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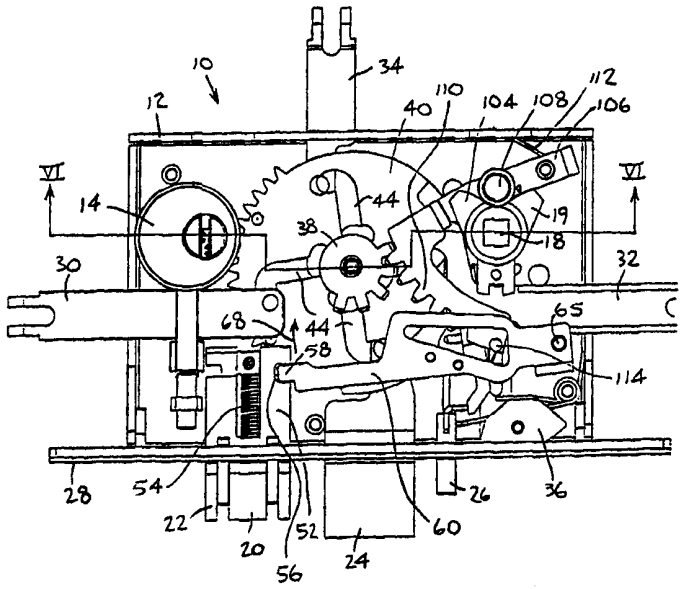

(57) Abstract

A mortise lock (10) including a mortise lock case (12) which houses a locking mechanism actuable by a key-operated lock cylinder (14), and separately by a handle (16) which engages a bolt follower (19) in operative connection with the locking mechanism, characterized in that the mortise lock (10) comprises a plurality of locking bolts (20, 22, 24, 26, 30, 32, 34) which are arranged to protrude outwards from the case (12), and wherein the handle (16) is operatively linked to the plurality of locking bolts (20, 22, 24, 26, 30, 32, 34) by a linkage wherein the plurality of locking bolts (20, 22, 24, 26, 30, 32, 34) are actuable into an unlocked position by suitable rotation of the handle (16) independently of whether or not the mortise lock (10) is locked by the key-operated cylinder.

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MORTISE LOCK

FIELD OF THE INVENTION

The present invention relates generally to mortise locks and particularly to a mortise lock with multiple bolts which may be actuated either by a key or by a door handle, and which includes a "quick-open" feature, i.e., all the bolts and latches of the mortise lock may be moved into an unlocked position by a partial turn of an inside door handle.

BACKGROUND OF THE INVENTION

Mortise locks, also known as rim locks, are well known locks set in a recess at an edge of a door and which includes latches or bolts which can be thrown into a locking engagement with recess formed in the door post.

Panic doors are well known doors which can be quickly opened in an emergency situation, no matter if the door is locked or not, generally by simply pushing an elongate, horizontal, waist-high bar from the inner side of the door (i.e., the side inside the building). This bar is mechanically linked to an override mechanism which opens all bolts or latches of the door, no matter if they were previously locked or unlocked.

It is however not known to fashion a mortise lock with multiple bolts and/or latches which may be actuated either by a key or by a door handle, and which includes a door-handle-actuated, quick-open feature, i.e., the equivalent of the panic door function.

SUMMARY OF THE INVENTION

The present invention seeks to provide a mortise lock with multiple bolts and/or latches which may be actuated either by a key or by a door handle, and which includes a door-handle-actuated quick-open feature. The lock of the present invention is particularly suitable for rooms of hotels, motels, office buildings, school buildings, dormitories, classrooms, public restrooms, and the like.

There is thus provided in accordance with a preferred embodiment of the present invention a mortise lock including a mortise lock case which houses a locking mechanism actuable by a key-operated lock cylinder, and actuable by a handle which engages a bolt follower in operative connection with the locking mechanism, and a plurality of locking bolts arranged for protruding outwards of the case and wherein the handle is operatively linked to the plurality of locking bolts by a linkage wherein the plurality of locking bolts are actuable into an unlocked position by suitable rotation of the handle independently of whether or not the mortise lock is locked by the key-operated lock cylinder.

In accordance with a preferred embodiment of the present invention the handle is selectively decouplable from at least one of the plurality of locking bolts, wherein when the handle is not coupled to the at least one of the plurality of locking bolts, the at least one of the plurality of locking bolts is actuable into the unlocked position only by operation of the key-operated lock cylinder.

Further in accordance with a preferred embodiment of the present invention the handle is selectively decouplable from at least one of the plurality of locking bolts without disassembling the case.

Still further in accordance with a preferred embodiment of the present invention the plurality of locking bolts are selectably couplable to and decouplable from the locking mechanism without disassembling the case.

Additionally in accordance with a preferred embodiment of the present invention the locking bolts are modularly installable in the case without disassembling the case.

In accordance with a preferred embodiment of the present invention the plurality of locking bolts includes a latch bolt, a bolt and a dead bolt latch which are configured to protrude from a faceplate of the case, at least one first locking bolt arranged to move generally vertically, and at least one second locking bolt arranged to move generally horizontally.

Further in accordance with a preferred embodiment of the present invention the lock includes a toggle which is mechanically linked to the bolt follower, wherein suitable rotation of the toggle selectively couples or decouples the bolt follower from the locking mechanism.

In accordance with a preferred embodiment of the present invention a pair of lock cylinders are mounted on opposite sides of the mortise lock, each lock cylinder including a pin tumbler rotatably mounted in a bore formed in the lock cylinder, a gear clutch slidingly mounted in the bore of each lock cylinder, and a pair of link-hubs rotatably mounted in the lock case and operatively connected to the locking mechanism, each gear clutch being adapted to mate with a corresponding one of the link-hubs, wherein the pin tumblers and the gear clutches are arranged such that a key can be inserted into one of the pin tumblers and push its corresponding gear clutch to protrude from the lock cylinder and mate with a corresponding one of the link-hubs, while at the same time, another key can be inserted into the other pin tumbler and push its corresponding gear clutch to protrude from that lock cylinder and mate

with the other link-hub, such that rotation of either of the gear clutches causes operation of the locking mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified pictorial illustration of a mortise lock constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 2 and 3 are simplified pictorial and plan view illustrations, respectively, of the inner locking mechanisms of the mortise lock of Fig. 1, the case of the lock being illustrated with its cover removed;

Fig. 4 is a simplified plan view illustration of the mortise lock of Fig. 1, in an unlocked orientation after having partially turned the inner door handle so as to implement the quick-open feature of the mortise lock;

Fig. 5 is a simplified, enlarged pictorial illustration of a portion of the mortise lock of Fig. 1;

