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ABSTRACT: A keylock mechanism is disclosed herein having a housing holding an outer cylinder and rotatably supporting a middle cylinder which, in turn, supports an inner cylinder rotatably mounted on a plug of a ratchet mechanism, all of which are in coaxial relationship. A plurality of tumbler chambers are formed in the outer cylinder resiliently holding a portion of a plurality of pins of varying lengths adapted to be combined to lock or release the cylinders and plug. The middle cylinder, inner cylinder and the plug are formed with openings adapted to be selectively aligned with selected ones of the chambers so as to slidably receive the set of combined pins carried in said selected chamber. A ratchet mechanism connected between the inner cylinder and the plug permits the openings therein and in the middle and inner cylinders to be selectively aligned with chamber openings in the outer cylinder so that a multiplicity of pin tumbler combinations can be chosen. An engineer's key is employed to rotate or set the middle and inner cylinders and their associated openings with respect to the outer cylinder chambers to change combinations and a guest or operative key is employed to actuate the pin tumblers in each of the selected chambers so as to rotate the inner cylinder and the plug to release the lock.

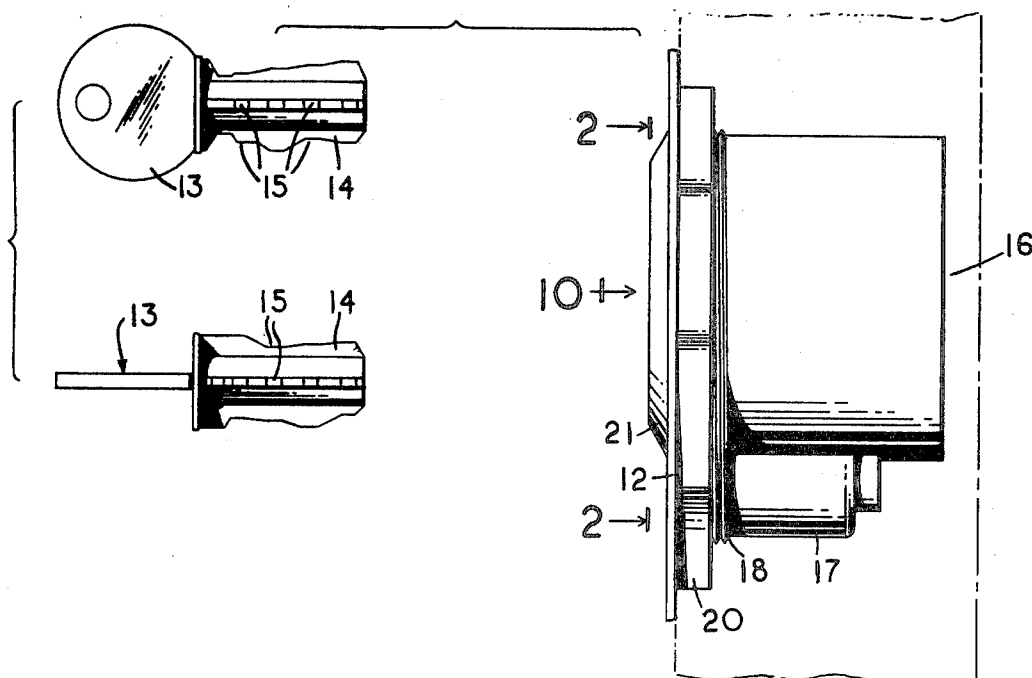
[54] KEYLOCK MECHANISM
11 Claims, 16 Drawing Figs.

[52]	U.S. Cl.....	70/383, 70/364
[51]	Int. Cl.....	E05b 25/00
[50]	Field of Search.....	70/385, 382, 383, 384, 339—343, 359, 364 R

[56] **References Cited**

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1,561,223	11/1925	Fremont	70/382
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2,113,007	4/1938	Swanson	70/340
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3,090,219	5/1963	Levin	70/315



