May 18, 1937. A. M. ZALKIND 2,080,684

LOCK

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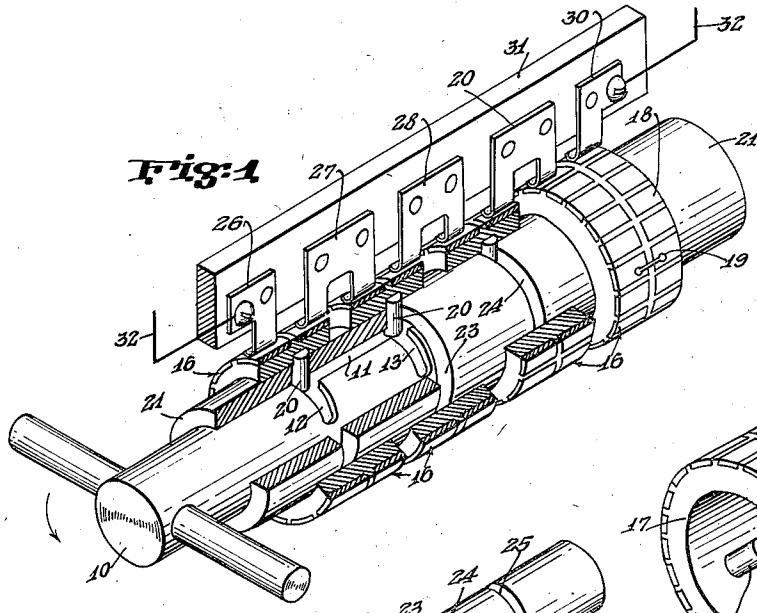


Fig: 1

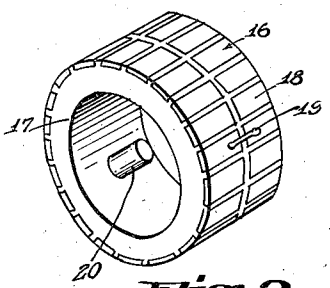


Fig: 2

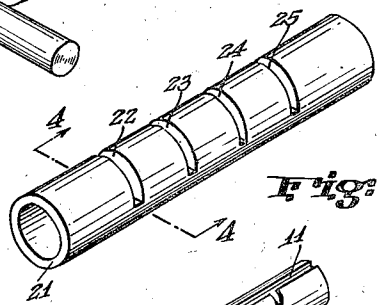


Fig: 3

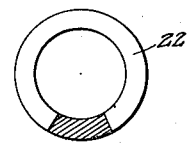


Fig: 4

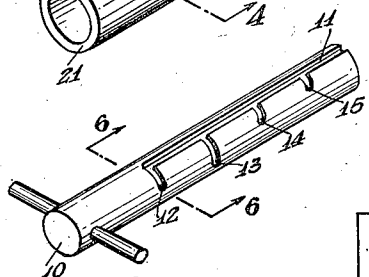


Fig: 5

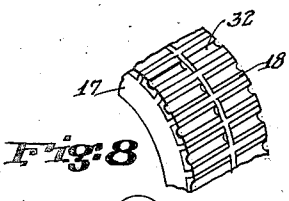


Fig: 8

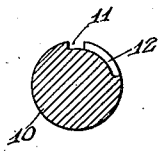


Fig: 6

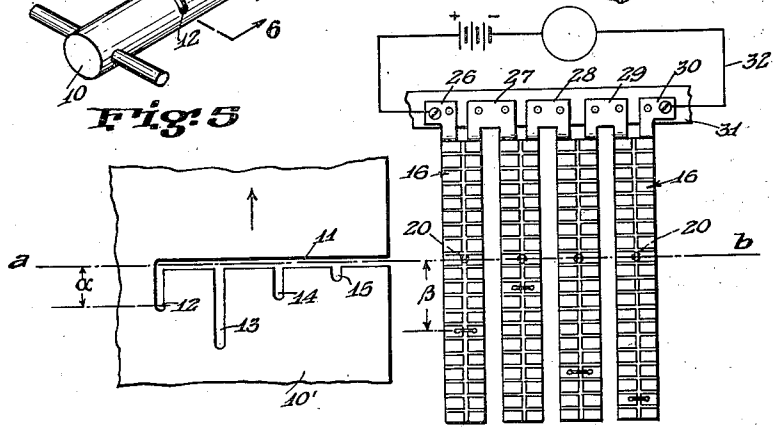


Fig: 7

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LOCK

Albert M. Zalkind, Bronx, N. Y.