Fig. 6 is a simplified sectional illustration of a linking mechanism which selectively actuates the quick-open feature of the mortise lock of Fig. 1 in accordance with a preferred embodiment of the present invention, taken along lines VI-VI in Fig. 3;

Fig. 7 is a simplified exploded illustration of a pair of lock cylinders mounted on opposite sides of the mortise lock of Fig. 1 with a clutch mechanism linking therebetween, constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 8A and 8B are simplified pictorial illustrations of one of the lock cylinders of Fig. 7, respectively before and after inserting a key into a keyway thereof;

Fig. 9 is a simplified front view of the lock cylinders of Fig. 7;

Fig. 10 is a simplified sectional illustration of the lock cylinders of Fig. 7, taken along lines X-X in Fig. 9;

Fig. 11 is a simplified side view of the lock cylinders of Fig. 7; and

Figs. 12, 13 and 14 are simplified front-view, sectional and perspective illustrations, respectively, of a link-hub and spur gear used with the lock cylinders of Fig. 7.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is now made to Fig. 1 which illustrates a mortise lock 10 constructed and operative in accordance with a preferred embodiment of the present invention.

Mortise lock 10 preferably includes a case 12 which houses a locking mechanism actuable by a key-operated lock cylinder 14, or by a handle 16 which engages a generally square spindle hole 18 of a bolt follower 19 (seen in Figs. 2 and 3). The details of the locking mechanism and operation thereof by lock cylinder 14 and handle 16 are described herein below. Mortise lock 10 is preferably a multiple bolt lock, i.e., it comprises a plurality of locking bolts and/or latches. Although any number of locking bolts or latches may be employed in the present invention, in the illustrated embodiment mortise lock 10 includes a latch bolt 20 having an auxiliary latch 22, a rectangular bolt 24, and a dead bolt latch 26 which are configured to protrude from a faceplate 28. In addition, the illustrated embodiment includes two locking bolts 30 and 32 arranged to move vertically in the sense of an upright door, and a locking bolt 34 arranged to move horizontally in the sense of an upright door. Locking bolts 20, 24, 30, 32 and 34 can engage a variety of locking hardware installed in a door and which are used to lock the door, such hardware being very well known in the art, so no further description is necessary for the skilled artisan.

Mortise lock 10 is preferably provided with two handles 16 one on each side of a door (not shown). As is well known in the art, the handle on the inner side of the door (i.e., the side inside a building) is typically movable to actuate the locking mechanism of the door, whereas the handle on the outer side of the door (i.e., the side outside the building) may be movable or non-movable, depending on the particular application. In the present invention, the outside handle is selectively movable or non-movable, the selection being accomplished by means of a toggle 36 which is mechanically linked to bolt follower 19. Toggle 36 acts like a clutch: by suitable rotation of toggle 36, bolt follower 19 is either coupled or decoupled from the locking mechanism, as is further described hereinbelow with reference to Fig. 5.

Reference is now made to Figs. 2, 3 and 4 which illustrate the locking mechanism of mortise lock 10. The locking mechanism preferably includes a gear wheel 38 selectively linked, as is described hereinbelow, with a toothed bolt-throw wheel 40. Gear wheel 38 is preferably generally coaxial with bolt-throw wheel 40. Bolt-throw wheel 40 meshes with a spur gear 42 (Figs. 2 and 4) which is rotated by suitable rotation of lock cylinder 14. (Lock cylinder 14 is omitted for clarity in Figs. 2 and 4 to expose spur gear 42.) For each locking bolt 24, 30, 32 and 34, bolt-throw wheel 40 has a radial groove 44 formed therein which receives therein a pin 46 attached to a corresponding one of locking bolts 24, 30, 32 and 34. Upon rotation of pinion gear 42 in the direction of an arrow 48 (Fig. 4), bolt-throw wheel 40 is caused to rotate in the direction of an arrow 50, thereby causing pins 46 to move radially

inwards in grooves 44 and bringing locking bolts 24, 30, 32 and 34 into an unlocked position shown in Fig. 4. Thus, locking bolts 24, 30, 32 and 34 are all actuable by the key-operated lock cylinder 14.

It is a particular feature of the present invention that locking bolts 24, 30, 32 and 34 are operatively engaged with the remainder of the locking mechanism of mortise lock 10 in a modular manner, i.e., the locking bolts are modularly installable in case 12 without disassembling case 12. Any number of the locking bolts may be installed in lock 10 and other locking bolts omitted, if desired. Moreover, locking bolts 24, 30, 32 and 34 may be selectably coupled to or decoupled from the remainder of the locking mechanism without disassembling case 12. These features are achieved by simply removing pins 46 which attach the locking bolts to bolt-throw wheel 40, pins 46 being accessible via access holes either on the front or rear face of case 12. In addition, after removal of a particular pin 46, any of the locking bolts can be reinstalled in case 12 at a different orientation. For example, the positions of the locking bolts can be interchanged, or the locking bolts can be inverted to face a different side of case 12.

The actuation of latch bolt 20 and auxiliary latch 22 by means of lock cylinder 14 is now described. Latch bolt 20 and auxiliary latch 22 are preferably attached to a support member 52 spring-loaded by means of a spring 54 (Fig. 3). Support member 52 has a notch 56 formed therein which engages a tongue 58 of a latch lever 60. A pair of pins 62 and 64 are fixedly attached to latch lever 60. Pin 62 plays a role in actuation of latch bolt 20 and auxiliary latch 22 as is described in the following paragraph. The significance of pin 64 is in the operation of dead bolt latch 26 as is described further hereinbelow. Latch lever 60 is pivoted about a pivot 65.

Reference is now additionally made to Fig. 5. Bolt-throw wheel 40 has a hooked recess 66 formed therein, configured to "snare", i.e., engage pin 62. Rotation of spur gear 42 in the direction of arrow 48 causes bolt-throw wheel 40 to rotate in the direction of arrow 50, thereby causing hooked recess 66 to engage pin 62. Hooked recess 66 abutting against and moving pin 62 causes latch lever 60 to swing generally in the direction of an arrow 68 (Fig. 3) about pivot 65, thereby moving support member 52 also generally in the direction of arrow 68. Since notch 56 of support member 52 engages tongue 58 of latch lever 60, the movement of support member 52 brings latch bolt 20 and auxiliary latch 22 inside case 12 into an unlocked position shown in Fig. 4. Thus, latch bolt 20 and auxiliary latch 22 are actuable by the key-operated lock cylinder 14.