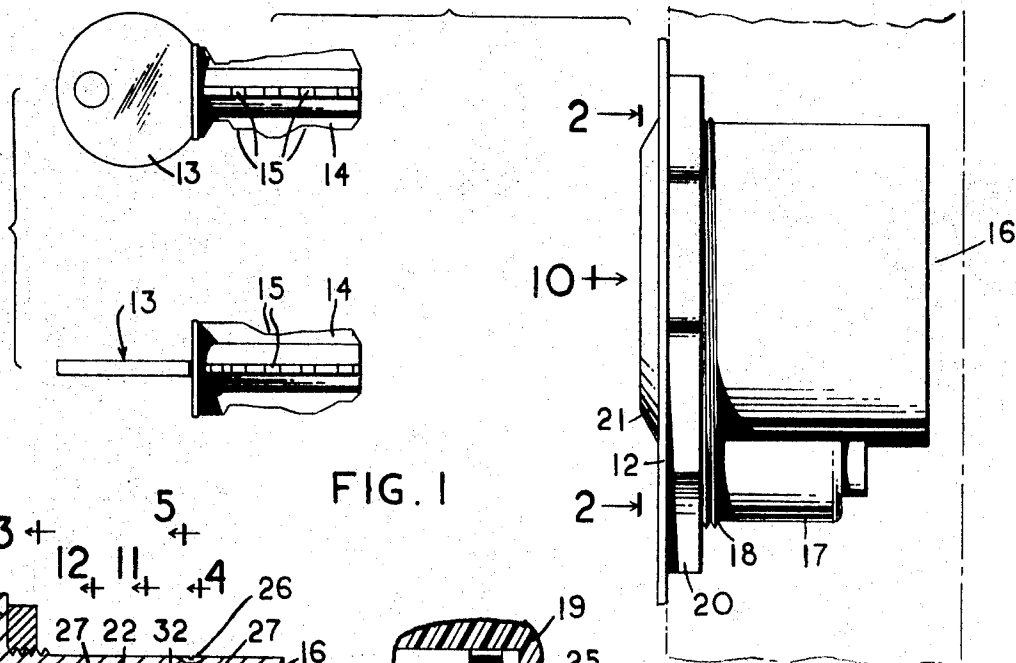


FIG. 1

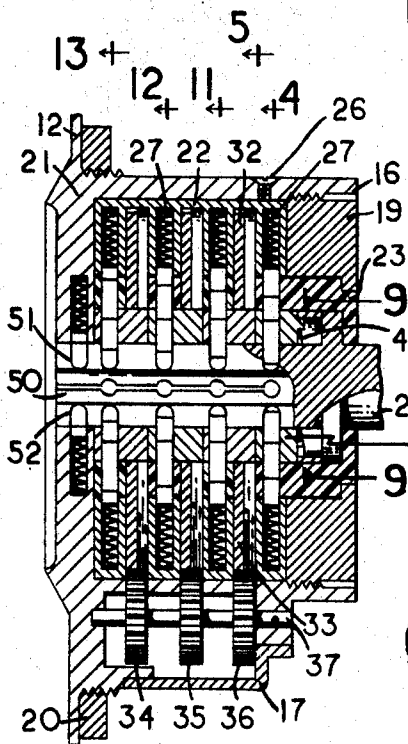


FIG. 3

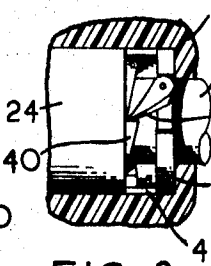


FIG. 8

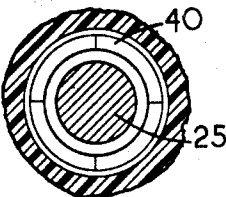


FIG. 9

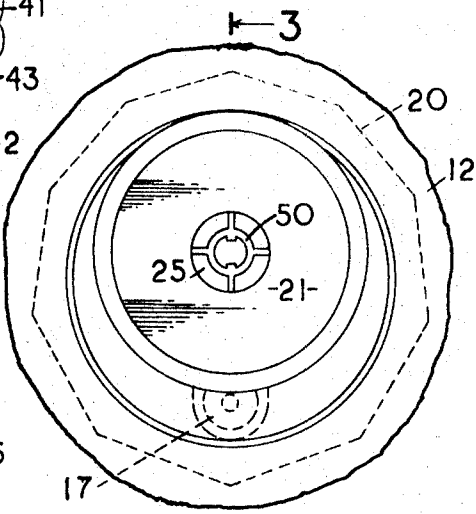


FIG. 2

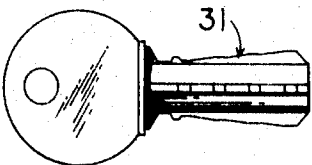


FIG. 5a

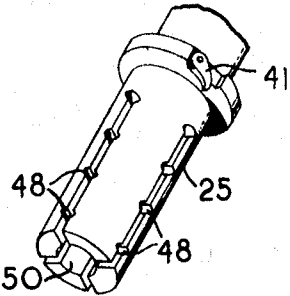


FIG. 7

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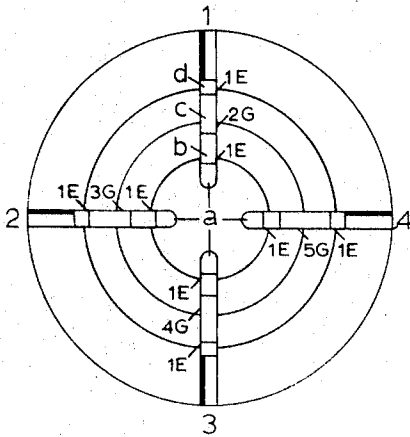


