This specification discloses a lock characterized by employing a plurality of rods reciprocal within apertures of a body, the apertures being blocked by pins unless the pins are properly positioned by a key. When properly positioned, the pins have an aperture which aligns with respective apertures in the body to allow the rods to move into the unlocked position. The matched key employs a combination of either elevations, or depressions, or both, to properly align apertures in the pins and the body. The lock is preferably spring loaded to the unlocked position such that it unlocks upon insertion of the key. Disclosed also are other specific aspects useful for a particular application of the lock; for example, whether used in a home or automobile. Also disclosed is a method of mass producing matched locks and keys.

24 Claims, 4 Drawing Figures
LOCK AND METHOD OF PRODUCTION THEREFOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to locks, and more particularly to locks that do not employ tumblers, in the conventional sense.

2. Description of the Prior Art

A wide variety of locks employing tumblers of numerous varieties have been employed. The wide variety of such locks attests, in a way, the lack of satisfactory locks that will alleviate carrying a wide variety of keys to fit home, auto, office, etc., prevent fumbling with key and trying to unlock doors when loaded; yet afford a positive lock that is difficult, if not impossible, to pick.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of an embodiment of the invention employed in locking a house door.

FIG. 2 is an isometric view of a pin that can be employed in an embodiment of the invention.

FIG. 3 is a cross-sectional view of a key means properly positioned by a spring finger on a slot member in an embodiment of the invention.

FIG. 4 is a top view of an embodiment of the invention employed in locking an automobile.

FIG. 5 is a partial isometric view of a spring in tension intermediate a body and support member in accordance with one embodiment of the invention.

DESCRIPTION OF PREFERRED EMBODIMENT(S)

Referring now to the figures, and more particularly to FIG. 1, lock 11 has as latching means latch bar 13 for effecting the locking. For example, lock 11 may be employed in a door and latch bar 13 protrude into a door jamb to effect the locking.Latch bar 13 is illustrated as a cylindrical bar effecting a positive lock. If desired, it can be of any cross-sectional shape, and can be provided with a beveled edge such that the door can be closed after the lock is locked. Such beveled edges are, however, subject to being forced open by use of a strong, thin, sometimes flexible member to force the beveled edge away from the locked position.

An interior pull means; such as, interior pull bar 15 is connected with latch bar 13 and protrudes inside the door through a slot, allowing reciprocal movement of interior pull bar 15. Interior pull bar 15 can be employed to effect withdrawal of latch bar 13 from the door jamb against the force of lock spring 17 without operation of the lock proper. Shaft 19 connects latch bar 13 with support member 21 in a manner that allows reciprocal movement of latch bar 13, independent of support member 21, but withdraws the latching means into an unlocked position when support member 21 is moved into the unlocked position. Specifically, shaft 19 may be reciprocally mounted in either latch bar 13 or support member 21 and effect the described result. As illustrated, shaft 19 is reciprocally movable in an aperture in support member 21.

Main guide rods 23, on either side, guide main support member 21 as it is reciprocated in locking and unlocking of lock 11. Opening springs 25 are in compression when lock 11 is locked and urge support member 21 toward the unlocked position. A plurality of rods 26 are connected with support member 21 and are adapted for reciprocal movement in apertures in a body.

A body 27 has a plurality of apertures 28 therein adapted to receive rods 26 for reciprocal movement thereof. Body 27 is also penetrated by main guide rods 23. Body 27 contains a plurality of slots 29 adapted to receive pins 30.

A plurality of pins 30 are provided and adapted for reciprocal movement in slots 29. Each pin prevents movement of rods 26 through a respective one of apertures 28 in all positions except one position. In the one position, pin 30, as illustrated in FIG. 2, has a second aperture 31 that aligns with a respective one of apertures 28 when the pin is in the one position. Thus, alignment of the apertures allows movement of the rods through their respective apertures.

To effect the respective one position of the respective pins, a key means; such as, key 33; is provided. Key 33 has either depressions, elevations, or both, illustrated by depressions 35 to effect the one position of the respective pins when emplaced adjacent body 27. To facilitate proper placement of key 33, a key way slot 34 is defined by slot member 47 attached to the bottom of body 27.

