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[54] **LOCK ASSEMBLY**

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[51] **Int. Cl.** **E05b 25/00**; E05b 29/02

[58] **Field of Search** ..... 70/276, 363, 382, 383, 70/384, 385, 405, DIG. 60, 339

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[57] **ABSTRACT**

A door lock assembly is provided which has particular utility in hotels and motels, and in other places where a change of occupancy frequently occurs. The assembly includes removable logic inserts which change the lock tumbler settings for each change of occupancy. In the embodiment to be described, multiple logic inserts are provided which permit the lock to be operated by different independent keys, each logic insert being independent of the others, and each being independently changeable. For example, three logic inserts may be used for the lock in a motel, to render the lock accessible to three different keys, namely, a guest key, a maid's key, and a master key. A mechanism is included in the lock, in the embodiment to be described, which may be actuated by the occupant within the room to prevent operation of the lock from the outside by one or more groups of the independent keys, for example, by any key but the master key when privacy is desired.

8 Claims, 4 Drawing Figures

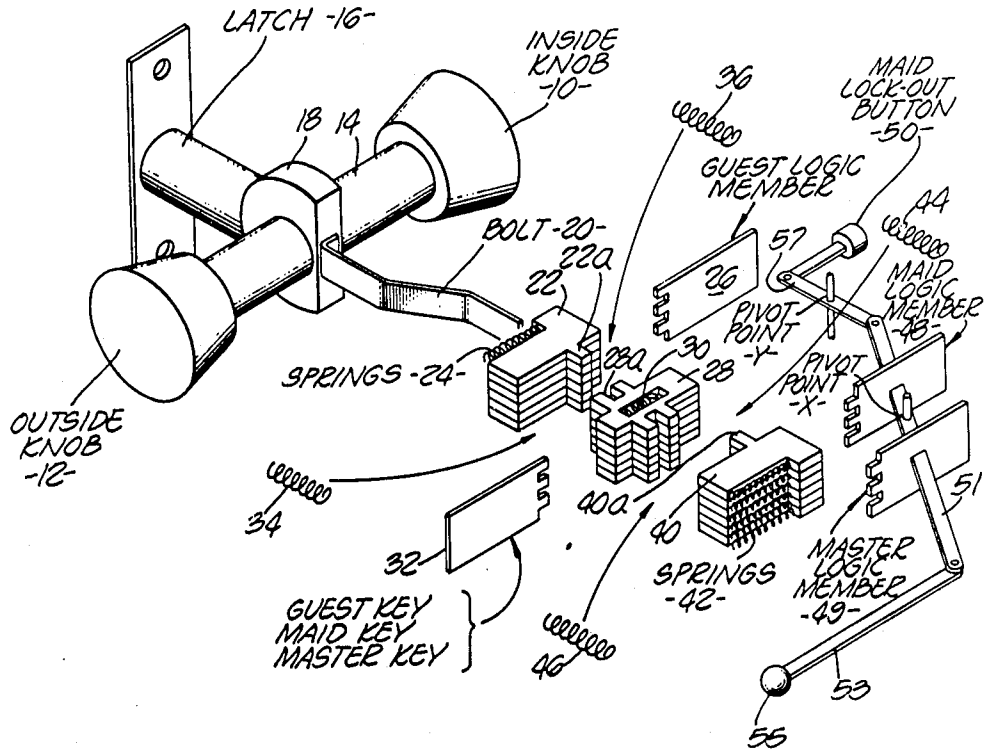


FIG. 1.