FIG. 10

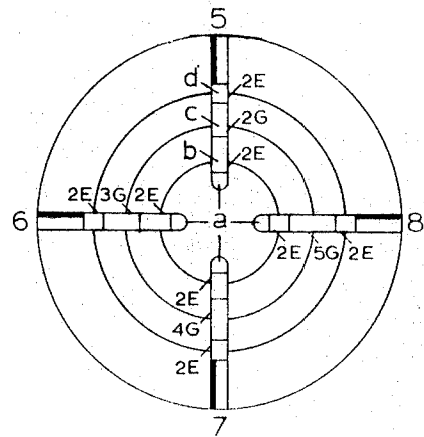


FIG. 11

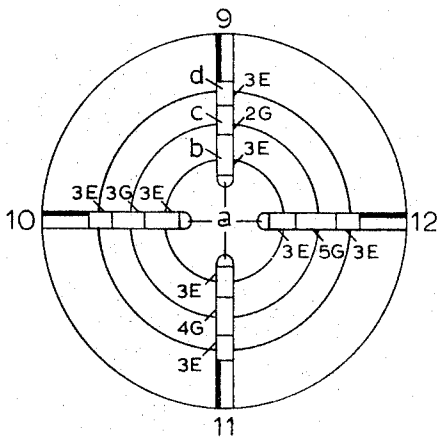


FIG. 12

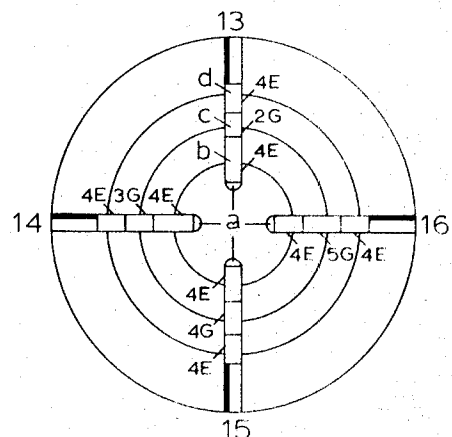


FIG. 13

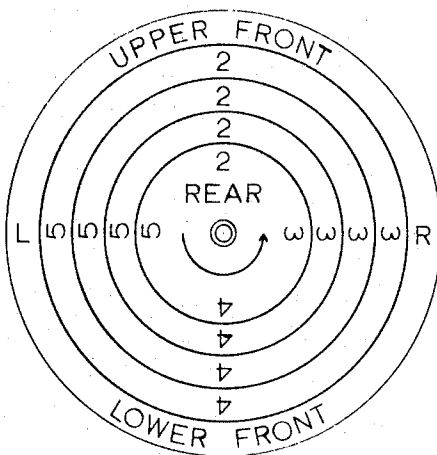


FIG. 14

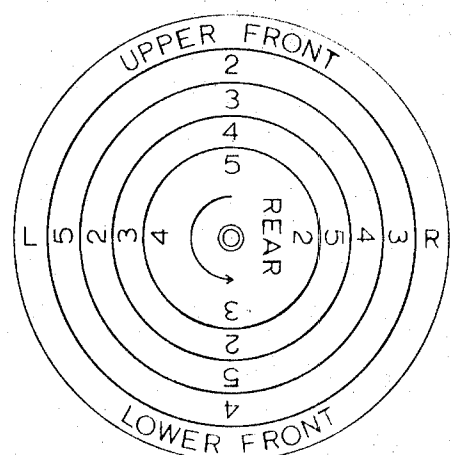


FIG. 15

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KEYLOCK MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to door locks and, in particular, to a novel keylock mechanism subject to operation by an operative key to selectively lock or unlock the mechanism and subject to change of the lock combination by use of an engineer's key. The mechanism is more appropriately one which finds considerable use in locks for public accommodations where a key may frequently change hands.

2. Description of the Prior Art

A particular type of installation where special key features are found advantageous resides in a hotel or motel where a key is given out to a different occupant each time a room is rented. Many times keys are not returned. Also, keys in the hands of casual occupants can easily be duplicated for future unauthorized use.

There is an obvious need for a pin tumbler lock that is suitable for door use in hotels, motels and other establishments in which it is necessary to change the combination with some frequency. Although these establishments have been employing combination locks for many years, the number of combinations available for change in each lock is very limited and it is difficult to change from one combination to another. It is the conventional practice to employ special tools and the skillful services of an expert to effect such combination changes even when the lock mechanism provides for such a change.

Conventionally, lock mechanisms have been developed for changing combinations which require the use of a key made in two parts, the two halves of which must be carefully and tediously maneuvered to adjust the pins of the mechanism to the contours of a new key. This procedure will obviously require the services of an expert and will in itself consume considerably time. It is also possible to open or release the lock mechanism by using conventional burglar's tools such as picks or the like, so that the lock mechanism is neither pick-proof or burglar-proof.

Examples of prior art lock mechanisms which permit changing of key combinations are located in the disclosures of U.S. Letters Pat. Nos. 1,561,223; 3,090,219 and 3,290,910. However, lock mechanisms of these latter types are limited in the number of combination changes which can be made and fall short of being burglar proof.

SUMMARY OF THE INVENTION

Accordingly, the difficulties and problems encountered with conventional lock mechanisms adapted to change combinations are obviated by the present invention which provides a keylock mechanism that is both pick-proof and burglar-proof. The keylock mechanism requires no special training to effect the change of combination and the multiplicity of combinations available are vastly increased over the number of possible combinations available by use of conventional locks. By employing an engineer's key which may be inserted in the lock keyway, a pin tumbler combination change may be effected in less than one second. A guest or operative key may be employed in the same keyway for effecting locking and unlocking procedures in accordance with the particular combination selected by the engineer key.

