

Nov. 8, 1955

M. E. COFFEY
COMBINATION LOCK

2,722,820

Filed May 21, 1954

2 Sheets-Sheet 1

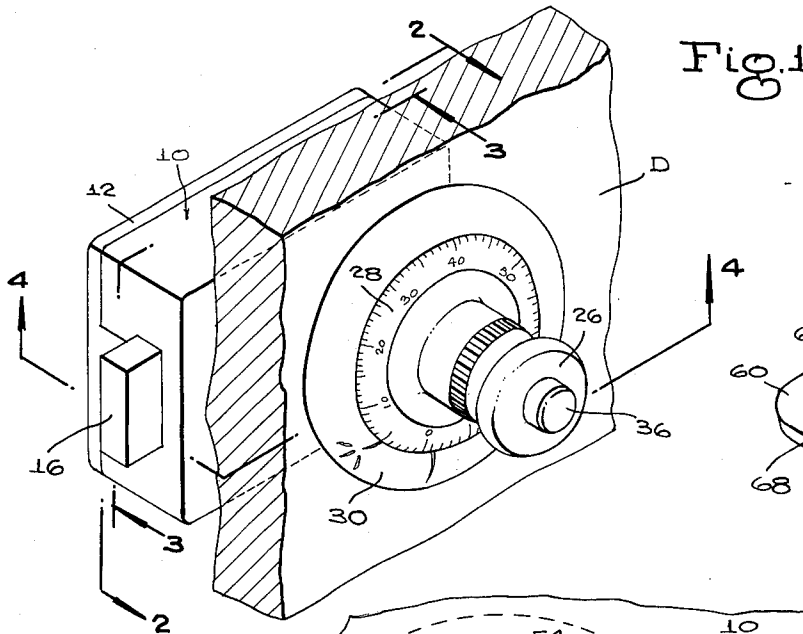


Fig. 1

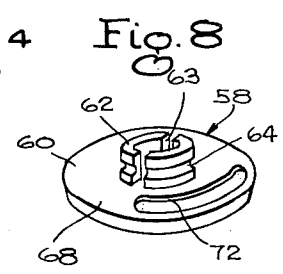


Fig. 8

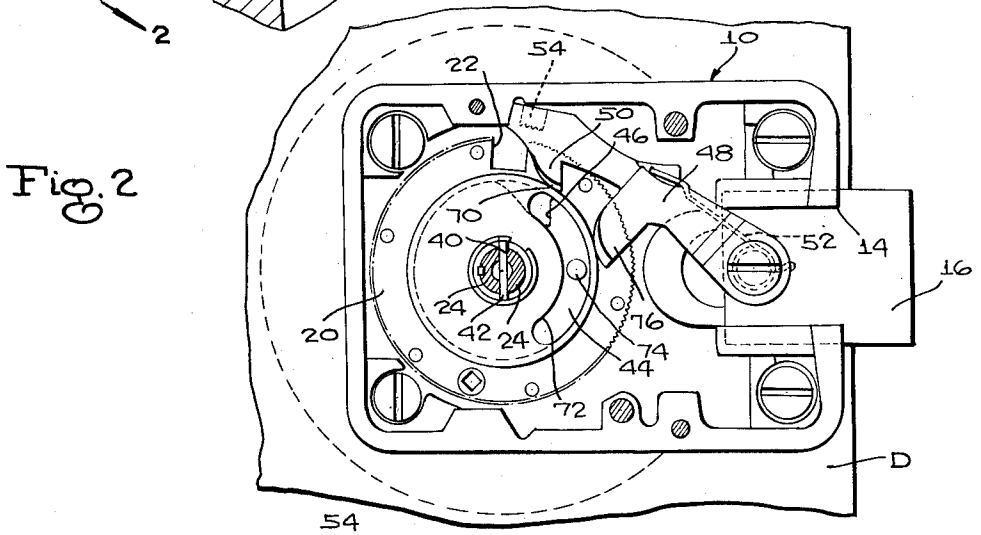


Fig. 2

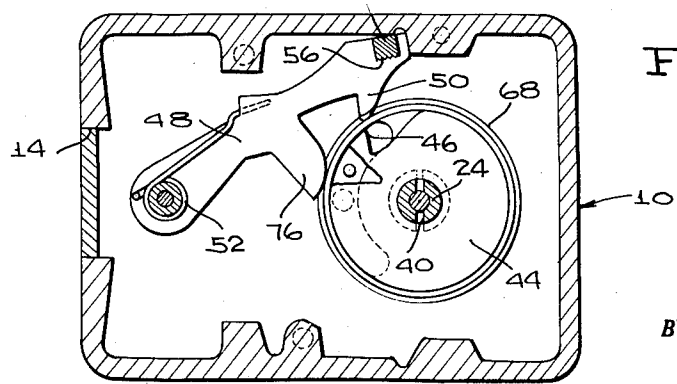


Fig. 3

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Fig. 4

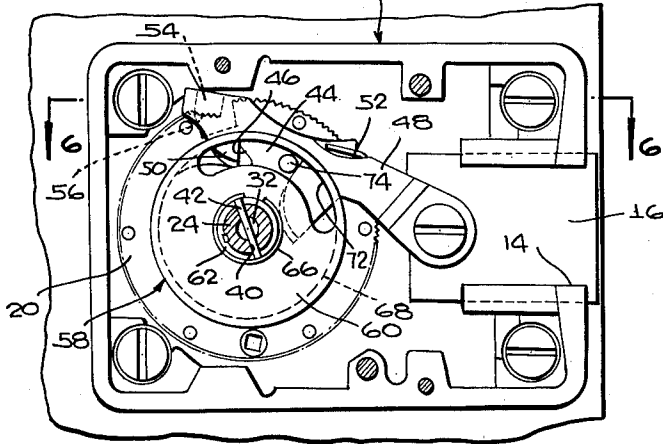
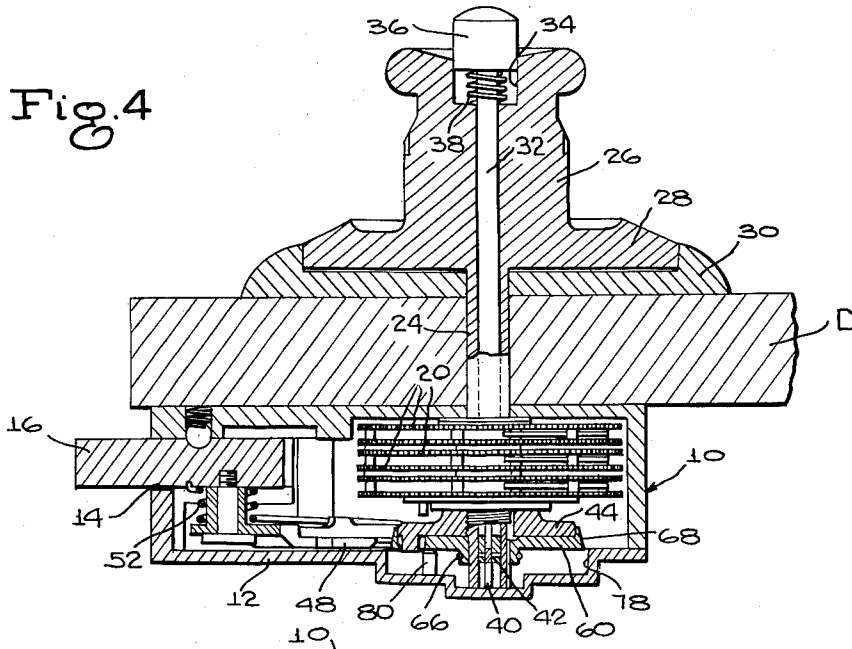


Fig. 5