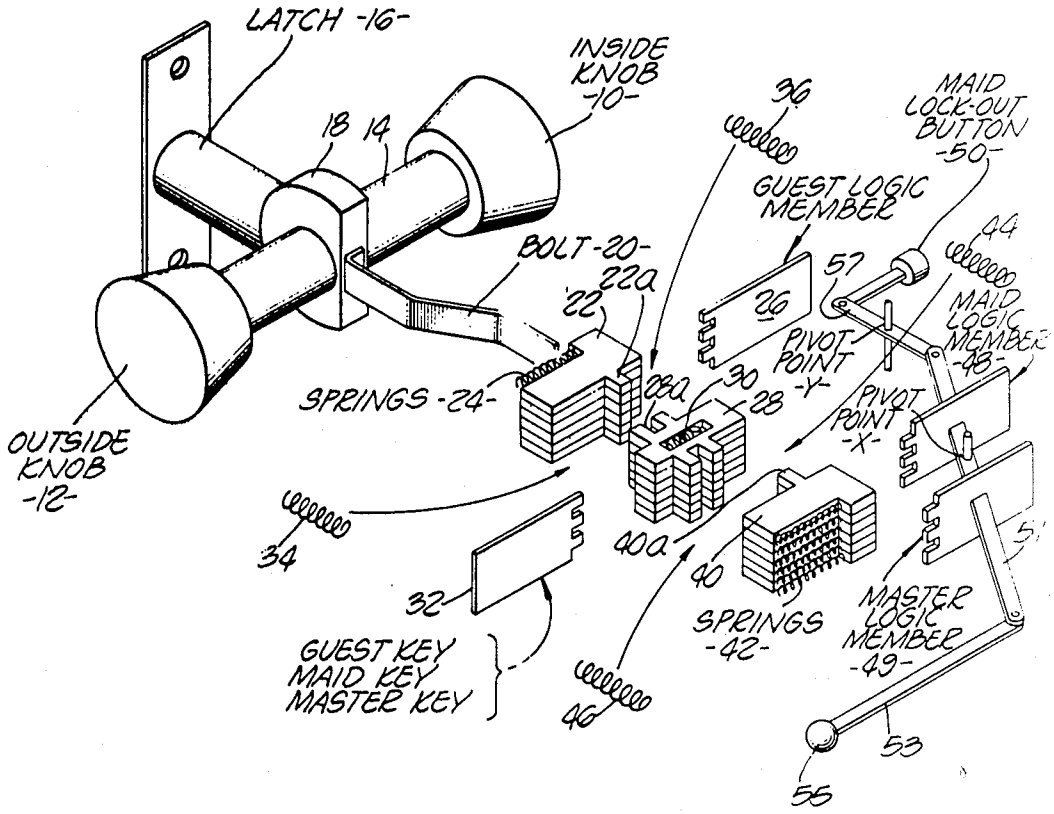
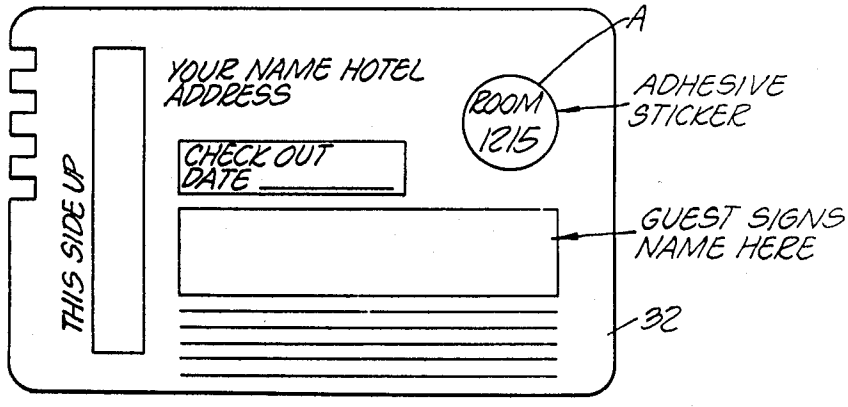

LATCH -16-
INSIDE KNOB -10-
18
14
36
MAID LOCK-OUT BUTTON -50-
GUEST LOGIC MEMBER
44
57
BOLT -20-
22a
22
26
MAID LOGIC MEMBER -48-
PIVOT POINT -Y-
SPRINGS -24-
30
28
PIVOT POINT -X-
OUTSIDE KNOB -12-
34
40a
40
32
SPRINGS -42-
MASTER LOGIC MEMBER -49-
GUEST KEY
MAID KEY
MASTER KEY
46
53
55

FIG. 2.