When the lock is locked, key 33 can be readily inserted and removed since the pins are free to move in their respective slots. In the unlocked position, however, rods 26 restrict movement of pins. Accordingly, key 33 is difficulty movable without provision of spring fingers 49, illustrated in FIG. 3, in slot member 47. With spring fingers 49, key 33 is allowed to move downward against the spring tension and to be withdrawn even though the lock is in the unlocked position. To further facilitate insertion and withdrawal of key 33, pins 30 are provided with rounded shoulders.

Moreover, the elevations or depressions in key 33 are provided a gradual change rather than an abrupt change in elevation. For example, the edges of the depressions are very shallow and reach the proper depth gradually; and, conversely, the elevations employ ramps which ascent to the proper elevation gradually.

In operation, the door is closed and latch bar 13 is moved into the locking position by sliding external knob 51, connected with support member 21 against spring 25, via a slot in the door. If desired, a plate can be employed to slide with knob 51 and support member 21 and still cover the slot in the door. Key 33 having been withdrawn, pins 30 fall to the bottom of their respective slots 29 and prevent reciprocal movement of rods 26, retaining the locked position.

Upon returning, the occupant inserts key 33, raising the respective pins 30 to their respective one positions where their apertures are aligned with apertures in body 27. Thereupon, springs 25 push support member 21 toward body 27 and disengages latch bar from its receptacle in the door jamb. There is no fumbling with the key and no dropping groceries, etc., if the occupant's arms are loaded. Thereafter, the unlocked door can be opened in conventional fashion. Key 33 can be removed by downward depression of spring fingers 49, leaving the lock in the unlocked position without a key therein.
It may be advisable, instead of employing springs 25 in compression between support member 21 and the end of guide rods 23, to employ a spring 77, FIG. 5, in tension along guide rods 23. For example, the spring may be connected with body 27, and under tension when support member 21 is in the locked position such that it will draw support member 21 towards body 27 when unlocked by insertion of key 33. Body 27 may be of a unitary block of material. It has been found advantageous, however, to employ a plurality of similar plates 53 having slots formed in one side thereof and assembled to form the body. The slots are readily formed in one side of a plate, in contrast to the more difficulty formed slots in a unitary body. If desired, a flat end plate 55 can be employed instead of terminating body 27 with a plate 53, having slots therein and of less pleasing appearance.

In any event, the slots are open at one edge, or top, of the body to allow insertion and removal of the pins. Key slot member 47 prevents the pins from dropping through the other edge of the body. If desired, an additional protrusion at the other edge of the body can be employed to prevent the pins dropping below their protruding roundness. Ordinarily, such a protrusion is not advisable and unnecessarily increases the cost of producing the lock. In unusual applications a cover can be provided for the one edge, or top, to prevent the pins from inadvertently falling from their slots.

The slots may be of any cross section although they are preferably rectangular to facilitate alignment and drilling of apertures in mass production, as described hereinafter.

Furthermore, rods, such as, guide rods 23 and rods 26, may be of any cross section. Preferably the rods are cylindrical such that conforming apertures can be readily drilled therefrom.

The lock has been described hereinbefore with respect to its employment on a door of a house. It also may be employed on a door of an automobile. It is uniquely advantageous when employed in conjunction with the ignition lock on an automobile, since its latch bar can readily engage and restrict movement of either the steering apparatus, the gear shift apparatus, or both. Such an embodiment is illustrated in FIG. 4. Therein, latch bar 13 is integrally connected with support member 21 and engages detent 61 in steering column 63 and detent 65 in gear shift apparatus 67 to restrict movement of these respective devices. If desired, a plurality of detents, or recesses, 61 can be provided around the periphery of steering column 63 such that the steering wheel may be locked in more than one position. Ordinarily, locking gear shift apparatus 67 in a single position, such as, detent 65, is sufficient since the position may be chosen to immobilize the vehicle; for example, park position of an automatic shift or reverse for a conventional shift. Apertures may be employed instead of detents if desired. Usually, latch bar 13 and most of the lock will be hidden behind the dashboard of the automobile in subbed lines, FIG. 4. Support member 21, however, will have an external protrusion extending through the dashboard and reciprocal in a slot therein. If desired, a plate can be attached to slide with support member 21 but cover the slot in the dash for improved appearance.