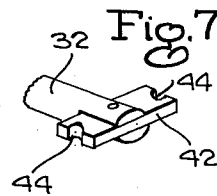


Fig. 7

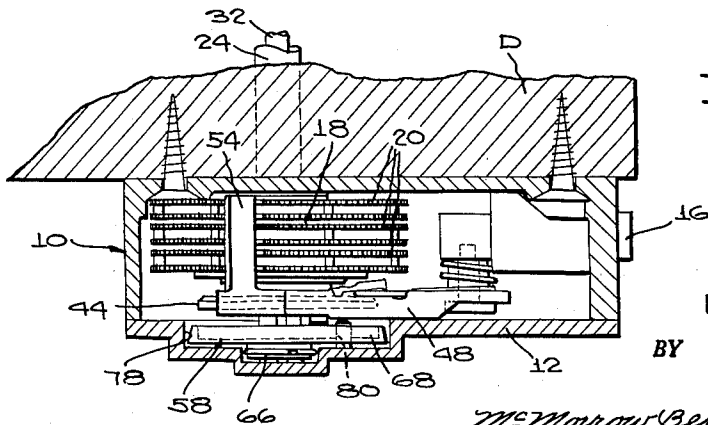


Fig. 6

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COMBINATION LOCK

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Application May 21, 1954, Serial No. 431,471

6 Claims. (Cl. 70—133)

This invention relates to a combination lock and more particularly to a lock of the type having tumbler wheels and a cam disk mounted to rotate about a common axis.

