

SPECIFICATION

Improvement Relating to Tumbler Locks

This invention relates to tumbler locks.

- Tumbler locks have been proposed, which
 5 operate by positive movement of the tumblers, but which do not incorporate a spring for holding or urging the tumblers; the tumblers in such locks are located in intimate contact with each other. However, the aforesaid contact results in
 10 considerable frictional resistance to unlocking movement, thus inhibiting smooth operation of the locks.

- According to the present invention we provide a tumbler lock, comprising: a plurality of tumblers
 15 mounted by a lock frame member and moveable between a locked position and an unlocked position; each tumbler having a surface portion engageable by a key whereby the tumblers are moveable to their respective unlocked positions;
 20 locating means for holding the tumblers in a predetermined spaced apart relationship within the lock, each tumbler having two projections; arm members on the frame member in spaced apart relationship together defining an enclosure within
 25 which a pin is mounted in predetermined position; said arm members being provided by opposed ends of a unitary plate member; and wherein the path of each tumbler in said movement is such that the respective projections are engageable
 30 with said pin element thereby to define the limits of travel of said tumbler.

Desirably the said surface portion will be provided on an opening in said tumbler.

- Also disclosed is a lock as aforesaid, each
 35 opening having the same dimension a in the direction of said movement, in combination with a key, said key having stepped surface portions which engage in respective tumbler openings when in the unlocking position, the width of the
 40 key at said stepped portions being a , said stepped portion being located at intervals along the length of the key, and interconnected by bevelled riser portions.

In the drawings

- 45 Fig. 1 is a section on I—I of Fig. 3 and illustrates the unlocked condition of a lock in accordance with the invention;
 Fig. 2 is a view similar to that of Fig. 1 but on line II—II of Fig. 3;
 50 Fig. 3 is a longitudinal sectional side view of a lock in accordance with the invention, key inserted in unlocking relationship;
 Fig. 4 is a view similar to Fig. 3, but using an incorrect key;
 55 Fig. 5 is a side view of a cylinder frame of the lock of Figs. 1 to 4;
 Fig. 6 is a front view of the cylinder frame of Fig. 5;
 Fig. 7 is a front view of the cylinder frame of
 60 another embodiment in accordance with the invention;
 Fig. 8 is a front view of the cylinder frame of Fig. 6 with a pin member mounted therein;
 Fig. 9 is a front view similar to Fig. 7, but with a

- 65 pin member mounted in the cylinder frame;

Fig. 10 is a view from the same direction as in Figs. 1, 2 and 6 to 9, showing the relationship, in an assembled lock, between a pin, mounted shown in Fig. 8, and a tumbler;

- 70 Fig. 11 is a view similar to Fig. 10, but of the embodiment of Figs. 7 and 9;

Fig. 12 is a sectional side elevation of a lock in accordance with the invention, key inserted; and

- Fig. 13 is a sectional elevation of the lock of
 75 Fig. 12, taken in a plane normal to that in Fig. 12.
 In the drawings, the 1—1 designates a key which unlocks the illustrated lock, and is referred to herein as the "proper key". The proper key has portions x for engaging tumblers 2 which have a width a ; as shown in this embodiment, the x portions may be located with a stepwise difference therebetween, being interconnected by a bevel portion to facilitate entry and removal of the key y . The key shown is formed with a large adjacent stepwise difference z . Insertion of the proper key 1—1 into the cylinder moves the
 80 tumblers 2 positively until they assume a position within permitting rotation of an inner member within an outer barrel 5 (explained more fully below). The tumblers 2 each have a keyhole 2-A with a main dimension corresponding to the width a of the engaging portion x of the proper key 1—1, the keyhole being located at each shifted position of the proper key 1—1, i.e., at
 85 position in coincidence with the stepwise difference z between the adjacent shifted location of the engaging portions x .

- Each tumbler 2 has a pair of projections 2-B, 2-B (Figs. 10—11) operatively associated with pins
 100 4—1 and 4—2, in a manner which will be described later. The numeral 3 designates a cylinder frame, which may be formed integrally as a pressing, having at opposite side walls tumbler openings 3-E (Fig. 5) for locating the tumblers 2 in a predetermined spaced apart relationship, and arm members 3A, 3B or 3C, 3D for locating the
 105 pins 4—1 or 4—2 (described in more detail below).

- Pins 4—1 and 4—2 are shown in the form of
 110 flat rods (Figs. 6, 8 and 10) and round bars (Figs. 7, 9 and 11). The pins are located between the alternating arm members 3-A and 3-B or 3-C and 3-D and lie between the projections 2-B and 2-B on the tumbler 2 to delimit the travel of the tumbler to ensure that it stops at a given predetermined position.