The operation of dead bolt latch 26 is now described with particular reference to Fig. 5. Dead bolt latch 26 preferably includes a tongue 70, which in the position illustrated in Fig. 5 abuts against an arresting lever 72 at a face 74 thereof. Dead bolt latch 26 is preferably biased by a biasing device such as a flat spring 75. Arresting lever 72 is pivoted about a pivot 76, and includes a stopping face 78. When tongue 70 abuts against face 74 of arresting lever 72, arresting lever 72 is pivoted such that pin 64 does not abut against stopping face 78, as shown in Fig. 5. In this position, face 74 of arresting lever 72 is biased against tongue 70 by a biasing device such as a spring 80.

When dead bolt latch 26 is moved inwards in the direction of an arrow 82 (the position shown in Fig. 4), spring tongue 70 slips off face 74 and spring 80 urges arresting lever 70 to pivot in the direction of an arrow 84, whereupon stopping face 78 swings to a position Q (shown in phantom lines in Fig. 5) abutting a flat face of pin 64. In this position, since pin 64 cannot move past stopping face 78 of arresting lever 72, pin 62 cannot be moved by hooked recess 66 of bolt-throw wheel 40. Therefore, latch lever 60 cannot move in the direction of arrow 68 (Fig. 3), and latch bolt 20 and auxiliary latch 22 cannot be externally pushed into the unlocked position shown in Fig. 4, thus achieving the dead bolt function.

The dead bolt function can be negated by turning spur gear 42 with key-operated lock cylinder 14 as is now described. Arresting lever 72 is preferably provided with a pin 73 which extends towards bolt-throw wheel 40. Bolt-throw wheel 40 is formed with a cam surface 71 which extends radially outwards slightly from the general perimeter of wheel 40. Upon rotation of spur gear 42 with key-operated lock cylinder 14, bolt-throw wheel 40 turns in the direction of arrow 50. Bolt-throw wheel 40 is configured such that *before* hooked recess 66 abuts against pin 62, cam surface 71 pushes against pin 73, thereby causing arresting lever to pivot about pivot 76, in the direction of an arrow 63, out of the position Q so as to release pin 64 and latch lever 60. This negates the dead bolt function. Now hooked recess 66 can engage pin 62 and move latch lever 60 to bring latch bolt 20 and auxiliary latch 22 into the unlocked position shown in Fig. 4.

It should be emphasized that key-operated lock cylinder 14 may be installed on only one side of the door or alternatively can comprise a double cylinder which is installed on both sides of the door. The dead bolt function can be negated by operational rotation of one or both key-operated lock cylinders 14. The dead bolt function can also be negated by turning handle 16 as is described further hereinbelow. As is described below, the ability of the handle 16 to negate the dead bolt function is selective, i.e., the user can select whether the handle 16

can negate or not negate the dead bolt function. In the illustrated embodiment, the option of selectively negating the dead bolt function with handle 16 is provided on only one side of the door, but it is appreciated that the option can be provided for both sides of the door. However, the handles on both sides of the door can always bring latch bolt 20 and auxiliary latch 22 into the unlocked position shown in Fig. 4.

Fig. 5 also illustrates the mechanism associated with toggle 36. In the position illustrated in Fig. 5, a face 86 of toggle 36 is biased against a detent 88, and toggle 36 is pivoted about a pivot 90. Upon rotation of toggle 36 about pivot 90 in the direction of an arrow 92, another face 94 is brought against detent 88, thereby urging detent 88 generally in the direction of an arrow 96 against a toggle follower 98. Toggle follower 98 thereby moves in the direction of arrow 96, causing a dog 100 of toggle follower 98 to engage a correspondingly formed notch 102 formed in bolt follower 19. Once dog 100 fixedly mates with notch 102, bolt follower 19 cannot be rotated. In such a locked position, handle 16 cannot be rotated in order to perform any action related to the locking mechanism of lock 10. Such an orientation is generally used for the outside handle of the door. Conversely, when handle 16 is decoupled from bolt follower 19, i.e., when dog 100 is brought out of engagement with notch 102 (the position illustrated in Fig. 5), handle 16 can be rotated to operate the locking mechanism of lock 10.

The actuation of latch bolt 20 and auxiliary latch 22 by means of handle 16 is now described. Bolt follower 19 includes a cam 104 which is arranged to push against a latch follower 106. Latch follower 106 is pivoted about a pivot 108 and includes a toothed arm 110 which meshes with gear wheel 38. Latch follower 106 is preferably biased against an inner surface of case 12 by means of a biasing device such as a spring 112. As can be seen in Figs. 2, 3 and 5, a pin 114 is fixed to an extreme end of toothed arm 110. In the position illustrated in Fig. 5, pin 114 abuts against a surface of an inner cutout 116 formed in latch lever 60.

Upon rotation of handle 16 in the direction of an arrow 118 (Fig. 4), cam 104 pushes latch follower 106 generally in the direction of an arrow 120. This causes pin 114 to pivot latch lever 60 generally in the direction of arrow 68 (Fig. 3) about pivot 65, thereby moving support member 52 also generally in the direction of arrow 68. As mentioned previously, since notch 56 of support member 52 engages tongue 58 of latch lever 60, the movement of support member 52 brings latch bolt 20 and auxiliary latch 22 into the unlocked position shown in Fig. 4. Thus, latch bolt 20 and auxiliary latch 22 are actuable by handle 16.

In addition to Fig. 5, reference is now made to Fig. 6. Gear wheel 38 is selectively linked with bolt-throw wheel 40 preferably by means of a pin 122. Pin 122 radially protrudes outwards from a threaded fastener, such as a set screw 124. Set screw 124 is threaded into a hub 125 about which bolt-throw wheel 40 is firmly mounted. Gear wheel 38 has an arcuate groove 126 formed therein. Fig. 6 illustrates pin 122 in groove 126. By suitable turning of set screw 124, pin 122 can be moved (downwards in the sense of Fig. 6) out of arcuate groove 126. When pin 122 is seated in groove 126, rotation of handle 16 in the direction of arrow 118 causes cam 104 to push latch follower 106 generally in the direction of arrow 120, which in turn causes gear wheel 38 *and* bolt-throw wheel 40 to rotate in the direction of arrow 50. Bolt-throw wheel 40 turns together with gear wheel 38 because pin 122 abuts against groove 126, thereby coupling bolt-throw wheel 40 to gear wheel 38. As mentioned above, the rotation of bolt-throw wheel 40 in the direction of arrow 50, causes pins 46 to move radially inwards in grooves 44 and bringing locking bolts 24, 30, 32 and 34 into the unlocked position shown in Fig. 4. Thus, when pin 122 is seated in groove 126, rotation of handle 16 in the direction of arrow 118 performs a quick-open function: locking bolts 24, 30, 32 and 34, as well as latch bolt 20 and auxiliary latch 22, are all actuable by partial rotation (typically, but not necessarily, about 30°) handle 16, regardless of being previously locked or not.