The primary object of the invention is to frustrate the unlocking of the lock by detection of the passage of the notches which open through the peripheries of the tumbler wheels and the recess which opens through the periphery of the cam disk beneath the fence and the operating lever of the lock.

Another object is to interpose between the recessed periphery of the cam disk and the cam follower tongue of a conventional lock a rim guard on the surface of which the cam follower tongue rides during the manipulation of the lock.

Another object is to disengage the rim guard from the cam disk when the combination has been set up to permit the entrance of the cam follower tongue into the notch of the cam disk to release the lock bolt.

The above and other objects may be attained by employing this invention which embodies among its features a rim guard mounted adjacent the cam disk for movement longitudinally relative thereto from an active position in which it encircles the cam disk and engages the cam follower tongue of the lock to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue.

Other features include a push rod mounted in the lock for movement longitudinally along the axis of the cam disk, an annular rim guard carried by the push rod for movement therewith adjacent the cam disk and means carried by the lock and operatively engaging the push rod for yieldingly advancing the annular rim guard under yielding pressure into cam disk encircling relation, and means operable from the front of the lock and operatively connected to the rim guard for moving it against the yielding pressure out of the path of advance of the cam follower tongue to permit the tongue to enter the recess in the cam disk to operatively connect the operating lever to the cam disk for movement of the bolt.

Still other features include beveling the periphery of the annular guard rim to facilitate the entrance thereof between the cam disk and the cam follower tongue under the influence of the yielding pressure, a stop pin carried by the lock and extending into the path of movement of the rim guard when the latter is moved against the effort of the yielding pressure, and said rim guard having a slot extending therethrough for receiving the stop pin to limit the rotation of the cam guard when it is moved out of the path of advance of the cam follower tongue.

Still other features include serrations on the surfaces of the tumbler wheels, and serrations on the fence for cooperating with the serrations on the surfaces of the tumbler wheels to frustrate any sense of feel being transmitted to the knob by which the tumbler wheels and cam disk are rotated.

In the drawings:

Figure 1 is a perspective view of a combination lock embodying the features of this invention;

Figure 2 is a longitudinal sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view taken substantially on the line 3—3 of Figure 1;

5 Figure 4 is a longitudinal sectional view taken substantially on the line 4—4 of Figure 1;

Figure 5 is a view similar to Figure 2, showing the bolt retracted;

10 Figure 6 is a horizontal sectional view taken substantially on the line 6—6 of Figure 5;

Figure 7 is an enlarged fragmentary perspective view of the inner end of the push rod; and

Figure 8 is a perspective view of the guard wheel.

Referring to the drawings in detail, a combination lock designated generally 10 and generally of the type disclosed in prior United States Patent No. 1,956,304, issued April 20, 1934, to Abbott and Miller, comprises a housing having a back cover plate 12 and an opening 14 through which a locking bolt 16 is mounted to move in a rectilinear path from an active position in which it is projected, as illustrated in Figure 2, to an inactive position in which it is retracted, as illustrated in Figure 5. Mounted for rotation about a tubular bearing 18 carried by the housing are tumbler wheels 20 which are provided with peripheral notches 22 for the reception of the fence bar of the lock when the combination has been properly set up. The structure so far defined is conventional with combination locks of the type to which this invention relates and forms no part of the invention except in combination therewith.

Mounted for rotation about a common axis which extends through the tubular bearing 18 is a tubular spindle 24 carrying adjacent its outer end a lock operating knob 26 and a dial 28, both of conventional form, it being understood that the dial cooperates with a dial plate 30 carried by a door D upon which the lock is mounted. Carried by the knob 26 and dial 28, and extending axially through the spindle 24 in alignment with the common axis and for rotation with the spindle 24 is a push rod 32 which extends through a recess 34 formed in the outer end of the knob 26 in axial alignment with the spindle 24. A push button 36 is carried by the push rod 32 and interposed between the bottom of the recess 34 and the inner end of the push button 36 is a compression coil spring 38 which, as will be readily understood upon reference to the drawings, tends to urge the push button 36 outwardly of the recess 34. Extending transversely through the spindle 24 and opening through the end thereof remote from the knob 26 is a slot 40 which opens through the end of the spindle 24 remote from the knob 26. Carried by the push rod 32 remote from the push button 36 and extending transversely through the slot 40 is a cross bar 42 having recesses 44 opening through opposite ends thereof which cross bar extends through the slot 40 in order to establish driving connection between the spindle 24 and the push rod 32, while permitting longitudinal movement of the push rod relative to the spindle.