A
YOUR NAME HOTEL ADDRESS
ROOM 1215
ADHESIVE STICKER
CHECK OUT DATE
GUEST SIGNS NAME HERE
THIS SIDE UP
32

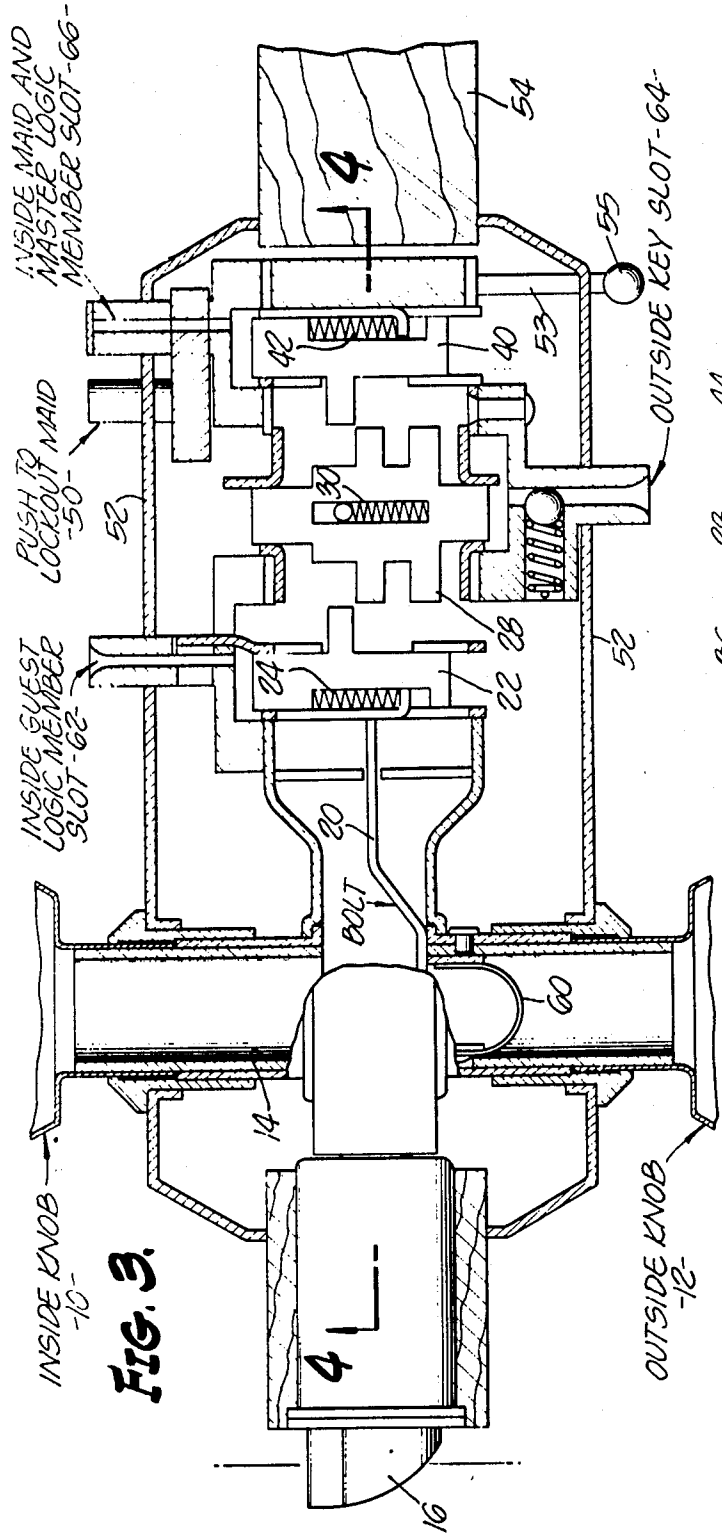

INSIDE MAID AND MASTER LOGIC MEMBER SLOT -66-
PUSH TO LOCKOUT MAID -50-
INSIDE GUEST LOGIC MEMBER SLOT -62-
INSIDE KNOB -10-
OUTSIDE KEY SLOT -64-
OUTSIDE KNOB -12-
BOLT
4
4
54
55
53
40
42
44
46
48
52
22
24
20
60
14
16

FIG. 3.