When pin 122 is not seated in groove 126, bolt-throw wheel 40 is decoupled from gear wheel 38. In this case, rotation of handle 16 in the direction of arrow 118 does not actuate locking bolts 24, 30, 32 and 34, but rather only actuates latch bolt 20 and auxiliary latch 22.

Rotation of handle 16, when the quick-open feature is selected, also negates the dead bolt function of dead bolt latch 26 and arresting lever 72 as is now described. Arresting lever 72 is preferably provided with a tongue 77, which in the position illustrated in Fig. 5, contacts bolt follower 19. Rotation of bolt follower in the direction of arrow 118 (Fig. 4), pushes tongue 77 and causes arresting lever 72 to pivot about pivot 76 in the direction of arrow 63 and out of the position Q so as to release pin 64 and latch lever 60. This negates the dead bolt function. Only *after* release of the dead bolt function, does continued rotation of bolt follower 19 by handle 16 bring pin 114 against inner cutout 116 so as to pivot latch lever 60 generally in the direction of arrow 68 (Fig. 3) about pivot 65, thereby moving support member 52 also generally in the direction of arrow 68, thereby bringing latch bolt 20 and auxiliary latch 22 into the unlocked position shown in Fig. 4.

As mentioned hereinabove, key-operated lock cylinder 14 may be installed on only one side of the door or alternatively can comprise a double cylinder which is installed on both sides of the door. As a further alternative, lock cylinders may be installed on both sides of the door which enable operating lock 10 by inserting a key into one of the lock cylinders, located on one side of the door, and turning the key to actuate latch bolt 20 and auxiliary latch 22, *even if another key is inserted and turned in the lock cylinder on the other side of the door*. This feature, described hereinbelow with reference to Figs. 7-14, may be particularly useful for locks installed in public places, such as hotels, wherein it may be desired to enter a room even if the occupant of the room has inserted a key in the inner-side lock and has even turned the key.

Reference is now made to Figs. 7-14 which illustrate a pair of lock cylinders 200 mounted on opposite sides of mortise lock 10 (illustrated in a simplistic form for the sake of clarity, although it is understood to be the same lock of Fig. 1), constructed and operative in accordance with a preferred embodiment of the present invention. Each lock cylinder 200 preferably includes a pin tumbler 202 rotatably mounted in a bore 204. A gear clutch 206 is slidingly mounted in bore 204 between an end of pin tumbler 202 and a cover 208 secured to an end of lock cylinder 200. A pair of springs 210 are preferably mounted between an end of gear clutch 206 and cover 208, and normally urge gear clutch 206 towards the key insertion end of pin tumbler 202. As seen in Fig. 8B, pin tumbler 202 and gear clutch 206 are arranged such that a key 212 can be inserted into pin tumbler 202 and push gear clutch 206 against springs 210, thereby sufficiently pushing gear clutch 206 to protrude from lock cylinder 200.

Gear clutch 206, when protruding from lock cylinder 200, can mate with a correspondingly formed aperture 214 of a link-hub 216. Link-hub 216 is attached to spur gear 42 (as seen best in Figs. 12-14) described hereinabove. When gear clutch 206 is mated with link-hub 216, turning of gear clutch 206, by suitable turning of key 212 inserted in pin tumbler 202, turns spur gear 42 to operate lock 10 as described hereinabove. As seen in Fig. 12, the aperture 214 on one side of spur gear 42 is the mirror image of the aperture 214 on the opposite side of spur gear 42.

Both link-hubs 216 are rotatably mounted in lock case 12, as seen in Fig. 10 (one link-hub 216 being visible on the left side of lock 10 in Fig. 7). As seen in Figs. 10 and 13, a spring 218 is preferably mounted between the two link-hubs 216 which normally distances the two link-hubs 216 from each other. Both link-hubs 216 are preferably mounted on a common shaft 217 (Fig. 13).

The operation of lock cylinders 200 is now described. Key 212 may be inserted into one of the lock cylinders 200, thereby pushing gear clutch 206 to protrude from that lock cylinder 200, as can be seen in Fig. 8B. In this position, as seen in the lower lock cylinder 200 of Fig. 10 (key 212 being omitted for clarity in Fig. 10), gear clutch 206 enters and mates with its corresponding link-hub 216. Key 212 can be turned to rotate link-hub 216 and spur gear 42 and operate lock 10. The other link-hub 216 (the upper one in Fig. 10) is urged against the gear clutch 206 of the opposite lock cylinder 200 (the upper one in Fig. 10) by spring 218. Since, as mentioned above, the apertures 214 are mirror images of each other, upper link-hub 216 does not mate with gear clutch 206.

Even with the first key 212 inserted and turned in the lower lock cylinder 200, a second key 212 can be inserted in the opposite lock cylinder 200 (the upper one in Fig. 10). As mentioned above, at this point, aperture 214 of the upper link-hub 216 is not aligned for mating with the upper gear clutch 206. However, key 212 can be turned to rotate pin tumbler 202 of the upper lock cylinder 200 so as to align upper gear clutch 206 with aperture 214 of the upper link-hub 216, at which point spring 218 urges upper link-hub 216 upwards in the sense of Fig. 10, so that aperture 214 mates with upper gear clutch 206. Once the upper link-hub 216 is mated with the upper gear clutch 206, the second key can now turn both link-hubs 216 and thus rotate spur gear 42 and operate lock 10, despite the presence of the first key in the upper lock cylinder 200.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

CLAIMS

What is claimed is:

1. A mortise lock (10) comprising:

a mortise lock case (12) which houses a locking mechanism actuable by a key-operated lock cylinder (14), and separately by a handle (16) which engages a bolt follower (19) in operative connection with said locking mechanism;

characterized in that

said mortise lock (10) comprises a plurality of locking bolts (20,22, 24, 26, 30, 32, 34) which are arranged to protrude outwards from said case (12), and wherein said handle (16) is operatively linked to said plurality of locking bolts (20,22, 24, 26, 30, 32, 34) by a linkage wherein said plurality of locking bolts (20,22, 24, 26, 30, 32, 34) are actuable into an unlocked position by suitable rotation of said handle (16) independently of whether or not the mortise lock (10) is locked by said key-operated lock cylinder (14).

2. The mortise lock (10) according to claim 1 further characterized in that said handle (16) is selectively decouplable from at least one of said plurality of locking bolts (20,22, 24, 26, 30, 32, 34), wherein when said handle (16) is not coupled to said at least one of said plurality of locking bolts (20,22, 24, 26, 30, 32, 34), said at least one of said plurality of locking bolts (20,22, 24, 26, 30, 32, 34) is actuable into said unlocked position only by operation of said key-operated lock cylinder (14).