In an automobile ignition lock, as such locks are commonly called, there is no need for an opening spring to urge the lock into the unlocked position.

Support member 21 is illustrated, FIG. 4, in the lock 1. position. It may be moved to any one of a plurality of positions. For example, it may be moved to an ACC position in which it supplies power only to certain accessories, generally not to the ignition. It may be moved to another or "Off" position where it does not supply power to any accessories nor to the ignition, yet does not lock steering column 63 or gear shift apparatus 67. It may be moved to an "On" position in which it supplies power to the ignition and accessories wired therefrom. Furthermore, it may be moved into a spring-opposed "Start" position effecting power to the ignition and starting of the engine. These positions are illustrated in FIG. 4. None of these positions can be effected, however, until key 33 is inserted forward and downward into key way slot 43 under body 27 of lock 11. Thereafter, as described in connection with FIG. 1, rods 23 are free to slide in their respective apertures and hence support member 21 can be moved to any position. Ordinarily, it will be advisable to provide detents 75 for the respective positions to prevent inadvertently moving support member 21 from one position to another. If desired, partial unlocking can be provided by only raising a portion of the pins to their respective one positions by special partial keys. For example, such partial keys could allow children to play the radio but deny access to the "On" and "Start" positions.

When support member 21 is moved to the start position at the extreme right, spring 69 opposes this position and acts to move support member 21 back to the on position as soon as support member 21 is released; such as, when the engine starts.

A particular advantage of the invention is that blank locks can be procured and drilled to match a given key; such as, key 33. Thus, house locks, auto locks, as well as other locks, can be fitted to a single key and prevent the necessity of carrying a number of keys. There is a high degree of security since the keys are not readily reproducible without a profile mill or elaborate casting to achieve the exact elevation of pins in their one position in which the apertures are aligned. If the pins are out of alignment by as little as 1/1,000 of an inch the lock will not open and picking of the lock is foiled.

The difficulty of the picking of the lock is readily seen from contemplation of the number of pins which have to be properly aligned in order to open the lock. A lesser number of pins can be employed for simple locks in which no valuables are being protected. On the other hand, a large number of pins can be employed for protecting items of great value. A commercial version of the lock employing 24 pins has been found to be satisfactory. It has not been picked yet although some able locksmiths have attempted to do so.

Because of the unique construction of the locks, they are unusually amenable to mass production techniques. Specifically, the latching means, support member and rods for each lock are pre-assembled. The body, having a plurality of plates with slots cut in one side and having blank pins therein and having a slot member defining a key way slot, are pre-assembled. A key is emplaced in the key way slot to effect the proper elevation of the blank pins in their respective slots. Thereafter, the
apertures are drilled through the body and the pins in one operation to accommodate the rods reciprocal movement therein. The assembly of the resulting matched key and lock is then completed.

The various components of the lock may be assembled by any of the conventional methods. For example, rods 23 may be screwed into support member 21, may be shrunk fit into an aperture in support member 21, or may be held by suitable opposing nuts on either side of support member 21. Similarly, body 27 can be fastened together by brads, or by suitable nut and bolt combination. Slot member 47 can be fastened to the bottom of body 27 as by pins, small screws, or tack welds.

The lock can be constructed of any material suitably strong and corrosion resistant for the purpose. It has been found advantageous to employ metals; such as, steels or bronze alloys. The respective protrusions which are subject to fatty acids from the skin may be of plastic or covered with plastic to resist any tendency for corrosion.

In an auto ignition lock employing an embodiment of the invention, a plurality of latch bars may be employed to engage steering apparatus and gear shift apparatus separately. To facilitate independent engagement, each may have a lock spring, similar in operation to lock spring 17, urging it into engagement with apertures or detents in the steering column and gear shift apparatus.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A lock comprising:
   a. latching means for effecting locking;
   b. support member connected with said latching means and operable to withdraw said latching means into an unlocked position;
   c. a plurality of rods connected with said support member and adapted for reciprocal movement between locked and unlocked positions in apertures in a body;
   d. a body having apertures therein adapted to receive said rods for reciprocal movement thereof and having a plurality of slots adapted to receive pins;
   e. a plurality of pins adapted for reciprocal movement in said slots, each pin preventing movement of one of said rods through a respective one of said apertures in all positions except one position and having a second aperture aligning with said respective one aperture in said one position to allow movement of said one of said rods through said respective apertures; and
   f. key means for effecting said one position for each of said pins.