Application May 13, 1933, Serial No. 670,967

3 Claims. (Cl. 200—42)

My invention relates to novel apparatus for and methods of switching an electric circuit and more particularly relates to novel electrically controlled locks and methods of operating the same.

Heretofore, locks have usually consisted of a lock mechanism having a specific construction adapted to cooperate in a particular manner with a special key of corresponding construction to effect the unlocking operation. In the more common construction a barrel is provided which is mounted in a cylinder. A plurality of tumblers guided in small openings in the barrel cooperate with corresponding tumblers mounted in openings in the cylinder. A key of proper shape when inserted in the barrel moves the tumblers therein into alignment with the corresponding tumblers of the cylinder to permit the unlocking operation.

In all these constructions heretofore used, which depend for their security against wrongful opening on a distinctive mechanical construction of the lock, it has been impossible to sufficiently complicate the mechanical construction to make it lock-pick proof.

Lock pickers are usually sufficiently skilled in the use of instruments such as lock picking tools to be able to determine the particular mechanical construction of the lock so that with the aid of tools they can open the locks in a comparatively short time. Where the lock is mechanically involved, more time is necessary the first time the lock is picked, thereafter less time is necessary for picking other locks of the same type.

Accordingly, I have invented a lock whose internal mechanical construction is identical with all other locks embodying my invention, but differentiates in that a particular key moves the lock mechanism in a predetermined selective operation which automatically results in an unlocking operation. There is nothing external about the lock to distinguish it from other locks of my type to enable the lock picker to detect the proper selection. Inasmuch as the number of selections that can be made with my invention are practically unlimited, there is no way in which he can pick the lock.

Accordingly, the main object of my invention is to provide a novel lock construction which is based solely on the selection principle and is independent of mechanical variations between locks.

A further object of my invention is to provide novel selector mechanisms for a lock and methods of operating the same.

Still a further object of my invention is to provide a novel electric selector and methods of operating the same.

Another object of my invention is to provide a novel key operated lock in which all the locks are mechanically identical but are distinctly operated by individual keys for unlocking purposes.

Still a further object of my invention is to provide locks in which a desired operation is effected only by a distinctive operation accomplished by an individual key.

In many locks based on the tumbler principle, skilled lock pickers have been able to feel the tumblers as they come into their proper places. The fact that the tumblers are successively operated facilitates the work of the lock picker. My lock provides a selectively operated arrangement in which nothing occurs until the entire selection has been completed.

With this arrangement the lock picker has no way of determining when he is partially successful in working out the proper selection but must separately make each selection completely and having failed with that one, must go on until he happens simultaneously to complete a predetermined arrangement.

There are other objects of my invention which together with the foregoing will appear in the detailed description which is to follow in connection with the drawing in which;

Figure 1 is a perspective view of the device partially broken away to show internal parts;

Figure 2 is a perspective view of a cylinder;

Figure 3 is a perspective view of the drum;

Figure 4 is a cross-section taken on line 4—4 of Fig. 3;

Figure 5 is a perspective view of the key;

Figure 6 is a cross-section on line 6—6 of Fig. 5;

Figure 7 is a diagrammatic representation of the device, in which the diverse parts are shown developed in a plane;

Figure 8 is a partial perspective view of a modified form of the cylinders.

Referring to Figures 1 and 5, the key 10 consists of a solid cylinder in which has been machined a groove 11 parallel to the axis of the cylinder and in which four lateral grooves 12, 13, 14, 15 are cut at equal intervals, but of different peripherical lengths. Figure 6 shows clearly axial groove 11 as cut in the body of the key and meeting lateral grooves, here represented by 12.