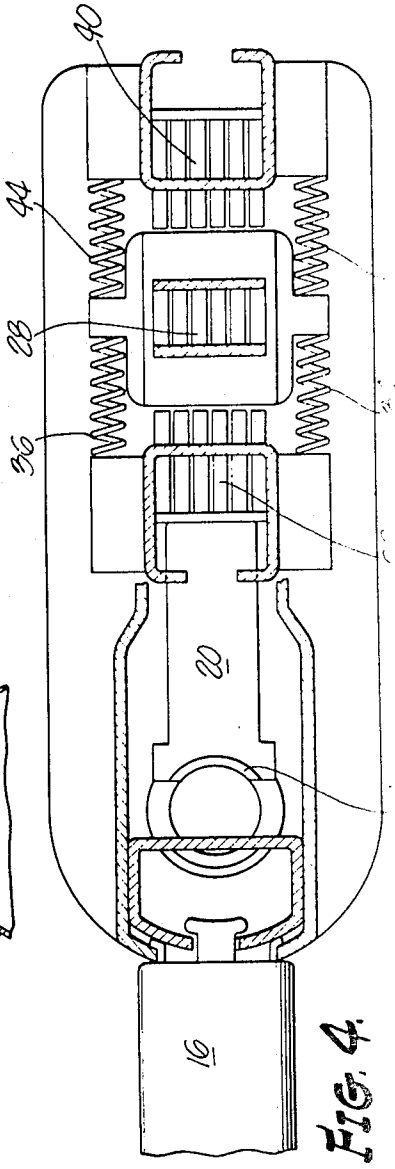

40
44
48
46
20
16

FIG. 4.

LOCK ASSEMBLY

BACKGROUND OF THE INVENTION

Although, for purposes of clarity, the specification herein will be directed to the utilization of the lock of the invention in hotels and motels, it will become evident as the description proceeds that the lock has general utility, for example, in institutions, industrial plants, government facilities, and so on, where changes in the locks are required with some frequency, and where master keying is employed.

Tremendous problems have arisen during recent years involving theft prevention in hotel and motel rooms due to the unauthorized use of the keys issued to guests and maids. Such keys are often lost, stolen, or otherwise find their way into the hands of thieves. The problem is aggravated because the prior art hotel keys normally carry identifying tags giving the thief exact information as to the name of the hotel, its address, and the room number to which access may be gained by use of the particular key.

Although the guest keys used in conjunction with the lock of the present invention may also carry the name and address of the hotel and the room number, the information is valueless because the key will no longer fit the lock of the specified room, because the lock mechanism is changed for each occupancy. The key itself may be disposable, and, because of that, and as an added feature, it can be imprinted with the guest's name or initials for proper identification when the guest requests his key at the desk during his stay at the motel.

When the lock of the invention is used in hotels or motels, it has an added advantage in that the maid can remove the previous guest's logic insert from the room after it has been made up following a check-out. She can then insert a special insert which will fit the bellman's key as he escorts a new guest to the room. This assures that the room will become available to the new guest, only after it has been made up and is ready for occupancy. The bellman can then replace the special logic insert with the logic insert issued to the new guest.

It is preferable that the independent inserts in each lock, which condition the lock to receive the maid's key and the master key, are not readily removable. This is in order that the lock may be rendered tamper-proof. In this way, the lock is accessible only to the master key, and those aspects of the lock are not under the control of the guest, or of the maid.

The basic purpose of the lock of the present invention, therefore, is to provide an assembly which is set to match a new key for each new occupancy of the room. Specifically, as described above, each lock is set by inserting a guest logic insert into the lock on the inside of the door. The guest logic insert then establishes a certain pattern in a first group of tumblers within the lock, and this pattern is matched by a second group of tumblers only when an appropriate key is inserted in the lock which has the capability of causing the second group of tumblers to assume a pattern which complements the pattern of the first group. With such a mechanism, each lock becomes operative only when it has received the appropriate logic insert, and at that time, the lock is conditioned only to operate in conjunction with a key corresponding to that particular insert. The lock of the invention is flexible, since it may provide that any particular key-logic insert combination may be used in conjunction with any door in the establishment.