In one form of the invention, a housing is provided for supporting a stationary outer cylinder formed with a plurality of axial chambers in communication with a central longitudinal opening. The outer cylinder coaxially and rotatably supports, within the central opening thereof, a middle cylinder, an inner cylinder and a plug having longitudinal keyway. Each of the middle and inner cylinders and the plug are formed with axial openings in alignment with each of the axial chambers formed in the outer cylinder. A plurality of pin tumblers are resiliently carried in each of the chambers and biased through respectively aligned openings in the middle and inner cylinder as well as in the plug so as to project into the keyway.

When a guest key is inserted into the keyway, selected ones of the pins in each chamber are aligned to provide a horizontal parting line in coextension with the interface of the inner cylinder with the middle cylinder whereby clockwise rotation of the key effects rotation of the plug. The plug carries an extension projecting beyond the housing adapted to actuate the door latch mechanism.

A combination change is effected in response to the presence of an engineer key in the keyway which sets the tumbler pins in the respective chambers so that only the parting line of the pins match the interface between the middle cylinder and outer cylinder so that rotation of the middle, and inner cylinders and the plug is produced. A ratchet mechanism interconnects the inner cylinder with the plug so that as the key is rotated clockwise, the first portion of the middle and inner cylinders will rotate to select another pin tumbler chamber. Second, third and fourth middle and inner cylinder portions are sequentially rotated for each quarter turn of the engineer key via a set of quarter or quadrant gears. The ratchet mechanism is stepped according to the quarter turn sequence. A ring gear and pinion gear arrangement cooperate with the quarter gears to serve as a transfer mechanism for aligning selected pin tumbler chambers with the holes or openings in the cylinders and plug to effect a variety of combination changes.

Therefore, it is among the primary objects of the present invention to provide a novel pin tumbler lock mechanism capable of effecting a multiplicity of unlocking combinations.

Another object of the present invention is to provide a novel pin tumbler lock mechanism adapted to be operated by a guest key and adapted to selectively change the unlocking combination by an engineer key.

Another object of the invention resides in providing a plurality of coaxial cylinders adapted to be selectively rotated together or separately so as to rearrange radial key cylinder assemblies to place the selected assemblies in an operative location for actuation by a guest key.

Still another object of the invention resides in providing a novel keylock mechanism which is pick-proof and burglar-proof and is operative in response to a guest key for actuation purposes while being operative in response to an engineer's key for effecting combination change of the lock mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of the novel key lock mechanism of the present invention shown in a typical installation on a door with a guest key in position for insertion therein;

FIG. 2 is a front elevational view of the installed keylock mechanism as taken in the direction of arrows 2-2 of FIG. 1;

FIG. 3 is a longitudinal cross-sectional view of the keylock mechanism illustrating the internal component parts thereof with a guest key inserted in the keyway of the mechanism;

FIG. 4 is a transverse cross-sectional view of the keylock mechanism as taken in the direction of arrows 4-4 of FIG. 3;

FIG. 5 is a transverse cross-sectional view of the keylock mechanism as taken in the direction of arrows 5-5 of FIG. 3;

FIG. 5A is a side elevational view of an engineer's key of the present invention;

FIG. 6 is an exploded view of a portion of two primary component parts employed in the keylock mechanism;

FIG. 7 is a perspective view of the ratchet mechanism employed in the keylock mechanism;

FIG. 8 is a fragmentary view of the ratchet mechanism mounted in the intermediate barrel;

FIG. 9 is a sectional view of the four slotted keyways employed in the keylock mechanism;

FIGS. 10-13 are transverse cross-sectional views of the keylock mechanism shown in FIG. 3 as taken in the direction of the respective numbered arrows thereof;

FIG. 14 is a front elevational view of a circular slide rule type chart showing initial pin tumbler cylinder assembly relationships for various combinations; and

FIG. 15 is a chart similar to the chart shown in FIG. 14 showing pin tumbler relationships for various guest key combinations.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a lock mechanism, indicated in the general direction of arrow 10, is illustrated as being mounted on a conventional door 11 having a front panel 12. The lock mechanism is shown in combination with a key 13 poised for insertion into the mechanism for effecting the unlocking thereof. The key 13 includes an elongated shank 14 which is, preferably for some applications, cylindrical and which is provided with a plurality of cutouts or bits 15. Each of the bits is cut to a predetermined depth and the depths of all the bits are selectively cut so as to provide a preselected code effective to unlock the mechanism. It is to be understood that the key 13 may include a pair of bit rows disposed on opposite sides of the shank 14 or, as illustrated, the shank may include four or more individual rows of bits wherein each row is located at an angle with respect to the adjacent rows equal to $360/n$, where n is the base number of the permutation P_r^n .

The lock mechanism includes a mechanism housing 16 incorporating a pinion housing 17 which is formed with a plurality of threads 18 adapted to threadably receive a mounting nut 20. A frontpiece 21 is carried on the forward end of the mechanism housing 16 and is formed with an annular flange adapted to seat against the front of the door panel 12 while the lock nut 20 holds the mechanism in place when the nut is tightened against the back side of the panel 12.