It will be noted that the arm members 3-A and 3-B have a configuration corresponding to that of the pin.

- Referring to Figs. 1, 2, 6 and 8 the arm members include stepped portions 3A, arranged in alternating sequence with portions 3B which are provided by a simple, non-stepped extension of the main wall of the lock frame; if desired 3B may be in the form of a generally U-shaped member, that is it may further include a portion similar to stepped portion 3A.

When a pin 4—1 is inserted between the arm members 3-A and 3-B, it is held therebetween.

Further the pin 4—1 is positioned between the projections 2-B and 2-B as described above so as to force the tumblers into engagement with the cylinder frame 3. When the pin 4—1 is

5 withdrawn, engagement between the pin 4—1 and the projections 2-B, 2-B is released and as a consequence, the tumblers 2 slip from the cylinder frame 3. It will of course be understood that the pin 4—1 after insertion thereof between
10 the arm members 3-A and 3-B has its ends bent over and secured to the cylinder frame 3 to prevent slipping thereof. The arm members 3-C and 3-D are similarly arranged, in this case, however they are part annular, to accomodate the
15 round rod pin 4—2.

The tumblers 2 are inserted into the cylinder frame 3 through the tumblers holes 3-E formed in the opposite side walls of the cylinder frame 3, and then the pin 4—1 or 4—2 is inserted and
20 secured between the arm members 3-A, 3-B or 3-C, 3-D. When the proper key 1—1 is inserted into the cylinder, the tumblers 2 are positively moved along the shifted surface of the proper key 1—1 through the tumbler holes 3-E in the cylinder
25 frame 3; they are thus moved from a locking position, in which they lie within a groove 5A in outer barrel 5, to the position shown e.g. in Figs. 1 and 2, which permits relative rotation of the cylinder frame 3 and the barrel 5.

30 When the proper key 1—1 is withdrawn, the tumblers 2 cannot slip through the cylinder frame 3 since the projections 2-B formed on the tumblers 2 engage the pin 4—1 or 4—2. Thus, the tumblers may travel only a predetermined
35 distance defined by 2-B and 2-B and the pin 4—1.

Should a false key 1—2 be inserted, at least one tumbler 2 is caused to deviate from the required unlocking position as shown in Fig. 4, and will, thus, lie within groove 5A, to prevent the
40 required relative rotation of barrel 5 and frame.

The preferred embodiment of the present invention has the operation and effects which may be summarized as follows:

45 (a) The tumblers 2 are located in spaced apart relationship within the cylinder frame 3, the spacing corresponding to the distance between the engaging portions x of a proper key. In the key the engaging portions x are interconnected by the
50 bevel riser portions y. Accordingly, the stepwise difference between the engaging portions x may be considerable; difference z may be freely chosen so that the lock is highly secure against unauthorised unlocking by insertion of a false key.

55 (b) Since the tumblers 2 are arranged in spaced

apart relationship within the cylinder frame 3, there is no friction between the tumblers 2, and insertion and withdrawal of the key 1—1 occurs relatively smoothly, thus providing a fairly durable
60 construction of lock.

(c) The cylinder frame 3 composed of an integral or unitary plate like member may be fairly readily disassembled and assembled merely by withdrawing and inserting the pins 4—1 and 4—
65 2 into the enclosure defined by the arm members 3-A, 3-B or 3-C, 3-D, respectively.

Further, once assembled, the pin 4 may engage the projections 2-B, 2-B of the tumblers 2 to prevent the latter from slipping so as to hold the
70 tumblers in position within the cylinder.

Claims

1. A tumbler lock comprising:

a plurality of tumblers mounted by a lock frame member and moveable between a locked position
75 and an unlocked position; each tumbler having a surface portion engageable by a key whereby the tumblers are moveable to their respective unlocked positions;

locating means for holding the tumblers in a
80 predetermined spaced apart relationship within the lock, each tumbler having two projections; arm members on the frame member in spaced apart relationship together defining an enclosure within which a pin is mounted in predetermined
85 position; said arm members being provided by opposed ends of a unitary plate member; and wherein the path of each tumbler in said movement is such that the respective projections are engageable with said pin thereby to define the
90 limits of travel of said tumbler.

2. A lock according to Claim 1, wherein the said surface portion is provided on the inner wall of an opening in said tumbler.

3. A lock according to Claim 2, each opening
95 having the same dimension a in the direction of said movement, in combination with a key, said key having stepped surface portions which engage in respective tumbler openings when in the unlocking position, the width of the key at
100 said stepped portions being a, said stepped portions being located at intervals along the length of the key, and interconnected by bevelled riser portions.

4. A lock according to Claim 1, substantially as described herein with reference to the
105 accompanying drawings.

5. A lock and key combination, substantially as described herein, with reference to the accompanying drawings.

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