ends lie at the shear line between the cylinder and the wall of the bore containing it.

For security reasons, the lock mechanism has been shown provided with seven tumblers 10 and a corresponding number of drivers. Also for security reasons, the keyway 17 is of the paracentric type characterized by a longitudinal rib 20 on one side thereof. The keyway, of course, has a cross section corresponding to that of the key so as to readily accommodate the rib 20.

According to this invention, the security afforded by the lock mechanism against picking and/or forcing is substantially improved through the expedient of providing a second set of tumblers 22 therefor. The tumblers 22 are also of the pin type, but they have no key actuated drivers such as are provided for the tumblers 10. Instead, the tumblers 22 are more or less in the shape of pins and comprise magnets having poles at their opposite axial ends.

The tumblers 22 are axially slidably mounted in radial holes 23 formed in a longitudinally extending enlargement 24 on the exterior of the body at a location diametrically opposite the enlargement 14. Seven such magnetized tumbler pins 22 have been shown mounted in holes 23, and they are arranged in a row which extends longitudinally of the keyway 17, along its upper edge, remote from the tumbler mechanism of the first described set.

In the locking position of the cylinder the tumblers 22 extend across the shear line between the cylinder and the wall of the bore to have their inner end portions disposed in wells 25 in the cylinder, opening to the exterior thereof in register with the tumbler receiving holes 23. Springs 26 yieldingly urge the magnetized tumblers to their operative positions seen in FIG. 1, at which their inner ends bottom in the wells 25. In that position, the inner polar ends of the tumblers 22 lie quite close to the smooth upper edge of a key in place in the cylinder.

The springs 26 react between the outer ends of the magnetized tumblers and a retainer clip 28 clinched onto the enlargement 24 in position covering the outer ends of the tumbler holes therein. The springs 26 are substantially small and weak, and their outer end portions project axially through the central holes in annular guide members 29. The guide members are pressed into the holes 23 and occupy positions directly adjacent to the underside of the retainer clip 28, and spaced from the magnetized pin tumblers 22.

At this point it should be observed that because the tumblers **22** comprise magnets, the cylinder **6** and lock body in which it is mounted must be made of a non-ferrous material. This poses no problem, however, as the main components of most cylinder lock mechanisms are made as die castings, of a nonmagnetic material.

It is important, however, that the key **19** also be made of a non-ferrous material such as now commonly used for cylinder locks. Brass or aluminum are suitable metals which have been extensively used for such keys.

Inasmuch as each of the magnetized tumblers **22** is spring urged radially inwardly toward the cylinder axis to an operative locking position extending across the shear line between the cylinder and the bore in which it rotates, the cylinder can only be released for unlocking rotation when both sets of tumblers, at opposite sides of its axis, are actuated radially outwardly to their retracted positions described.

As mentioned, such retraction of the pin tumblers **10** is effected through the bitting on the lower edge of the key **19.** Retraction of the magnetized pin tumblers is also effected by the key **19** when the same is inserted fully into the cylinder to its position seen in FIG. **2.** For this purpose, the key is provided with a number of magnet bits **31** arranged in spaced relation along its smooth upper edge, or more precisely, that edge thereof which is remote from the bitting **18** thereon. One such magnet bit **31** is provided for each of the magnetized tumblers **22,** and it is so embedded in the key as to align or register with the axis of its associated magnetized tumbler when the key is in position in the cylinder.

The magnet bits **31** are oriented on the key as to assure repulsion of the magnetized tumblers **22** to retracted positions outwardly of their respective wells **25** when the key is inserted into the cylinder. For that purpose, the outermost pole face of each magnet bit is of the same polarity as the innermost end of its corresponding magnetized pin tumbler **22.**

For maximum security, the magnetized pin tumblers are randomly arranged so that the north polar ends of some of them are innermost while the south polar ends of the remainder are innermost. The order in which they are oriented, of course, is subject to wide variation, as is the arrangement and lengths of the tumbler means in the set thereof which is controlled by the bitting on the key.

From the foregoing description, together with the accompanying drawing, it will be readily apparent to those skilled in the art that this invention provides a cylinder lock mechanism featuring exceptional security against picking or forcing due to the incorporation therein of a set of more or less conventional pin tumbler mechanisms in combination with a set of magnetized tumblers, to require concurrent retraction of a far greater number of tumblers (of both sets) than was heretofore possible.

Those skilled in the art will appreciate that the invention can be embodied in forms other than as herein disclosed for purposes of illustration.

The invention is defined by the following claims:

1. Lock mechanism of the type having a body with a bore and a lock cylinder rotatable therein out of a locked position upon insertion of a proper key into a substantially narrow keyway in the cylinder, characterized by:

A. the key and keyway being of the paracentric type and the median plane of the keyway containing the axis of the bore in the lock cylinder;

B. one edge of the key having bitting thereon and its other edge being straight;

C. a multiplicity of magnet bits embedded in said straight edge of the key at spaced locations along its length and of such small size that no dimension thereof is substantially greater than the thickness of the key;

D. said magnet bits having poles which are contiguous to said straight edge of the key and which are randomly arranged along its length with respect to polarity;

E. diametrically opposite rows of radially aligning tumbler receiving apertures in the body and in the cylinder, centered on said median plane, the cylinder apertures of one row extending into the keyway from one narrow side thereof, and the diametrically opposite cylinder apertures comprising uniform diameter wells having their bottoms in the cylinder and spaced outwardly from the other narrow side of the keyway and the straight edge of a key therein;

F. pin tumbler means in said apertures;

G. springs confined in the body apertures of said one row to urge the pin tumbler means therein radially inwardly toward cylinder locking positions at which portions of said pin tumbler means project into the keyway for engagement by the bitting on the key, whereby insertion of the key into the keyway effects movement of said last named pin tumbler means to cylinder releasing positions;

H. the pin tumbler means in said wells being magnetized and having direct guiding engagement with the walls of their respective wells;

I. springs confined in said wells to urge the magnetized pin tumblers toward cylinder locking positions engaging the bottoms of said wells;

J. means to retain said last named springs properly engaged with said magnetized pin tumblers comprising spring guide and locating members fixed in the outer portions of said wells in outwardly spaced relation to said magnetized pin tumblers and having portions loosely encircling their springs;

K. and said magnetized pin tumblers being arranged to register with the magnet bits in the key when the latter is in place in the keyway, and being in such polar relation to said magnet bits as to be repelled thereby to cylinder releasing positions wholly within the body.

2. The lock mechanism of claim **1,** further characterized by:

A. said tumbler means in said one row comprising a number of pin tumblers which normally extend across the shear line between the cylinder and the wall of the bore, and drivers for said tumblers which are engaged by the bitting on the key to hold the tumblers in retracted positions.

3. The lock mechanism of claim **2,** further characterized by:

A. there being a number of magnetized tumblers equal to the number of pin tumblers;

B. and the key having embedded in said straight edge thereof a number of magnet members corresponding to the number of magnetized tumblers.

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