Referring now to FIGS. 2 and 3, the mechanism housing 16, including a backup plate 19, is provided with an internal cavity which is occupied by an outer cylinder 22, a middle cylinder 23, an inner cylinder 24, and a plug 25. One end of the plug 25 projects outwardly from the housing plate 19 and is suitably connected to a conventional latch mechanism (not shown) adapted to actuate a latch upon rotation of the plug. The outer cylinder 22 is held stationary by means of a setscrew 26 which suitably secures the outer cylinder to the housing 16. The outer cylinder includes a plurality of axial pin tumbler chambers, such as is indicated by numeral 27 wherein each chamber is adapted to resiliently mount a portion of a tumbler pin assembly comprising a plurality of pins of varying lengths which are placed in end-to-end relationship so as to project out of the chamber into aligned apertures or holes formed in the middle and inner cylinders as well as in the plug 25. The chambers 27 are arranged in rows corresponding to the number of bits on the key 13. For example, if the key is provided with two bits, then an upper and lower row of chambers and tumbler pin assemblies are provided. In the event the key is provided with four bits, then four rows of chambers are provided at a 90° relationship corresponding to the four bits of the key.

For clarification, a single chamber and tumbler pin assembly will be described. In chamber 27, for example, as seen in FIG. 4, four pins are illustrated in alignment which are biased in the direction of the plug 25 by means of an expansion spring 30 into a keyway of the plug. The endmost pin "a" of the plurality is adapted to pass through the plug 25 into communication with a selected cut in the key. The plurality of pins commencing with pin "d" bearing against spring 30 and extending to pin "a" adapted to enter the cutout of the key bit may be represented by the letters "d," "c," "b" and "a," respectively. When the guest key 13 is fully inserted into the plug 25, pins "b" and "c" associated with each of the cylinder assemblies

are displaced a distance equal to the corresponding cuts in the key and form a parting line in alignment with the interface of the inner cylinder and the middle cylinder, so that rotation of the inner cylinder with respect to the middle cylinder can take place. Pins "a" lock the plug to the inner cylinder and the pins "c" lock the middle cylinder to the outer cylinder. Therefore, insertion of the guest key 13 effects rotation of the plug and inner cylinder as a unit and, since rotation of the plug 25 actuates the latch mechanism, locking or unlocking of the latch is thereby effected.

The "b" and "c" pins are contained mostly within the respective chambers of the inner and middle cylinders and project partially into the outer cylinder only when a key is inserted in the lock. The "a" pins are contained in the plug at all times and only the "b" pins normally extend into the chambers of the inner cylinder. The "b" pins and "c" pins vary in length from chamber to chamber, but their combined length is always the same and therefore constant and exactly equals the combined length of the chambers of the inner and middle cylinders.

In FIG. 4, the relationship of each of the aligned and radial chamber assemblages carrying the respective lengths of combined pins is illustrated. When the guest key is inserted in the keyway, it can be seen that the "a" pins lock the plug to the inner cylinder and that the "c" pins lock the middle cylinder to the outer cylinder.

Referring now to FIGS. 3 and 5, the lock mechanism is provided with a means for effecting combination change by rotating selected chambers so as to carry a portion of the pins of each assembly therewith from one set of chamber pin assemblages to another. This is achieved by means of insertion of an engineer's key as illustrated by key 31 in FIG. 5a. The engineer's key includes cutouts or bits in a similar fashion to key 13 with the exception that the depth of the cutouts are coded differently therefrom. The lock mechanism includes a 360° full round advance mechanism which includes a spur gear 32 rotatably carried within the respective outer cylinder chambers and which are attached to the middle cylinder 23. In addition, selected ones of the cylinder assemblages include a quarter or quadrant gear 33. The quadrant gears are similarly secured to the middle cylinder 23. However, it is to be noted that the middle cylinder 23 is segmented along its length into four sections so that rotation of each section is effected by rotation of a preceding middle cylinder section. By this means, a type of advance or transfer mechanism is provided by positioning various groups or assemblages of pins with respect to one another and with respect to pins held by the other cylinder and plug. The 360° gears, as well as the quadrant gears, are actuated by means of pinion gears 34-36 inclusive which are rotatably carried on a pinion shaft 37 fixed in the pinion housing 17. It is to be noted that the middle cylinder segment, fourth cylinder assembly, is not attached to nor carries a 360° full round advancement gear. It does, however, attach to a 90° quadrant. The middle cylinder segment of the fourth assembly, therefore, will rotate through 270° or three pin positions before the leading edge of the quadrant will engage the number three advance pinion indicated by numeral 36. This pinion, in turn, meshes with a 360° gear that is attached to the middle cylinder segment of cylinder assembly number three.

Now, as cylinder assembly number four is rotated into the fourth pin position, the attached quadrant rotates pinion number three which, in turn, rotates the full round gear attached to cylinder assembly number three and advances this assembly one pin position. The quadrant attached to assembly number three also is advanced one position.