Figure 2 shows in perspective a cylinder, 16, of which four are used in this instance. It consists of an annular body 17, made of insulating material, in which metal sectors, uniformly dis-

tributed on the outer surface, are inserted or imbedded, remaining electrically insulated from each other except two of them, which are bridged as by soldering a short piece of wire **19** across their gap. On the inner surface of the cylinder is a pin **20** rigidly fastened thereto. The four cylinders are mounted on barrel **21** having four slots **22, 23, 24, 25**, equally spaced, through which pins **20** protrude.

Referring to Figure 4, which is a section through one of the slots of the barrel, all four slots are cut through embracing almost all of the periphery of the barrel, there remaining small arcs of bridging material, which have the double service of holding the barrel together and serving as definite stops for pins **20** when cylinders **16** are rotated.

With reference to Figure 1, which shows the key inserted in place in the lock, before turning, it is to be noted that pins **20** of all four cylinders **16** are lined up, having been so before the insertion of the key since pins **20** must slide in axial slot **11**. As the key is fully inserted, slots **12, 13, 14, 15** will register with slots **22, 23, 24, 25**, respectively, through which pins **20** protrude, so that the key may now be turned, pins **20** sliding now in slots **12, 13, 14, 15** until each individual pin comes in contact with the ends of these slots, thereafter, as the key continues to rotate, the cylinders being carried along. Since the lateral slots vary in length, the ends of these slots will catch the pins at different times causing a differential combination of rotation of the four cylinders. The bridging wires **19** of each cylinder are so angularly located with respect to pins **20** that, if the correct key is used, when all the pins have reached the ends of their engaging lateral slots of key **10**, the bridged sectors of the four cylinders will line up and be carried in this formation until they come simultaneously in contact with the five stationary brushes **26, 27, 28, 29, 30** mounted on fixed member **31** of the lock, thus closing an electric circuit **32**. In taking the key out, it is rotated in the opposite direction until the four pins are again lined up against the wall of groove **11** opposite to the lateral grooves, at which time the key may be withdrawn.

In Figure 7 the four cylinders are shown developed in a plane, pins **20** being shown therein in dotted outline. **10'** is a development of the surface of key **10**, the arrow shown there indicating the direction in which the key is to be turned to open the lock. It is clear here that in order to bring all the bridged sectors into line, the smaller the angular distance of these sectors from the corresponding pins, the longer will the angular length of the corresponding lateral slots in key be from the axial slot.

The friction of the cylinders upon the barrel as well as the friction of the brushes upon the cylinders is utilized here to steady the motion of the cylinders and to keep them stationary in a set position, although grooves **32** (see Figure 8) may be cut across all the sectors, so that the flexible brushes will spring into, securing thus a more stable setting for the cylinders.

I claim:

1. In a lock, a drum having an opening for receiving a key, a plurality of contacts selectively mounted on an unexposed portion of said drum, the interior exposed surface of said drum presenting a substantially continuous smooth surface to prevent the detection of the conducting portion, a first and second conductor extending within said drum, and means whereby a specially formed key inserted and turned in the opening completes the circuit from one of said conductors through predetermined ones of said contacts to the other conductor.

2. In a lock, a drum having an opening for receiving a key, electrical contact members mounted on an unexposed surface of said drum, a contactor individual to each of said contact members disposed at predetermined angular positions, and means responsive to the insertion and turning of a specially formed key in said opening for simultaneously changing the relative angular position of said contact members with respect to their associated contactors whereby said contact members engage their associated contactors.

3. In a lock, a drum having an opening for receiving a key, electrical contact members mounted on an unexposed surface of said drum, a contactor individual to each of said contact members and disposed at predetermined angular positions, and means responsive to the insertion and turning of a specially formed key in said opening for simultaneously moving said contact members through predetermined angles to engage their associated contactors.

ALBERT M. ZALKIND.