Since the tumbler characteristics of the lock of the invention may be changed at will, merely by issuing a new key-insert combination, the problem of lost keys is solved, and each guest has the security of knowing that there are no old keys to the lock of his room which may be in the hands of unauthorized persons. Another advantage of the lock assembly of the invention is that the lock is capable of operation by means of relatively inexpensive and disposable logic inserts, and by inexpensive and disposable keys.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation showing in perspective the lock assembly in accordance with one embodiment of the invention;

FIG. 2 is a representation of an appropriate card-like key which may be issued to a guest to operate the lock of FIG. 1, when an appropriate mating guest logic member is inserted into the lock from the inside of the room to set the lock tumblers to a particular configuration;

FIG. 3 is a top section showing a lock assembly constructed to incorporate the concepts of the embodiment of FIG. 1; and

FIG. 4 is a side section of the assembly of FIG. 3, taken essentially along the line 4—4 of FIG. 3.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The lock assembly of FIG. 1 includes a usual door actuating mechanism which, in turn, includes an inside knob **10**, an outside knob **12**, and a shaft **14** intercoupling the two knobs. In accordance with usual prior art practice, the inside knob **10** is coupled to a latch **16**, so that the latch may be operated whenever the knob **10** is turned in either direction. The outside knob **12** is coupled to the latch **16** through a cam **18**, and is capable of operating the latch only when the cam **18** can turn. In the assembly of FIG. **1**, the cam **18** is enegaged by a bolt **20**, so that it can turn only when the bolt is freely slidable along a particular path.

A first tumbler means **22** is disposed in the path of the bolt **20**, and it comprises a stack of individual leaf members. Each leaf in the stack is shaped to define a tongue **22***a* on the side of the stack remote from the bolt **20**, as shown. A plurality of springs **24** bias the individual leaf members of the tumbler means **22** into a transversely aligned position, as shown in FIG. **1**. However, when a guest logic member **26** is inserted through an opening in the lock on the inside of the door, a pattern of teeth on the forward edge of the logic member shifts selected ones of the transverse leaf members of the tumbler means **22** to various displaced positions.

As the bolt **20** moves to the right in FIG. **1**, it carries with it the tumbler means **22**. A second tumbler means **28** is disposed in the path of the tumbler means **22**. Each leaf member of the tumbler means **28** defines a groove section **28***a* on the side of the tumbler means **28** facing the tumbler means **22**, and this groove receives the tongue section **22***a* of the tumbler means **22**, only when the displaced leaf members of the tumbler means **28** complement the displaced leaf members of the tumbler means **22**. The leaf members of the tumbler means **28** are biased to a normally transverse aligned position by a plurality of springs **30**. However, these leaf members may be displaced transversely when a key **32** is in-

serted into a keyhole formed in the lock outside of the door.

The key 32 may, like the logic member 26, be a flat member with a pattern of teeth formed on its forward edge. It will be appreciated that when the pattern of teeth on the key 32 is related to the pattern of teeth on the logic member 26, such that the displacement of leaves in the tumbler means 28 complements the displacement of leaves in the tumbler means 22, the tumbler means 22 will be free to move to the right in FIG. 1, as it is actuated by the bolt 20, with the irregularly-shaped tongue portion 22*a* being received in the complementing irregularly-shaped groove portion 28*a*.

The key 32 may, for example, be a guest key which, as shown in FIG. 2, is in the form of a card having teeth on its forward edge which must complement the teeth of the guest logic member 26 in order for the lock to be operated. As noted, when an appropriate match is achieved between the transverse settings of the leaves of the tumbler means 22 and of the tumbler means 28, movement of the tumbler means 22 into the tumbler means 28 is permitted, so that the door may be opened. The tumbler means 22 and 28 are normally biased away from one another along the aforesaid path by appropriate springs, such as springs 34 and 36.

As explained above, when a guest checks into the motel or hotel, he is issued a guest logic member 26 and a mating guest key 32. Then he, or the bellman, inserts the guest logic member 26 into an inside opening in the lock of the room allocated to the guest, thereby conditioning the lock to be operated by the insertion of the mating guest key 32 into the outside keyhole of the lock, so that the guest may subsequently gain access to his room.

In the embodiment of FIG. 1, a third tumbler means 40 is provided in the path of the tumbler means 28. The tumbler means 40 also is formed of a stack of leaf members which are biased into a transverse aligned position by appropriate springs, such as the springs 42. Each of the leaf members of the tumbler means 40 is formed to define a tongue section 40A. This tongue section is received in a mating groove section 28*b* of the tumbler means 28, only when the positions of the transversely displaced leaves of the tumbler means 40 complements the position of the displaced leaf members of the tumbler means 28. Unless such a match is achieved, the tumbler means 40 prevents movement of the tumbler means 28 along the path. The tumbler means 28 and 40 may be biased in opposite directions by appropriate springs, such as springs 44 and 46.