Threadedly engaged with the spindle 24 adjacent the end thereof remote from the knob 26 is a cam disk 44 having a recess 46 extending therethrough and opening through the periphery thereof into which the cam follower tongue of the operating lever, to be more fully hereinafter described, is advanced when the proper combination has been set up to bring the notches 22 in the tumbler wheels into alignment. Mounted on the bolt 16 for movement in an arcuate path which intersects the common axis about which the tumbler wheels 20 and cam disk 44 rotates is an operating lever 48 carrying a cam follower tongue 50 which enters the slot 46 and establishes operative connection between the cam 46 and bolt 16 to cause the bolt 16 to be retracted upon rotation of the knob 26 when the proper combination has

been arrived at. The cam follower tongue 50 is advanced toward the cam disk 44 under yielding pressure exerted by a torsion spring 52, one leg of which is anchored in the bolt 16, while the opposite leg bears on the operating lever 48. Carried by the operating lever 48 and extending transversely across the peripheries of the tumbler wheels 20 is a fence 54 which in the preferred form of the invention is provided on its underside with serrations 56.

A guard wheel designated generally 58 comprises a disk 60 having an axial opening extending therethrough for the reception of the spindle 24, and carried by said disk 60 and extending outwardly therefrom in concentric spaced relation to the axis thereof is a hub 62 having a transverse slot 63 extending therethrough for the reception of the cross bar 42 to establish rotary driving connection between the spindle 24 and the guard wheel 58. In order to move the guard wheel 58 longitudinally in unison with the push rod 32, the hub 62 is provided with an annular groove 64 which is adapted to register with the notches 44 to receive a spring ring 66 by which the guard wheel 58 is coupled to the push rod 32 for longitudinal movement therewith. Carried by the disk 60 and extending around the periphery thereof is a cone-shaped guard rim 68 which projects laterally from the disk 60 on the side thereof remote from the hub 62 and is adapted to encircle the periphery of the cam disk 44 previously referred to. It is to be noted that the guard rim 68 diminishes in diameter as it recedes from the outer side of the disk 60 so that it may enter between the periphery of the cam disk and the cam follower tongue 50 under the influence of the spring 38 to move the cam follower tongue out of contact with the periphery of the cam disk during the manipulation of the lock. The cam follower tongue is preferably provided with a beveled edge 70 which cooperates with the thin edge of the guard rim 68 in forcing the operating lever 48 to move against the effort of the spring 52 under the influence of the spring 38. Extending through the disk 60 between the hub 62 and rim 68 is an arcuate slot 72 which accommodates an actuating pin 74 which projects outwardly from the cam disk 44 for engaging the lock bolt projecting tongue 76 carried by the operating lever 48.

In the preferred form of the invention, the cover plate 12 is provided with a chamber 78 which aligns axially with the spindle 24 for the accommodation of the guard wheel 58 when the latter is moved under the influence of the push rod 32 to its inactive position out of the encircling relation to the cam disk 44 and carried by the back wall of the chamber 78 is a guard pin 80 which prevents the entrance of the guard wheel 58 into the chamber except when the slot 72 is in registration with the pin 80. Owing to the fact that the slot 72 extends only for a portion of the distance equal to about 90° of the periphery of the guard disk, it is evident that the guard disk cannot be moved under the influence of the push button 36 except when the slot 72 therein registers with the guard pin 80, and obviously engagement of the guard pin 80 with opposite ends of the slot 72 will limit the magnitude of rotation of the guard wheel to only that required for moving the bolt 16.