The quadrant attached to cylinder segment number four now disengages from its pinion and is allowed to rotate through 270° (three pin positions) before it will again engage the pinion.

Bear in mind that the number three segment quadrant does not cause the number two assembly to rotate until it has rotated through 270° or three pin positions and has engaged advance pinion number two. This pinion number two as in-

dictated by numeral 35 will now rotate the full round 360° gear attached to cylinder assembly number two and will rotate this assembly through one position of 90°, advancing the attached quadrant to the next succeeding position. It is important to note that one quadrant and one full round gear attach to the same cylinder segment, except for segment four which does not attach to a 360° gear, and segment one which does not attach to a quadrant.

A feature of the invention resides in the fact that a ratchet mechanism interconnects the plug with the inner cylinder and is indicated by a plurality of teeth 40 carried on the last segment of the inner cylinder and a ratchet pawl 41 carried on the plug. This ratchet mechanism is shown more clearly in FIGS. 8 and 9 with the extreme end of the inner cylinder annularly notched to rotatably ride on an annular flange 42 carried on a pawl mounting ring 43.

Referring now in detail to FIG. 6, the lock mechanism is shown in an exploded view so that the component parts may be readily identified and correlated with the longitudinal sectional view shown in FIG. 3. The outer cylinder 22 includes a plurality of chambers 27 adapted to receive portions of tumbler pin assemblies respectively. Alternate chambers, such as is indicated by numeral 45, are intended to receive a 360° advancement gear 32. As mentioned previously, the middle cylinder 23 is segmented along its length and includes rear portion 23' which carries a quadrant gear 33. Other middle cylinder segments take the form of middle segment 23'' which includes a 360° advancement gear 32 and a quadrant gear 33 fixed on opposite sides of the segment. Each segment of the middle cylinder includes holes or apertures 46 adapted to be placed in alignment with the respective chambers 27 of the outer cylinder while the 360° advancement gear is disposed within the respective chambers 45 and the quadrant gear 33 is similarly disposed in chambers 45. The inner cylinder 24 is similarly segmented along its length which includes a segment 24' which is repeated for each of the outer cylinder chambers 27, and an end segment 24'' which is provided with teeth 40 adapted to operate with the ratchet pawl 41. All of the segments of the inner cylinder include holes or apertures 47 adapted to be selectively aligned with the apertures 46 and chambers 27. However, it is to be noted that the plug 25 is not segmented and is a continuous length with a plurality of holes 48 formed therein so as to be selectively aligned with the chambers 27 and holes 46 and 47 respectively.

In FIG. 7, it can be seen that the plug 25 includes a keyway 50 adapted to insertably receive the shank of the key 13 or 31.

With reference to FIGS. 10-13 inclusive, it can be seen that the combination of pin tumbler assemblies may be readily changed by inserting the engineer's key into the keyway of plug 25, turning the key in a clockwise direction for a quarter turn and then returning the key, plug and pawl to the original upright position and withdrawing the key from the keyway. When this procedure has been completed, the lock cannot be opened until a new guest key has been issued and inserted into the keyway. In these latter FIGURES, FIG. 10 is a view of the first (front) cylinder and pin tumbler assembly in each of the aligned cylinder and plug holes with the chamber 27 associated with a radial set of assemblies. FIG. 11 is a view of the second cylinder and tumbler assemblies and FIGS. 12 and 13 are similar views of the third and fourth (rear) cylinder and tumbler assemblies.

Typical pin lengths are given in the following tables associated with each of the FIGS. 10-13 inclusive and where all "c" pins are preferably of the spool type.

FIGURE 10

Pin 1a=0.100"	Pin 2a=0.100"
Pin 1b=0.120"	Pin 2b=0.100"
Pin 1c=0.160"	Pin 2c=0.180"
Pin 1d=0.060"	Pin 2d=0.060"
Pin 3a=0.100"	Pin 4a=0.100"
Pin 3b=0.080"	Pin 4b=0.060"

Pin 3c=0.200"
Pin 3d=0.060"

Pin 4c=0.220"
Pin 4d=0.060"

FIGURE 11

Pin 5a=0.080"	Pin 6a=0.080"
Pin 5b=0.140"	Pin 6b=0.120"
Pin 5c=0.140"	Pin 6c=0.160"
Pin 5d=0.080"	Pin 6d=0.080"
Pin 7a=0.080"	Pin 8a=0.080"
Pin 7b=0.100"	Pin 8b=0.080"
Pin 7c=0.180"	Pin 8c=0.200"
Pin 7d=0.080"	Pin 8d=0.080"

FIGURE 12

Pin 9a=0.060"	Pin 10a=0.060"
Pin 9b=0.160"	Pin 10b=0.140"
Pin 9c=0.120"	Pin 10c=0.140"
Pin 9d=0.100"	Pin 10d=0.100"
Pin 11a=0.060"	Pin 12a=0.060"
Pin 11b=0.120"	Pin 12b=0.100"
Pin 11c=0.160"	Pin 12c=0.180"
Pin 11d=0.100"	Pin 12d=0.100"