3. The mortise lock (10) according to claim 1 further characterized in that said handle (16) is selectively decouplable from at least one of said plurality of locking bolts (20,22, 24, 26, 30, 32, 34) without disassembling said case (12).

4. The mortise lock (10) according to claim 1 further characterized in that said plurality of locking bolts (20,22, 24, 26, 30, 32, 34) are selectably couplable to and decouplable from the locking mechanism without disassembling said case (12).

5. The mortise lock (10) according to claim 1 further characterized in that said locking bolts (20,22, 24, 26, 30, 32, 34) are modularly installable in said case (12) without disassembling said case (12).

6. The mortise lock (10) according to claim 1 further characterized in that said plurality of locking bolts (20,22, 24, 26, 30, 32, 34) comprises a latch bolt (20, 22), a bolt (24) and a dead bolt latch (26) which are configured to protrude from a faceplate (28) of said case (12), at least one first locking bolt (30, 32) arranged to move generally vertically, and at least one second locking bolt (34) arranged to move generally horizontally.

7. The mortise lock (10) according to claim 1 further characterized in that said lock (10) comprises a toggle (36) which is mechanically linked to said bolt follower (19), wherein suitable rotation of said toggle (36) selectively couples or decouples said bolt follower (19) from the locking mechanism.

8. The mortise lock (10) according to claim 6 further characterized in that:

said locking mechanism comprises a bolt-throw wheel (40) mechanically linked to said bolt (24), said dead bolt latch (26), said at least one locking bolt (30, 32) and said other locking bolt (34), wherein suitable rotation of said bolt-throw wheel (40) brings said bolt (24), said dead bolt latch (26), said at least one locking bolt (30, 32) and said other locking bolt (34) into an unlocked position;

wherein said suitable rotation of said bolt-throw wheel (40) is imparted by suitable operational rotation of said lock cylinder (14) which meshes with said bolt-throw wheel (40) via a spur gear (42);

and wherein said bolt follower (19) is arranged to push against a latch follower (106) which meshes with a gear wheel (38), said gear wheel (38) being selectively linked with said bolt-throw wheel (40), such that when said gear wheel (38) is linked with said bolt-throw wheel (40), partial rotation of said handle (16), independent of said suitable operational rotation of said lock cylinder (14), imparts said suitable rotation of said bolt-throw wheel (40) via said bolt follower (19), said latch follower (106) and said toothed arm (110), so as to bring said bolt (24), said dead bolt latch (26), said at least one first and second locking bolts (30, 32, 34) into said unlocked position.

9. The mortise lock (10) according to claim 6 further characterized in that:

said locking mechanism comprises a bolt-throw wheel (40) mechanically linked to said bolt (24), said dead bolt latch (26), said at least one locking bolt (30, 32) and said other locking bolt (34), wherein suitable rotation of said bolt-throw wheel (40) brings said bolt (24), said dead bolt latch (26), said at least one locking bolt (30, 32) and said other locking bolt (34) into an unlocked position;

wherein said suitable rotation of said bolt-throw wheel (40) is imparted by suitable operational rotation of said lock cylinder (14) which meshes with said bolt-throw wheel (40) via a spur gear (42);

and wherein said bolt follower (19) comprises a cam (104) which is arranged to push against a latch follower (106) which comprises a toothed arm (110) which meshes with a gear wheel (38), said gear wheel (38) being selectively linked with said bolt-throw wheel (40),

such that when said gear wheel (38) is linked with said bolt-throw wheel (40), partial rotation of said handle (16), independent of said suitable operational rotation of said lock cylinder (14), imparts said suitable rotation of said bolt-throw wheel (40) via said bolt follower (19), said latch follower (106) and said toothed arm (110), so as to bring said bolt (24), said dead bolt latch (26), said at least one first and second locking bolts (30, 32, 34) into said unlocked position.

10. The mortise lock (10) according to claim 9 further characterized in that:

said bolt-throw wheel (40) has a radial groove (44) formed therein which receives therein a pin (46) attached to a corresponding one of said locking bolts (24, 30, 32, 34), wherein said suitable rotation of said bolt-throw wheel (40) causes said pins (46) to move radially inwards in said grooves (44) so as to bring said bolt (24), said dead bolt latch (26), said at least one locking bolt (30, 32) and said other locking bolt (34) into an unlocked position.

11. The mortise lock (10) according to claim 8 further characterized in that said gear wheel (38) is generally coaxial with said bolt-throw wheel (40).

12. The mortise lock (10) according to claim 1 further characterized in that:

said latch bolt (20, 22) is attached to a support member (52) which engages a latch lever (60), and wherein a first pin (62) is fixedly attached to said latch lever (60),

and wherein said bolt-throw wheel (40) has a hooked recess (66) formed therein configured to engage said first pin (62), wherein suitable operational rotation of said lock cylinder (14) causes said bolt-throw wheel (40) to rotate, thereby causing said hooked recess (66) to engage said first pin (62), thereby causing said latch lever (60) to move, and thereby causing said support member (52) to move and bring said latch bolt (20, 22) into an unlocked position;

and wherein said bolt follower (19) comprises a cam (104) which is arranged to push against a latch follower (106) which comprises a toothed arm (110), a pin (114) being fixed to said toothed arm (110),

wherein suitable rotation of said handle (16) causes said cam (104) to push said latch follower (106), thereby causing said pin (114) to move said latch lever (60), and thereby causing said support member (52) to move and bring said latch bolt (20, 22) into said unlocked position.

13. The mortise lock (10) according to claim 9 further characterized in that:

said gear wheel (38) has an arcuate groove (126) formed therein,

and a pin (122) radially protrudes outwards from a threaded fastener (124) which is threaded into a hub (125) about which said bolt-throw wheel (40) is firmly mounted, wherein by suitable turning of said fastener (124), said pin (122) can be moved in or out of said arcuate groove (126);

wherein when said pin (122) is positioned in said groove (126), rotation of said handle (16) causes rotation of both said gear wheel (38) and said bolt-throw wheel (40) together, and when said pin (122) is not positioned in said groove (126), said bolt-throw wheel (40) is decoupled from said gear wheel (38).