In use, it will be evident that upon turning the knob 26, the spindle 24 will be rotated and one knowing the combination will employ the dial plate 28 and indices carried by the dial 30 to move the tumbler wheels 20 so that the slots 22 therein will register beneath the fence 54, then by turning the cam disk 44 into a position to register the recess 46 therein with the cam follower tongue 50, it will be evident that upon depressing the push button 36 against the effort of the spring 38, the guard wheel 58 will be moved into the chamber 78 to remove the guard rim 68 from its position between the cam follower tongue 50 and the cam disk 44, thus enabling the arm 48 to move under the influence of the

spring 52 toward the axis of the spindle 24 and the fence 54 into the recesses or notches 22 in the tumbler wheels 20. As the cam follower tongue 50 enters the recess 46 in the cam wheel 44, it will be evident that upon rotating the spindle 24 in a counterclockwise direction when viewed in Figure 2, the bolt 16 will be retracted. When it is desired to restore the lock to locked position, the spindle 24 is rotated in a clockwise direction when viewed in Figure 2 to cause the pin 74 to engage the bolt actuating arm 76 to move the lever 48 in a direction to project the bolt. As the arm 76 and tongue 50 move outwardly while the bolt 16 is being projected, the fence 54 will be lifted out of the notches 22 in the tumbler wheels 20 into a position substantially as illustrated in Figure 2, and as these elements 76 and 50 move outwardly or away from the axis of the spindle 24 against the effort of the spring 52, the sharpened or thinner edge of the rim 68 will enter between the periphery of the disk 44 and the cam follower tongue 50 so that the cam follower tongue will ride on the guard rim 68 when the spindle 24 is rotated in either direction. By thus interposing the guard rim 68 between the cam follower tongue 50 and the periphery of the cam disk 44, it will be evident that detection of the passage of the recess 46 beneath the cam follower tongue will be avoided. Owing to the fact that it is necessary to register the slot 72 with the guard pin 80 in order to move the guard rim 68 clear of the cam disk 44, it will be evident that for the major portion of the operation, the guard disk 58 will not respond when pressure is applied on the button 36 to disengage the periphery of the cam disk. Moreover, during the period that the slot 72 may register with the guard pin 80, unless the notches 22 in the tumbler wheels 20 align beneath the fence 54, the serrations 56 on the fence will, if the fence moves downwardly far enough to engage the peripheries of the tumbler wheels, mesh with the serrations on the peripheries of the tumbler wheels so as to frustrate any attempt on the part of an unauthorized person to manipulate the lock and feel the passage of the notches 22 beneath the fence.

From the foregoing, it will be evident that a manipulation-proof lock is provided which will frustrate any attempt on the part of an authorized person to open the lock.

While in the foregoing there has been shown and described the preferred embodiment of this invention, it is to be understood that minor changes in the details of construction, combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

What is claimed is:

1. In a combination lock of the type comprising a bolt mounted to move in a rectilinear path, a cam disk mounted to rotate about a common axis which intersects and extends perpendicularly to the rectilinear path, said cam disk having a recess extending therethrough and opening through the periphery thereof, an operating lever carried by the bolt for movement in an arcuate path which intersects the common axis, and a cam follower tongue carried by the operating lever for engagement with the periphery of the cam disk and advance into the recess therein to retract the bolt upon rotation of the cam disk, means for preventing detection of the passage of the recess beneath the cam follower tongue comprising a rim guard mounted adjacent the cam disk for movement longitudinally of the common axis from an active position in which it encircles the cam disk and engages the cam follower tongue to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue.

2. In a combination lock of the type comprising a bolt mounted to move in a rectilinear path, a cam disk mounted to rotate about a common axis which intersects and extends perpendicularly to the rectilinear path, said cam disk having a recess extending therethrough and

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opening through the periphery thereof, an operating lever carried by the bolt for movement in an arcuate path which intersects the common axis, a cam follower tongue carried by the operating lever for engagement with the periphery of the cam disk and advance into the recess therein to retract the bolt upon rotation of the cam disk, means for preventing detection of the passage of the recess beneath the cam follower tongue comprising a push rod mounted in the lock for movement longitudinally along the common axis, an annular rim guard carried by the push rod for movement therewith adjacent the cam disk from an active position in which it encircles the cam disk and engages the cam follower tongue to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue, and means carried by the lock and operatively engaging the push rod for yieldingly advancing the annular rim guard under yielding pressure into cam disk encircling relation.