FIGURE 13

Pin 13a=0.040"	Pin 14a=0.040"
Pin 13b=0.180"	Pin 14b=0.160"
Pin 13c=0.100"	Pin 14c=0.120"
Pin 13d=0.100"	Pin 14d=0.100"
Pin 15a=0.040"	Pin 16a=0.040"
Pin 15b=0.140"	Pin 16b=0.120"
Pin 15c=0.140"	Pin 16c=0.160"
Pin 15d=0.100"	Pin 16d=0.100"

When the engineer's key 31 is inserted into the keyway of the lock, the "a" pins are displaced a distance equal to the corresponding cuts in the shank of the key. The "b" pins unlock the plug 25 from the inner cylinder and the "d" pins unlock the middle cylinder from the outer cylinder 22. The "c" pins lock inner and middle cylinders together. Pawl 41, carried on the plug 25, is made to rotate in a clockwise direction, turning the inner cylinder through one quarter revolution. The inner cylinder 24 to which the ratchet pawl head 40 is affixed and middle cylinder is thus made to rotate through one quarter revolution. Plug and pawl are now returned to their original positions and the key is removed from the lock, leaving the inner and middle cylinders in their advanced positions.

The new set of "b" pins and "c" pins, having the same overall length, but of different individual lengths, have now changed the combination so that a new guest key will have to be employed before the lock can be opened. The "a" pins and "d" pins retain their original length.

The rotational relationship of the inner and middle cylinders and the plug are clarified in FIGS. 14 and 15 which show the change of combination by using a circular slide rule pin tumbler chart 60 having independently rotatable discs 61, 62, 63, 64 and 65. Each disc may be rotated to simulate the quarter turn of the respective cylinders and plug. The number of changes is very high and may be computed for any specific application with the formula $P_r^n = n^r$ where n is the total number of pins contained in a radial pin assembly and r is the number of assemblies in use. Thus, let us say that each assembly contains two raceways with one pin in each raceway and that five assemblies are in use. Then $P_5^2 = 2^5 = 32$ combination changes available.

This particular design is ideal for use in apartment buildings. If the average tenant remains 6 months in one suite of rooms,

it will take 16 years to use up the available combination changes, after which all combinations, in their proper order, will automatically repeat themselves. In this particular design, there will be $n=10$ pins in each combination change. Therefore, the lock will use a conventional two-bitted, flat key.

A door lock that is ideal for use in offices, storefronts and home rentals would have, for example, $P_3^2=2^3=8$ combination changes, or $P_4^2=2^4=16$ combination changes. Two housing pins 51 and 52 shown in FIG. 3 will convert these from 6 to 8 pins respectively. The purpose of the housing pins is to prevent the key from being withdrawn until the plug and inner cylinder has been returned to the upright position. Hotels and motels will probably require the use of locks having one thousand or more combination changes (P_8^4 , for example).

These locks, by reason of the number of pins employed, are virtually pick-proof. Top security applications, nevertheless, may require the use of locks having as many as one-hundred-thousand combination changes (P_8^{10}), or even one million combination changes (P_8^{10}). The physical dimensions of these locks, in most cases, will be no greater than those in today's market.

Any lock in which n is greater than 2 will require the use of a barrel type key, but these acquire a feature of dependability unexcelled by existing locks. The number of bits in any case is equal to n .

A master combination can be designed into the guest lock simply by cutting the center pins, but then, if a master key is lost, stolen, duplicated or sold (selling of these keys is common) it would be necessary to disassemble every lock in the hotel, motel or other establishment in order to change the master combination. It is easier, wiser and more economical to use a service lock in which the master combination can be changed as easily and as quickly as the guest combination. As a matter of fact, this procedure is absolutely necessary for the safety and complete protection of the tenants. The service lock will be designed into the system in such a way as to bypass the guest lock.

A very good service lock, using a conventional two-bitted key is found to have $P_8^2=2^5=32$ 10-pin combinations. These are converted by the housing pins to combinations having 12 pins each. This particular lock, also, is ideal for use in apartment building and/or office buildings in which the combination will be changed only two or three times a year.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What I claim is:

1. A lock mechanism adapted to be unlocked by a guest key and changed in combination by an engineer's key comprising:
 - a housing holding an outer chamber having a central bore and a plurality of closely fitting inner and middle cylinder segments, each assembly of cylinder segments forming a plurality of radial chambers in communication with said central bore;
 - a series of middle cylinder segments rotatably mounted in said bore having a plurality of holes aligned with said radial chambers;
 - said series of inner cylinder segments rotatably mounted in coaxial alignment with said middle cylinder and having a plurality of holes aligned with said middle cylinder holes;
 - an elongated plug rotatably carried on and in coaxial relationship with said inner cylinder segments having a keyway and a plurality of holes aligned with said inner and middle cylinder holes;
 - a tumbler pin assembly resiliently carried in each of said radial chambers and extending through respective aligned inner and middle cylinder segments and plug holes extending into said plug keyway;

means connecting between said inner and middle cylinder segments and said plug for selectively aligning said holes in said cylinders and said plug with respect to each other so that a multiplicity of tumbler pin combinations can be chosen in response to insertion of the engineer's key into said plug keyway; and

said tumbler pin assemblies being operative to permit rotation of selected ones of said inner cylinder segments and said plug as a unit to effect release of the lock in response to insertion of the guest key into said plug keyway.