14. The mortise lock (10) according to claim 1 further characterized in that:

said latch bolt (20, 22) is attached to a support member (52) which engages a latch lever (60), and wherein a first pin (62) and a second pin (64) are fixedly attached to said latch lever (60),

and wherein said bolt-throw wheel (40) has a hooked recess (66) formed therein configured to engage said first pin (62), wherein suitable operational rotation of said lock cylinder (14) causes said bolt-throw wheel (40) to rotate, thereby causing said hooked recess (66) to engage said first pin (62), thereby causing said latch lever (60) to move, and thereby causing said support member (52) to move and bring said latch bolt (20, 22) into an unlocked position;

and wherein said dead bolt latch (26) comprises a tongue (70) arranged to abut against an arresting lever (72), said arresting lever (72) being pivoted about a pivot (76) and comprising a stopping face (78), wherein when said tongue (70) abuts against said arresting lever (72), said arresting lever (72) is pivoted such that said second pin (64) does not abut against said stopping face (78),

and wherein when said tongue (70) does not abut against said arresting lever (72), said arresting lever (72) is pivoted such that said second pin (64) abuts against said stopping face (78), thereby arresting movement of said latch lever (60).

15. The mortise lock (10) according to claim 14 further characterized in that:

said bolt-throw wheel (40) is formed with a cam surface (71) which extends radially outwards from a perimeter of said bolt-throw wheel (40), and said arresting lever (72) is provided with a third pin (73) which extends towards said bolt-throw wheel (40), said bolt-throw wheel (40) being configured such that before said hooked recess (66) abuts against said first pin (62), said cam surface (71) pushes against said third pin (73),

wherein suitable operational rotation of said key-operated lock cylinder (14) causes said bolt-throw wheel (40) to rotate and, before said hooked recess (66) abuts against said first pin (62), said cam surface (71) pushes against said third pin (73), thereby causing said arresting lever (72) to pivot about said pivot (76) so as to release said second pin (64) and said latch lever (60), and permit movement of said latch lever (60) to bring said latch bolt (20, 22) into the unlocked position.

16. The mortise lock (10) according to claim 14 further characterized in that:

said arresting lever (72) comprises a tongue (77), wherein suitable rotation of said bolt follower (19) pushes said tongue (77) and causes said arresting lever (72) to pivot about said pivot (76) so as to release said second pin (64) and said latch lever (60), and permit movement of said latch lever (60) to bring said latch bolt (20, 22) into the unlocked position.

17. The mortise lock (10) according to claim 1 further characterized by:

a pair of lock cylinders (200) mounted on opposite sides of said mortise lock (10), each lock cylinder (200) including a pin tumbler (202) rotatably mounted in a bore (204) formed in said lock cylinder (200);

a gear clutch (206) slidingly mounted in said bore (204) of each lock cylinder (200); and

a pair of link-hubs (216) rotatably mounted in said lock case (12) and operatively connected to said locking mechanism, each gear clutch (206) being adapted to mate with a corresponding one of said link-hubs (216);

wherein said pin tumblers (202) and said gear clutches (206) are arranged such that a key (212) can be inserted into one of said pin tumblers (202) and push its corresponding gear clutch (206) to protrude from said lock cylinder (200) and mate with a corresponding one of said link-hubs (216), while at the same time, another key (212) can be inserted into the other pin tumbler (202) and push its corresponding gear clutch (206) to protrude from that lock cylinder (200) and mate with the other link-hub (216), such that rotation of either of the gear clutches (206) causes operation of said locking mechanism.

18. A mortise lock (10) comprising:

a mortise lock case (12); and

a locking mechanism housed in said lock case (12) actuable by a key-operated lock cylinder (200); characterized by

a pair of lock cylinders (200) mounted on opposite sides of said mortise lock (10), each lock cylinder (200) including a pin tumbler (202) rotatably mounted in a bore (204) formed in said lock cylinder (200);

a gear clutch (206) slidingly mounted in said bore (204) of each lock cylinder (200); and

a pair of link-hubs (216) rotatably mounted in said lock case (12) and operatively connected to said locking mechanism, each gear clutch (206) being adapted to mate with a corresponding one of said link-hubs (216);

wherein said pin tumblers (202) and said gear clutches (206) are arranged such that a key (212) can be inserted into one of said pin tumblers (202) and push its corresponding gear clutch (206) to protrude from said lock cylinder (200) and mate with a corresponding one of said link-hubs (216), while at the same time, another key (212) can be inserted into the other pin tumbler (202) and push its corresponding gear clutch (206) to protrude from that lock cylinder (200) and mate with the other link-hub (216), such that rotation of either of the gear clutches (206) causes operation of said locking mechanism.