3. In a combination lock of the type comprising a bolt mounted to move in a rectilinear path, a cam disk mounted to rotate about a common axis which intersects and extends perpendicularly to the rectilinear path, said cam disk having a recess extending therethrough and opening through the periphery thereof, an operating lever carried by the bolt for movement in an arcuate path which intersects the common axis, and a cam follower tongue carried by the operating lever for engagement with the periphery of the cam disk and advance into the recess therein to retract the bolt upon rotation of the cam disk, means for preventing detection of the passage of the recess beneath the cam follower tongue comprising a rim guard mounted adjacent the cam disk for movement longitudinally of the common axis from an active position in which it encircles the cam disk and engages the cam follower tongue to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue, and means carried by the lock and operatively engaging the rim guard for advancing the rim guard under yielding pressure into cam disk encircling position, and means operable from the front of the lock and operatively connected to the rim guard for moving it against the yielding pressure out of the path of advance of the cam follower tongue to permit said tongue to enter the recess in the cam disk and operatively connect the operating lever to the cam disk for movement of the bolt.

4. In a combination lock of the type comprising a bolt mounted to move in a rectilinear path, a cam disk mounted to rotate about a common axis which intersects and extends perpendicularly to the rectilinear path, said cam disk having a recess extending therethrough and opening through the periphery thereof, an operating lever carried by the bolt for movement in an arcuate path which intersects the common axis, a cam follower tongue carried by the operating lever for engagement with the periphery of the cam disk and advance into the recess therein to retract the bolt upon rotation of the cam disk, means for preventing detection of the passage of the recess beneath the cam follower tongue comprising a rim guard mounted adjacent the cam disk for movement longitudinally of the common axis from an active position in which it encircles the cam disk and engages the cam follower tongue to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue, means carried by the lock and operatively engaging the rim guard for advancing the rim guard under yielding pressure into cam disk encircling position, means operable from the front of the lock and operatively connected to the rim guard for moving it against the yielding pressure out of the path of advance of the cam follower tongue to permit said tongue to enter the recess in the cam disk and operatively connect the operating lever to the cam disk for movement of the bolt, and the outer periphery of

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the annular rim guard being beveled to facilitate the entrance thereof between the cam disk and the cam follower tongue.

5. In a combination lock of the type comprising a bolt mounted to move in a rectilinear path, a cam disk mounted to rotate about a common axis which intersects and extends perpendicularly to the rectilinear path, said cam disk having a recess extending therethrough and opening through the periphery thereof, an operating lever carried by the bolt for movement in an arcuate path which intersects the common axis, and a cam follower tongue carried by the operating lever for engagement with the periphery of the cam disk and advance into the recess therein to retract the bolt upon rotation of the cam disk, means for frustrating the unlocking of the lock by detection of the passage of the recess beneath the cam follower tongue comprising a rim guard mounted adjacent the cam disk for movement longitudinally of the common axis from an active position in which it encircles the cam disk and engages the cam follower tongue to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue, said rim guard having a slot extending therethrough in spaced concentric relation to the common axis, and a pin carried by the lock and projecting outwardly therefrom and into the path of the rim guard for entrance into the slot when the rim guard is moved out of the path of advance of the cam follower tongue.

6. In a combination lock of the type having a bolt mounted to move in a rectilinear path, tumbler wheels and a cam disk mounted to rotate about a common axis which intersects and extends perpendicularly to the rectilinear path, the peripheries of the tumbler wheels being serrated and having fence receiving notches opening thereinto, said cam disk having a recess extending therethrough and opening through the periphery thereof, an operating lever carried by the bolt for movement in an arcuate path which intersects the common axis, a cam follower tongue carried by the operating lever for engagement with the periphery of the cam disk and advance into the recess therein to retract the bolt upon rotation of the cam disk, a fence carried by the operating lever and extending across the tumbler wheels for entrance into the notches therein when the cam follower tongue enters the recess in the cam disk, means for preventing detection of the passage of a notch beneath the fence and the passage of the recess in the cam disk beneath the follower tongue, said means comprising a rim guard mounted to move longitudinally along the longitudinal axis from an active position in which it encircles the cam disk and engages the cam follower tongue to hold it out of contact with the cam disk to an inactive position in which it lies to one side of the cam disk and out of the path of advance of the cam follower tongue, means carried by the lock and operatively engaging the rim guard for advancing it under yielding pressure into active position, manually actuated means carried by the rim guard and extending through the lock for moving the rim guard against the yielding pressure to inactive position adjacent the cam disk to allow the fence to advance into contact with the tumbler wheels, and spaced parallel serrations carried by the fence and extending parallel with the common axis for meshing engagement with the serrations on the tumbler wheels and frustrating the detection of the passage of a notch beneath the fence.

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