It will be appreciated, therefore, that when a match is achieved between the tumbler means 22 and the tumbler means 28, the tumbler means 22 is free to move along its path into engagement with the tumbler means 28, so that the door may be opened. At that time, movement of the tumbler means 28 along the path is prevented by the unmatched tumbler means 40. On the other hand, when a match is achieved between the tumbler means 28 and the tumbler means 40, movement of the bolt 20 causes the unmatched tumbler means 22 to move the tumbler means 28 into engagement with the tumbler means 40, so that again the door may be opened, this being due to a completely independent interrelationship between the key operating the tumbler means 28, and a further key operating the tumbler means 40.

The purpose of the additional tumbler means 40 is to permit access to the room by a master key or by a maid's key, each of which is independent of the particular key issued to the guest. The leaf members of the tumbler means 40 may be set, for example, to a particular displaced configuration by means of a maid logic member 48 which, together with a master logic member 49 is mounted on a lever 51 within the lock assembly. The lever 51 is pivoted at a pivot point X, and is moved by an actuating bar 53 which is attached to one end of the lever 51 and which protrudes through the front side of the lock to be terminated by an operating knob 55.

When it is desired to operate the lock by the maid's key, the knob 55 is pushed, so as to remove the master logic member 49 from the lock and to insert the maid's logic member 48 into the lock. Then, the lock is conditioned for operation by the maid's key. Alternately, when it is desired to condition the lock for operation by the master key, the knob 55 is pulled, which pivots the lever 51 about the pivot point X to remove the maid logic from the tumbler means 40, and to insert the master logic member 49. This conditions the lock for operation by the master logic member.

A further lever 57 is coupled to the other end of the lever 51, and is pivoted at a pivot point Y. The lever 57 is operated by a pushbutton 59 inside of the room which can be pushed in to a latched position to lock out the maid logic member 48 and to lock in the master logic member 49. This action locks the bar 53, so that the maid is no longer capable of inserting the maid logic member 48 into the lock, and the lock can only be operated by a master key which matches the master logic member 49. The pushbutton 59 is coupled to the door mechanism in a usual manner, so that its latch is released whenever the door is closed as the occupant leaves the room.

The guest key shown in FIG. 2 includes the room number to which the key is currently issued which may, for example, be attached to the key by an adhesive sticker A. The key may be disposable, as mentioned above, in which event, each time the guest checks out of the hotel, the key and the associated guest logic member 26 is discarded. When a new guest checks into the hotel, he is issued a key, such as the guest key 32, and his room number is affixed to the key by the adhesive sticker A. The bellman is also issued a matching guest logic member 26. Then, as the guest enters his room, the bellman inserts the guest logic member 26 into the inside slot in the lock of his room and, thereafter, he can operate his lock by his guest key.

As shown in FIG. 2, the guest may sign his name on the key when he checks out, and the check-out date may be entered on the key. The forward edge of the key contains appropriate teeth, so that it can displace the leaf members of the tumbler means 28 to the appropriate transverse positions to complement the displaced positions of the tumbler means 22 to permit the door to be opened. When the guest checks out of the hotel, he may take his guest key 32 with him, or throw it away. Then, as described above, after the room has been made up for a new guest, the maid may remove the old guest logic member 26 from the lock, and replace it with a bellman logic member which will match the lock with the bellman's key.

On check-in, the bellman replaces the bellman logic member with the particular guest logic member 26 in-

sued to the guest. It the hotel service does not include bellmen, the new guest logic member may be inserted into each lock by appropriate personnel, as the rooms become available, and matching guest keys may then be identified with respect to the various rooms, to be issued to the guests as they check in.

