April 25, 1933. H. R. KIRKWOOD 1,905,177

LOCK

Filed Sept. 9, 1932

Fig. 2.

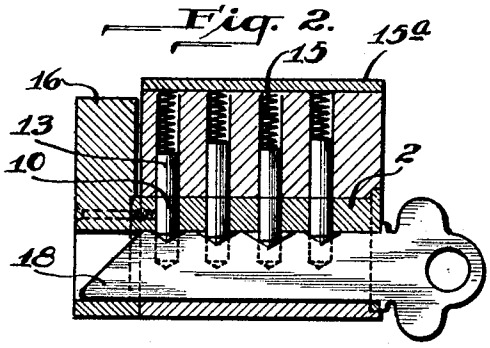


Fig. 1.

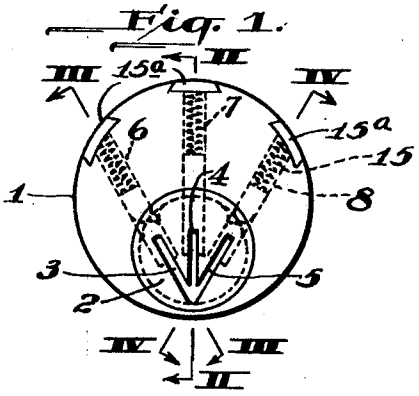


Fig. 3.

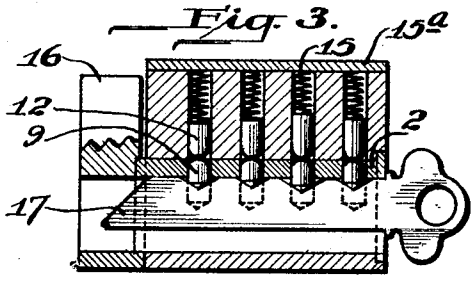


Fig. 5.

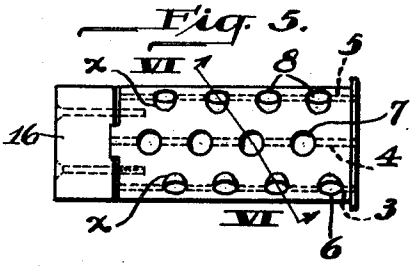


Fig. 4.

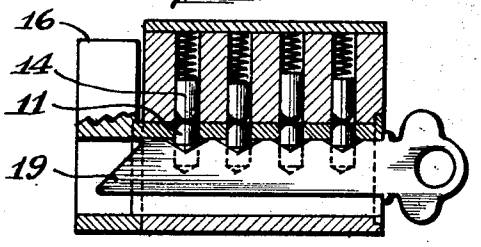


Fig. 6.



Fig. 8.

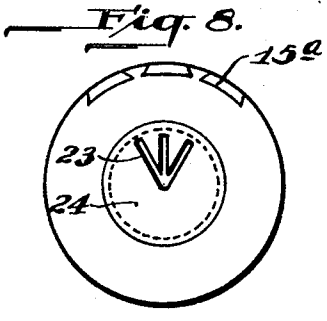
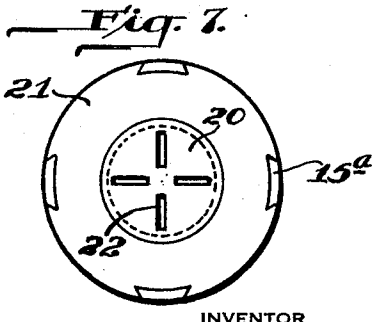


Fig. 7.



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UNITED STATES PATENT OFFICE

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LOCK

Application filed September 9, 1932. Serial No. 632,329.

The invention relates to locks of the cylinder type, and has for its objects the provision of an improved construction with a single cylinder requiring for its operation a plurality of keys. A further object is the provision of a lock of the character specified which is substantially as compact as a single key lock and whose cost is only slightly greater than the single key lock. The lock has a large field of use in connection with voting machines and safety deposit boxes in those cases in which it is desired that the compartment controlled shall be opened only when the individuals holding the keys are all present. Aside from its reduced cost as compared with a plurality of separate locks, the lock presents in certain of its embodiments much greater security against picking than a plurality of separate locks due to the fact that in such forms the key slots have a common lower edge which interferes with the entrance of more than one tool at a time. Certain embodiments of the invention are shown in the accompanying drawing, wherein:

Figure 1 is a front elevation. Figs. 2, 3 and 4 are sections on the lines II—II, III—III and IV—IV respectively of Fig. 1, but with the keys inserted. Fig. 5 is a plan view of the cylinder. Fig. 6 is a section on the line VI—VI of Fig. 5. And Figs. 7 and 8 are front elevations showing modifications.

