This invention relates to non-tumbler locks and keys thereof, and pertains more particularly to improvements in the lock portion of an automotive ignition switch adapted for use with a tumblerless key for operating the switch.

Heretofore, tumblerless keys for ignition switches and other non-tumbler locks have been of two general types:

1. a so-called central type key having a substantially straight and solid shank portion; and a forked type key having a longitudinally slotted shank portion. Each type has operated satisfactorily in the lock, but the lock receiving that key may also be operated by a screwdriver, or similar flat and stiff implement which will fit in the lock chamber, so that the switch is subject to tampering by unauthorized persons.

2. The forked type key and complementary lock socket obviate the tampering objection, yet keys and locks of this type are more difficult and expensive to produce, and do not afford the simplicity of manufacture and operation afforded by the solid central type of tumblerless key.

It is accordingly the principal purpose of the present invention to provide a non-tumbler lock, for ignition switches or the like, having a rotatable shaft which may be operated by a complementary key having a straight and solid shank, and which cannot be operated by a screwdriver or other simple instrument.

A recommended embodiment of the invention will be described in connection with the accompanying drawings illustrating a heavy-duty, automotive ignition-switch providing for three positions, an "off" position, an "ignition" position and a "start" position. It will be understood however, that the invention may be embodied in other forms of switches or non-tumbler locks, and that the structural details of the mechanisms herein illustrated may be varied to suit particular conditions or installations, without departing from the essence of the invention as set forth in the appended claim.

In the drawings:

FIG. 1 is a perspective view of an ignition-switcher switch provided with a lock incorporating the improved features, with the tumblerless key in operative position; FIG. 2 is a diametrical section of the switch, with the key and certain switch parts in elevation; FIG. 3 is a section on line 3—3 of FIG. 2; FIG. 4 is a composite view of certain removable elements of the switching mechanism; FIG. 5 is a section on line 5—5 of FIG. 2; FIG. 6 is a side view of the switch-operating shaft, turned 90° from the shaft position in FIG. 1; and FIG. 7 is a face view of the outer end of a bushing formed with a key slot to receive the tumblerless key as shown in FIG. 1.

In the embodiment chosen for the purpose of illustration, the switch comprises a generally cylindrical casing 11 of conventional or knOWN type, housing conventional switching mechanism for operating the ignition and starting circuits of a motor vehicle upon rotation of an axial shaft 12 from an "off" position (as shown) to an "ignition" position or to a "start" position.

Although the particular construction and operation of such mechanism is immaterial to the present invention, the elements thereof may comprise a base member 13 of insulating material, suitably fastened to the rearward end of casing 11 and carrying suitably spaced contacts 14 and terminals 15; a switch plate 16 having depressed contact buttons 17, mounted upon a disc 18 of insulating material, which is permitted to fit on the inner end of shaft 12, and which is normally urged toward the base 13 by a spring 20, to ensure engagement of the switch contacts; an actuator 21 having a central slot 22 receiving a flat portion 23 of the rotatable shaft, and having legs 24 (FIG. 4) received in complementary slots 25 of the disc 18, so that rotation of the shaft causes corresponding rotation of the actuator and disc, and the switch plate 16 which is locked to the disc by the ears 26; and a second spring 27 having a leg portion 28 engageable by a tab 29 of the actuator 21 and tending to restore the switch shaft to "ignition" position after it has been turned by the key to "start" position and then released; the other leg 30 of restoring spring 27 engaging a stationary stop member 31.

For the purposes of this invention, the outer end portion 32 of shaft 12 is rotatable in a bushing 33, and said end portion is hollow, providing a substantially cylindrical chamber or cavity 34 (FIG. 5), and the walls of said chamber are formed with opposed slots 35. The walls of the hollow shaft end are also grooved peripherally to receive a spring C-ring 36 (FIG. 6) which resiliently retains the removable key in the switch lock as hereinafter explained.

The outer end of bushing 33 has a key slot 37, formed with an enlarged cylindrical center opening 38 as best shown in FIG. 7. The narrow ends of slot 37 are normally aligned with the shaft slots 35 when the key is to be inserted in the lock portion of the switch. The bushing may be externally screw threaded at its outer end, to receive one or more nuts 38, 39 for securing the switch to a dashboard or panel; the inner end of the bushing being suitably affixed to the casing 11, and the bushing preferably having axial openings 40 providing drain holes from the chamber 34.

The key 41 has a handle portion 42 and a straight, solid, fin like shank 43 of the "central" type of tumblerless key. The width of the flat, fin shank is such that its edge portion may slide through the narrow end portion of the key slot 37 of the stationary bushing 33 and into the slots 35 in the cylindrical wall of the hollow end portion 32 of the switch shaft 12. The sides of the key shank 43 are notched or recessed at 44 to receive the retaining spring 36, and the inner end of the shank may be tapered at 45 to engage in a conical recess in the shaft 12 at the inner end of the chamber 34.

Remote from its inner end, the key shank is notched or recessed at 46, so that the reduced width may be rotated in the enlarged central opening 37 of the key slot 37, after the key has been fully inserted in the lock. In that position, rotation of the tumblerless key will rotate the shaft 12 and operate the switch mechanism, by reason of the engagement of the shank edges in the shaft slots 35. However, when the wide portion of the key shank is disposed in the key slot 37 of the bushing 33, it is not possible to rotate the key to turn the shaft.

Hence, the lock cannot be operated by a screwdriver or other flat blade of substantially uniform width. If the blade is rotatable in the opening 37 of the key slot of the bushing, it will turn freely in the hollow chamber at the end of the shaft; whereas, if the blade is wide enough to engage in the operating slots 35 of the shaft end, it cannot be rotated in the key slot 37 of the bushing. The improved non-tumbler lock is accordingly substantially tamper proof, yet it may easily be operated by a simple and inexpensive, central type key having a straight and solid shank or blade, provided with a portion of reduced width at the notches 46.
I claim:

A non-tumbler lock operable by a tumblerless key having a central, straight, solid shank provided with a portion of reduced width remote from its inner end, said lock comprising a cylindrical shaft and a bushing in which the shaft is rotatable, the outer end of the shaft having a hollow portion, providing a chamber defined by a substantially cylindrical wall, and said wall having opposed slots therein adapted to receive the opposite edges of the key shank, and the bushing having a key-receiving slot consisting of relatively narrow end portions in which the edges of the key shank are freely slideable and an enlarged central opening in which the reduced width of the key shank is adapted to rotate when the key is inserted in the lock and turned therein; said narrow end portions of the slot being normally aligned with said opposed slots in the wall of the hollow portion of the shaft; and said shaft wall having a peripheral groove intersecting said wall slots, and a spring ring in said groove adapted resiliently to retain the key shank in the lock.

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