As shown in FIGS. 3 and 4, the internal mechanism of one embodiment of the lock assembly of the invention is enclosed in an appropriate lock casing 52 which, in turn, is mounted in an appropriate opening in the hotel room door 54. As shown in FIG. 3, for example, the shaft 14 between the knobs 10 and 12 is coupled to the operating mechanism of the lock assembly through an appropriate slip clutch 60. This clutch causes the outside knob 12, for example, to rotate whenever excessive torque is applied to the knob in an effort to gain unauthorized entrance into the room. Access for the guest logic card 26 is gained through an inside slot designated 62, and the maid and master logic members are mounted in a appropriate slot 66 for operation by the bar 53, as described above.

The invention provides, therefore, an improved lock assembly which may be set for each new occupancy of a hotel room, or the like, and which has the additional feature in that a maid may obtain access to the room through the use of an independent key which operates independent tumblers within the lock, or by a master key. Also, provisions are made to permit the occupant to lock out the maid when he is in the room, if he so desires. However, even though the maid can be locked out of the room, the master key can still be used to gain access to the room, which may often be desirable in the case of an emergency.

It will be appreciated that although a particular embodiment of the invention has been shown and described, modifications may be made. It is intended in the claims to cover the modifications which come within the spirit and scope of the invention.

What is claimed is:

1. A lock assembly including: a casing; a first plurality of tumblers mounted in said casing and individually settable to different positions established by a first logic member; a second plurality of tumblers mounted in said casing and individually settable to different positions established by a key, said tumblers of said second plurality permitting movement of said tumblers of said first plurality relative thereto only when the positions of the tumblers of said first plurality have a predetermined relationship with respect to the positions of the tumblers of said second plurality; and a third plurality of tumblers mounted in said casing and individually settable to different positions established by at least one further logic member, said tumblers of said third plurality permitting movement of said tumblers of said second plurality relative thereto only when the positions of the tumblers of said second plurality have a predetermined relationship with the positions of said tumblers of said third plurality.

2. The lock assembly defined in claim 1, and which includes mechanical means for selectively moving a second logic member and a third logic member into engagement with the tumblers of said third plurality.

3. The lock assembly defined in claim 2, and which includes a locking means mounted on said casing and coupled to said mechanical means for locking said third logic member into engagement with said third tumbler means.

4. A lock assembly including: a casing; a bolt member mounted in said casing and slidable along an axis in said casing; a first tumbler means mounted in said casing and positioned on said axis adjacent said bolt member, said first tumbler means comprising a stack of leaf members individually slidable transversely to said axis to positions established by a first logic member; second tumbler means mounted in said casing and positioned on said axis adjacent said first tumbler means, said second tumbler means comprising a stack of leaf members individually slidable transversely to said axis to positions established by a key, said second tumbler means permitting movement of said first tumbler means along said axis relative to said second tumbler means only when the positions of the leaf members of said first tumbler means have a predetermined relationship with respect to the positions of said leaf members of said second tumbler means; and a third tumbler means mounted in said casing and positioned on an axis adjacent said second tumbler means, said third tumbler means comprising a stack of leaf means individually slidable transversely to said axis in positions established by at least one further logic member, said third tumbler means permitting movement of said second tumbler means relative to said third tumbler means only when the positions of said leaf members of said second tumbler means have a predetermined relationship with respect to the positions of said leaf members of said third tumbler means.

5. The lock assembly defined in claim 4, and which includes first spring means resiliently biasing said leaf members of said first tumbler means transversely of said axis to a transversely aligned position, and second spring means resiliently biasing said leaf members of said second tumbler means transversely of said axis to a transversely aligned position.

6. The lock assembly defined in claim 5, and which includes third spring means resiliently biasing said leaf members of said third tumbler means transversely of said axis to a transversely aligned position.

7. The lock assembly defined in claim 4, and which includes first spring means resiliently biasing said first and second tumbler members along said axis away from one another, and second spring means resiliently biasing said third and second tumbler means along said axis away from one another.

8. The lock assembly defined in claim 4, in which one of said first and second tumbler means is shaped to define a tongue section, and the other of said first and second tumbler means is shaped to define a groove section for receiving said tongue section only when the positions of the leaf members of said first tumbler means match the positions of said leaf members of said second tumbler means; and one of said second and third tumbler means defines a tongue section, and the other of said second and third tumbler means defines a groove section for receiving said last-named tongue section only when the positions of the leaf members of said second tumbler means complements the positions of said leaf members of said third tumbler means.

* * * * *