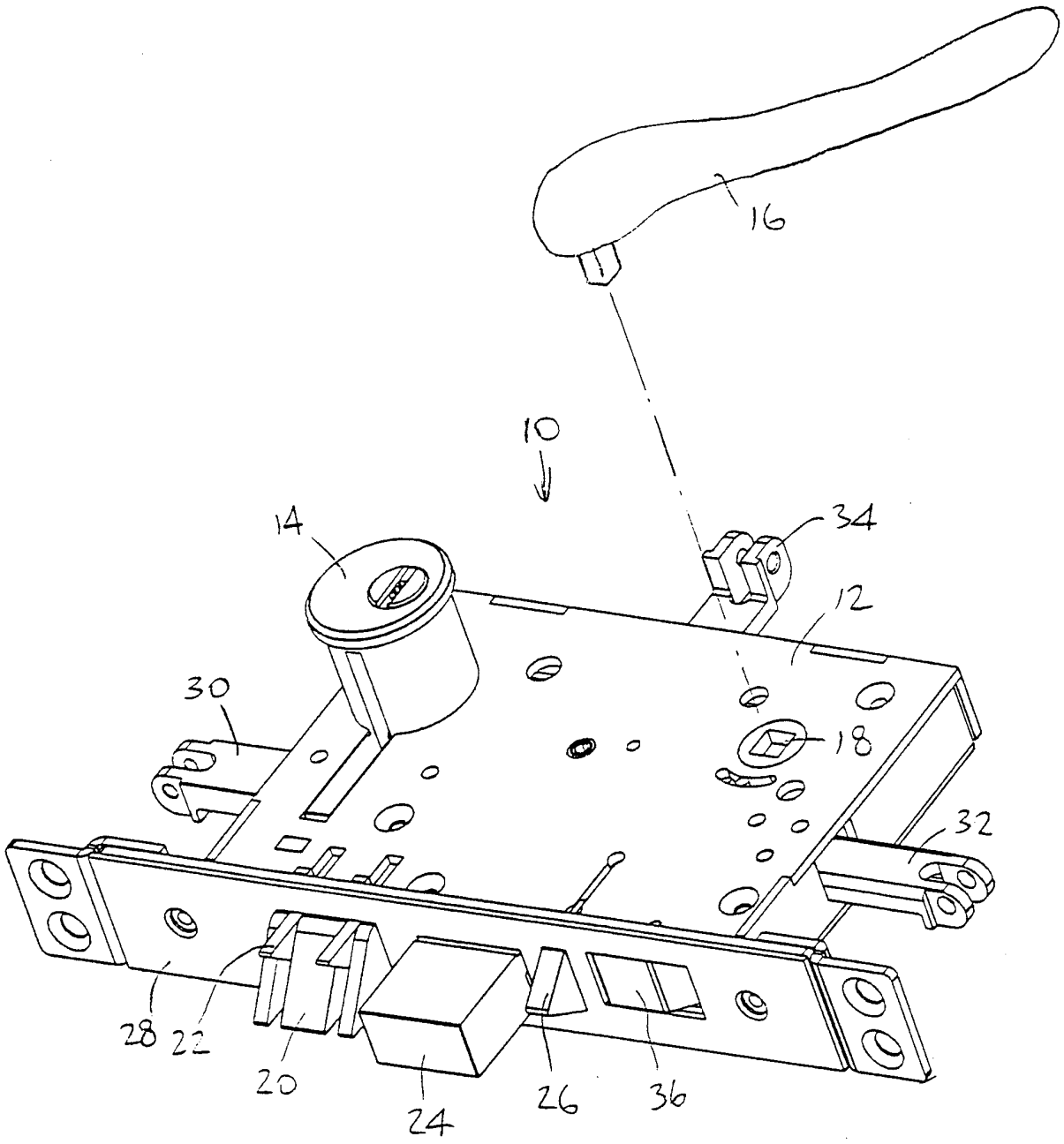
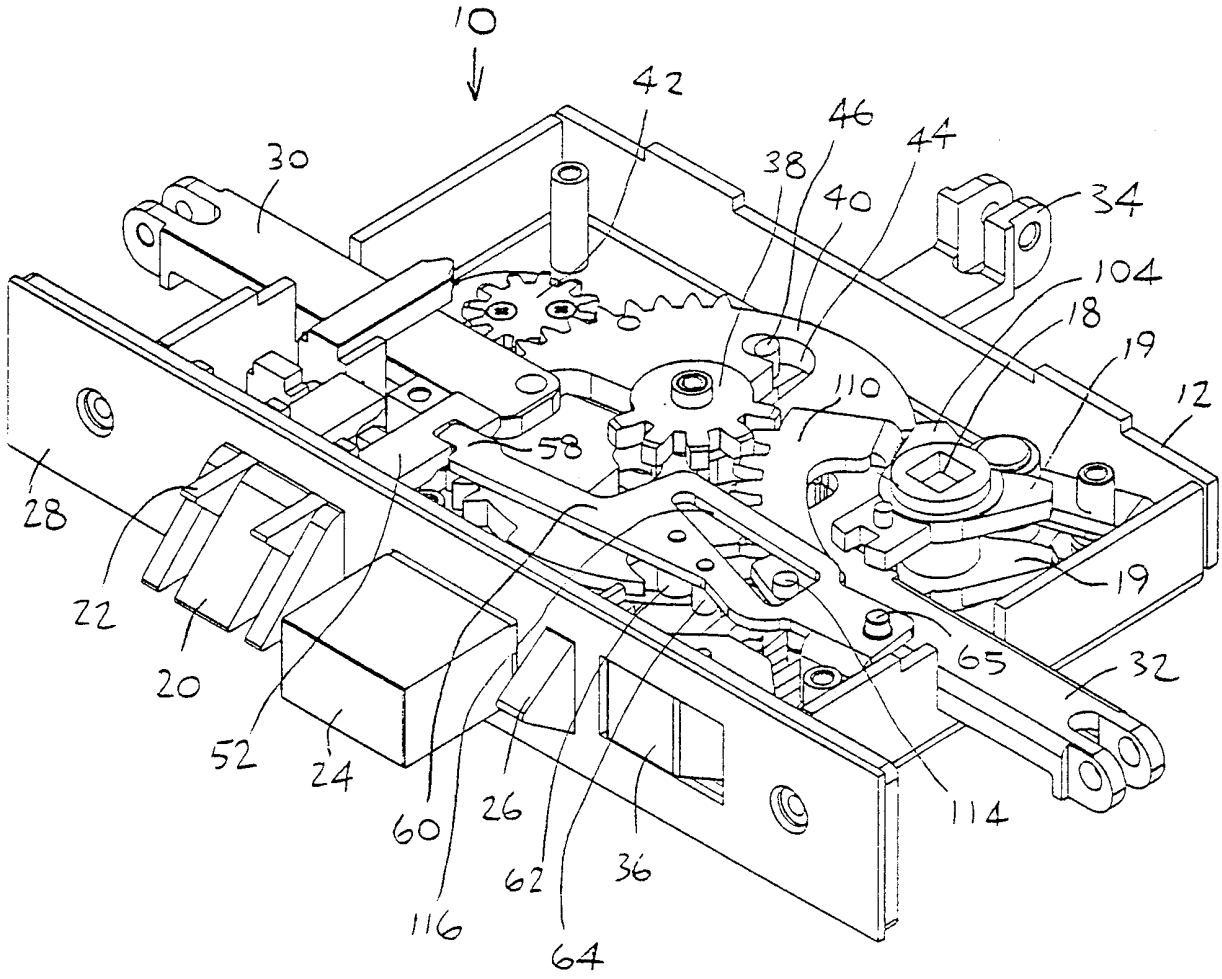