Referring to the drawing, 1 is a lock case of cylindrical form (often referred to as "the cylinder") with a longitudinal bore in which is mounted the plug or drum 2. The drum is provided with the three-key slots 3, 4 and 5 extending longitudinally of the drum and meeting at their inner or lower edges, as indicated in Fig. 1, from which point, the slots diverge radially. Also located in the drum in alignment with the key slots, are three sets of tumbler slots 6, 6, 6, 6; 7, 7, 7, 7 and 8, 8, 8, 8, in which are mounted the three sets of pins 9, 9, 9, 9; 10, 10, 10, 10 and 11, 11, 11, 11 (ordinarily referred to in the art as tumblers). Each set of tumblers is operated by its own key and when these keys are all pushed in, as indicated in Figs. 2, 3 and 4, the upper ends of the pins lie at the periphery of the drum holding the locking pins in release position.

The case or cylinder 1 is provided with three sets of locking pin sockets, in which are mounted the three sets of locking pins 12, 12, 12, 12; 13, 13, 13, 13 and 14, 14, 14, 14, such pins being pressed down by the springs 15. When the key is removed, the springs push the locking pins down into the drum and lock it against rotation. Since the meeting edges of the key slots 3, 4 and 5 are not located on the center of rotation of the drum, it is desirable to round the meeting ends of the tumblers and locking pins, as indicated in Figs. 2, 3 and 4, thus avoiding the tendency present with flat-ended pins to interfere with the rotation of the drum when the pins are in release position. For a similar reason the inner edges of the slots 6 and 8 are countersunk, as shown at x in Fig. 6. The slots 6, 7 and 8 in the drum are staggered, as indicated in Fig. 5, as are also the slots carrying the locking pins to avoid interference and prevent the locking pins from entering any of the sockets in the drum other than the one for which it is intended. The tumbler arrangement is, of course, different for each key slot, so that the keys required are all different, and the drum can only be operated when the keys are all pushed into place. The drum carries the usual talon or arm 16 at its inner end for moving the locking detent bolt or other equivalent element when the drum is rotated.

In opening the lock, all three keys 17, 18 and 19 are pushed into position, as indicated in Figs. 2, 3 and 4, thus moving the detents and locking pins to release position, after which the drum may be turned to operate the bolt through the arm 16.

Fig. 7 illustrates a modification, in which the drum 20 in the case 21 is provided with four key slots 22 and four keys are required to release the drum. There are in this construction four sets of detents and locking pins whose construction and operation is the same as illustrated and described in connection with Figs. 1 to 6, except that the opposing ends of the detents and locking pins are

not rounded, this being unnecessary where the detents and locking pins extend radially from the axis of the drum. It will be understood that the number of keys and locking units is not limited to three or four, as shown, but may be any number greater than one.

Fig. 8 illustrates a modification similar to that of Figs. 1 to 6 except that the key slots 23 in the drum 24 are arranged radially from the axis of rotation of the drum. Here, as in the Fig. 4 construction, the detents and locking pins with the rounded ends are not required, but the case and drum are necessarily larger in diameter than the case and drum in the Figs. 1 to 6 construction in order to permit the use of detents and locking pins of the same length as those employed in the Figs. 1 to 6 construction. The Figs. 1 to 6 construction, therefore, is preferable from the standpoint of compactness, weight and cost. In each form of lock, the springs are shown as held in place by the retainers 15*a* which slide into undercut grooves in the periphery of the case, but this may be done in various other ways well known in the art.

What I claim is:

1. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots lengthwise of the drum and extending radially thereof, each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of the sockets, all so arranged that each set of tumblers may be operated by its own key independently of the operation of the other sets of tumblers.

2. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots extending lengthwise of the drum meeting at their inner edges and diverging radially from such edges toward the periphery of the drum, each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of the sockets, all so arranged that each set of tumblers may be operated by its own key independently of the operation of the other sets of tumblers.

3. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots lengthwise of the drum and extending radially thereof, each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of the sockets, the drum being mounted eccentrically of the casing.

4. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots extending lengthwise of the drum meeting at their inner edges adjacent one side of the drum and diverging radially from such edges toward the periphery of the drum, each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of the sockets, all so arranged that each set of tumblers may be operated by its own key independently of the operation of the other sets of tumblers.

5. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots lengthwise of the drum and extending radially thereof, each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of the sockets, said pin sockets being arranged in staggered relation in the drum.

6. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots extending lengthwise of the drum meeting at their inner edges intermediate the center and periphery of the drum, and diverging from such meeting point toward the periphery of the drum, said slots being each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of said sockets,

said tumblers and locking pins having their meeting ends rounded.

7. In combination in a lock, a case, a drum mounted for rotation in the case provided with a plurality of key slots extending lengthwise of the drum meeting at their inner edges intermediate the center and periphery of the drum, and diverging from such meeting point toward the periphery of the drum, said slots being each adapted to receive a key which may be inserted and removed independently of each other key, a series of pin sockets in the case in alignment with each of the key slots when the drum is in locked position, corresponding tumbler slots in the drum also in alignment with the sockets when the drum is in locked position, a tumbler in each tumbler slot, and a spring pressed locking pin in each of said sockets, said tumblers and locking pins having their meeting ends rounded, and the tumbler slots which are not in alignment with the center line of the drum having their ends at the periphery of the drum counter sunk.

In testimony whereof, I have hereunto subscribed my name this 7th day of Sept., 1932.

HARRY R. KIRKWOOD.