2. The lock of claim 1 wherein a slot member defines a key way slot to facilitate proper placement of said key means.

3. The lock of claim 2 wherein said slot member has spring fingers to further facilitate insertion and removal of said key means, whether said lock is locked or unlocked.

4. The lock of claim 1 wherein said key means contain elevation means of either depressions, elevations, or both to effect said one position of each of said pins.

5. The lock of claim 4 wherein said key means contains depressions.

6. The lock of claim 4 wherein said key means contains ramps as elevations.

7. The lock of claim 1 wherein said lock has guide rods connected with said body and with said support member to facilitate alignment of and reciprocal movement of said rods in said apertures.

8. The lock of claim 7 wherein said lock has spring means urging said support member into the unlocked position.

9. The lock of claim 8 wherein said spring means comprises a spring supported in compression against a fixed end of said guide rod and urges said support member away from said fixed end of said guide rod.

10. The lock of claim 8 wherein said spring means comprises a spring supported in tension on said guide rod and urges said support member toward said body.

11. The lock of claim 1 wherein said lock is employed in a door and has an interior pull means connected with said latching means and reciprocally movable for moving said latching means independently of said support member.

12. The lock of claim 11 wherein said latching means is urged toward the locked position by spring means independently of said support member.

13. The lock of claim 11 wherein said support member carries an external knob that can reciprocally move said support member via a slot in said door for facilitating locking.

14. The lock of claim 1 wherein said body comprises a plurality of similar plates having slots formed in one side thereof, said one side abutting a flat other side of an adjacent plate.

15. The lock of claim 14 wherein said body also contains a flat end plate.

16. The lock of claim 1 wherein said slots in said body are open at one edge of said body to allow insertion and removal of said pins.

17. The lock of claim 1 wherein said rods are cylindrical and said apertures and said second apertures are circular in cross-section.

18. The lock of claim 1 wherein said lock is employed in an automobile lock, said latching means in the locked position restricts movement of said steering apparatus of said auto, and said support member is adapted to be moved manually away from said steering apparatus and toward said body when unlocked by insertion of a proper key means to an "On" position supplying power to the ignition and accessories wired therethrough, and into a "Start" position effecting starting of the engine; a spring being disposed to act on said support member in said "Start" position biasing it toward said "On" position when released from being manually held in said "Start" position; and a holding means being provided in said "On" position for releasely retaining said support member in said "On" position.

19. The lock of claim 18 wherein said support member is also adapted to be moved manually into an "Accessory" position supplying power only to certain accessories, a holding means being provided in said
"Accessory" position for releasably retaining said support member in said "Accessory" position.

20. The lock of claim 18 wherein said support member is also adapted to be moved manually into an "Off" position neither supplying power to accessories nor to ignition, nor restricting movement of said steering apparatus; a holding means being provided in said "Off" position for releasably retaining said support member in said "Off" position.

21. The lock of claim 18 wherein said latching means, in the locked position, is disposed to engage a portion of a gear shift apparatus and restrict movement of said gear shift apparatus.

22. An article of manufacture comprising a blank lock adapted to be matched with a key having a given pattern of elevation effecting means thereon, the blank lock consisting essentially of:
   a. latching means for effecting locking;
   b. support member connected with said latching means and operable to withdraw said latching means into an unlocked position;
   c. a plurality of rods connected with said support member and adapted for reciprocal movement in respective apertures in a body;
   d. a body having a plurality of slots and a plurality of blank pins that are reciprocally movable in said slots and have a portion extending beyond said body so as to engage the elevation effecting means on the key; and
   e. means for emplacing said key adjacent said body to effect a proper elevation of said blank pins for drilling said respective apertures simultaneously through said body and said pins.

23. The article of manufacture of claim 22 wherein said means for emplacing said key is a slot member that defines a key way slot to facilitate proper placement of said key.

24. The article of manufacture of claim 23 wherein said slot member has spring fingers to further facilitate insertion and removal of said key.

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