2. A lock mechanism adapted to be unlocked by a guest key and changed in combination by an engineer's key comprising:

- a housing holding an outer chamber having a central bore and a plurality of radial chambers in communication with said central bore;

- a middle cylinder rotatably mounted in said bore having a plurality of holes aligned with said radial chambers;

- an inner cylinder rotatably mounted in and coaxial with said middle cylinder having a plurality of holes aligned with said middle cylinder holes;

- an elongated plug rotatably carried on and in coaxial relationship with said inner cylinder having a keyway and a plurality of holes aligned with said inner cylinder holes;

- a tumbler pin assembly resiliently carried in each of said radial chambers and extending through respective aligned cylinder and plug holes into said plug keyway;

means connecting between said inner cylinder and plug for selectively aligning said holes in said cylinders and said plug with respect to each other so that a multiplicity of tumbler pin combinations can be chosen in response to insertion of the engineer's key into said plug keyway;

said outer cylinder is fixedly secured to said housing and said middle cylinder, said inner cylinder and said plug are all coaxially disposed and adapted to rotate independently of each other or selectively together as a unit as predetermined by the individual dimensional length of each of said pins in each of said assemblies;

said middle cylinder is segmented along its length to permit separate rotation of each of said segments; and gear means interconnected between said segments for selectively rotating said segments upon insertion and rotation of the engineer KEY.

3. A lock mechanism adapted to be unlocked by a guest key and changed in combination by an engineer's key comprising:

- a housing holding an outer chamber having a central bore and a plurality of radial chambers in communication with said central bore;

- a middle cylinder rotatably mounted in said bore having a plurality of holes aligned with said radial chambers;

- an inner cylinder rotatably mounted in and coaxial with said middle cylinder having a plurality of holes aligned with said middle cylinder holes;

- an elongated plug rotatably carried on and in coaxial relationship with said inner cylinder having a keyway and a plurality of holes aligned with said inner cylinder holes;

- a tumbler pin assembly resiliently carried in each of said radial chambers and extending through respective aligned cylinder and plug holes into said plug keyway;

each of said tumbler pin assemblies includes a plurality of coaxially disposed pins;

means connecting between said inner cylinder and said plug for selectively aligning said holes in said cylinders and said plug with respect to each other so that a multiplicity of tumbler pin combinations can be chosen in response to insertion of the engineer's key into said plug keyway;

said tumbler pin assemblies being operative to permit rotation of said inner cylinder and said plug as a unit to effect release of the lock in response to insertion of the guest key into said plug keyway;

said middle cylinder comprises a plurality of coaxial cylinder segments adapted to rotate about said inner cylinder independently of each other; and

means carried on said middle cylinder segments for selectively rotating said middle cylinder segments with respect to each other to effect alignment of selected ones of said tumbler pins in one of said assemblies with said tumbler pins in another one of said assemblies.

4. The invention as defined in claim 3 wherein said connecting means comprises a ratchet mechanism having a pawl pivotally carried on one end of said plug and a plurality of ratchet teeth carried on one end of said inner cylinder.

5. The invention as defined in claim 3 wherein said rotating means includes a 360° ring gear fixed on selected ones of said middle cylinder segments and a quarter gear fixed on selected ones of said middle cylinder segments; and

a rotatable shaft mounted on said housing carrying pinion gears meshed with each of said ring gears respectively, and selectively meshed with certain ones of said quarter gears.

6. The invention as defined in claim 3 wherein said pin tumbler assemblies each include a plurality of coaxially disposed pins of varying lengths but having the same combined dimensioned length; and

selected ones of said pins in each of said assemblies being adapted to be combined with adjacent assemblies upon rotation of said middle and inner cylinders to effect lock combination change.

7. The invention as defined in claim 3 including key registration means carried on said housing adapted to releasably engage with a cutout formed in said engineer's key or said

guest key.

8. The invention as defined in claim 3 wherein said outer cylinder is fixedly secured to said housing and said middle cylinder, said inner cylinder and said plug are all coaxially disposed and adapted to rotate independently of each other or selectively together as a unit as predetermined by the individual dimensional length of each of said pins in each of said assemblies.

9. The invention as defined in claim 3 wherein said middle cylinder is segmented along its length to permit separate rotation of each of said segments; and gear means interconnected between said segments for selectively rotating said segments upon insertion and rotation of the engineer's key.

10. The invention as defined in claim 2 wherein said gear means includes a ring gear and a quarter gear carried on selected ones of said middle cylinder segments; and

pinion gears rotatably carried on said housing meshed with said ring gears and selectively meshed with said quarter gears so that said ring gear carried by one segment and said quarter gear carried by another segment are engaged simultaneously.

11. The invention as defined in claim 2 wherein said inner cylinder is segmented along its length and each of its segments are adapted to rotate independently.

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