FIG. 1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42
46
44
38
40
34
30
104
18
19
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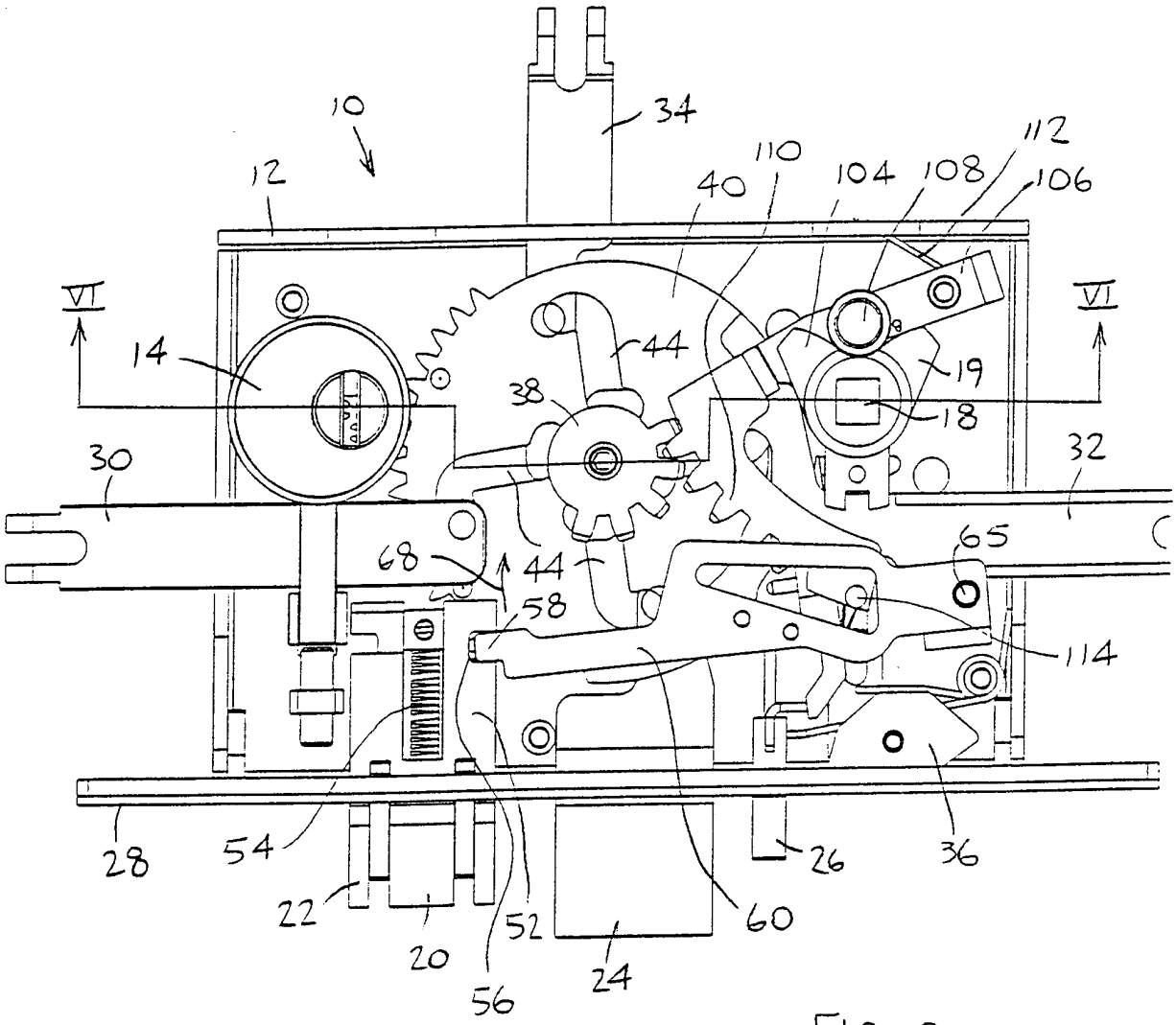
22
20
52
24
60
26
62
36
116
64
65
32
114
19

FIG. 2


10
34
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40
110
104
108
112
106
VI
VI
14
44
19
38
18
30
32
68
44
65
58
114
54
28
22
20
52
56
24
60
26
36

FIG. 3

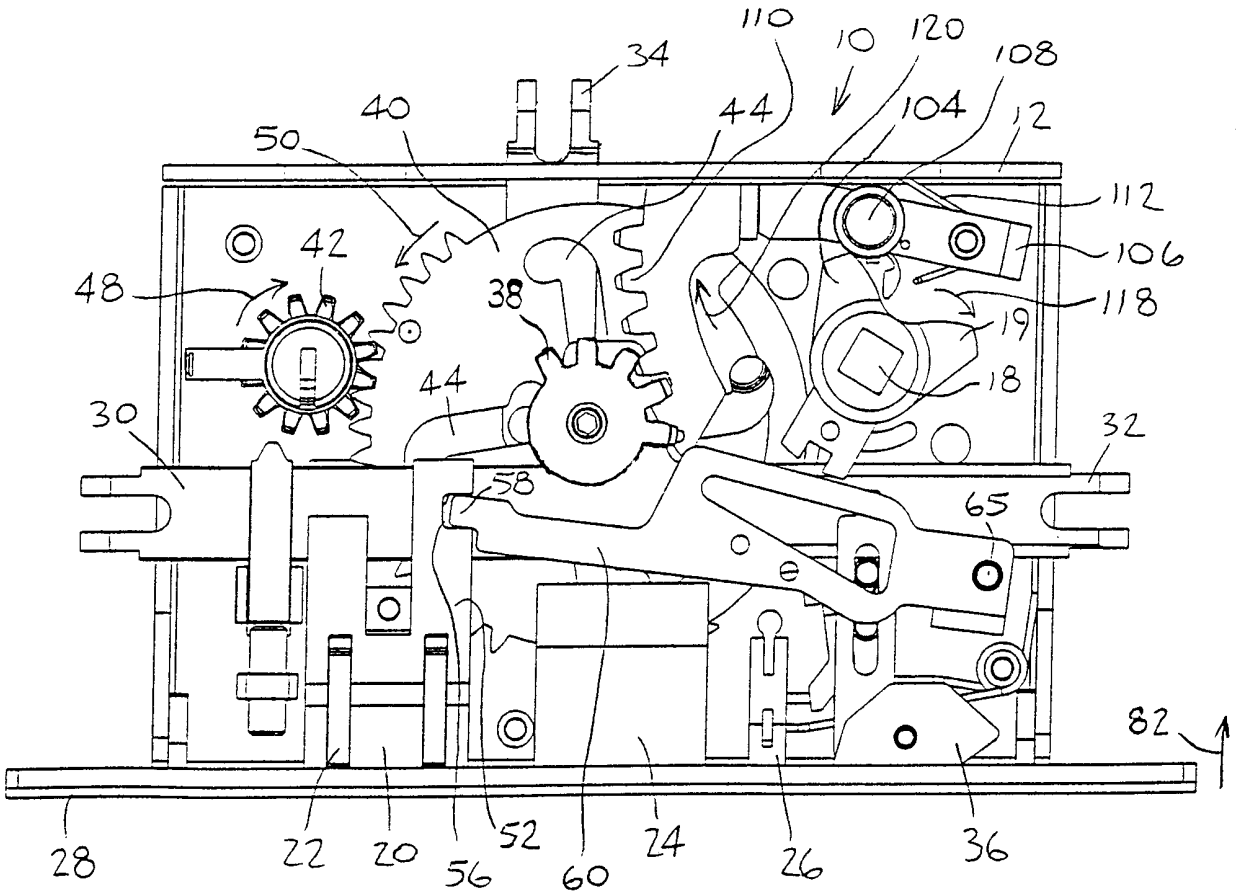
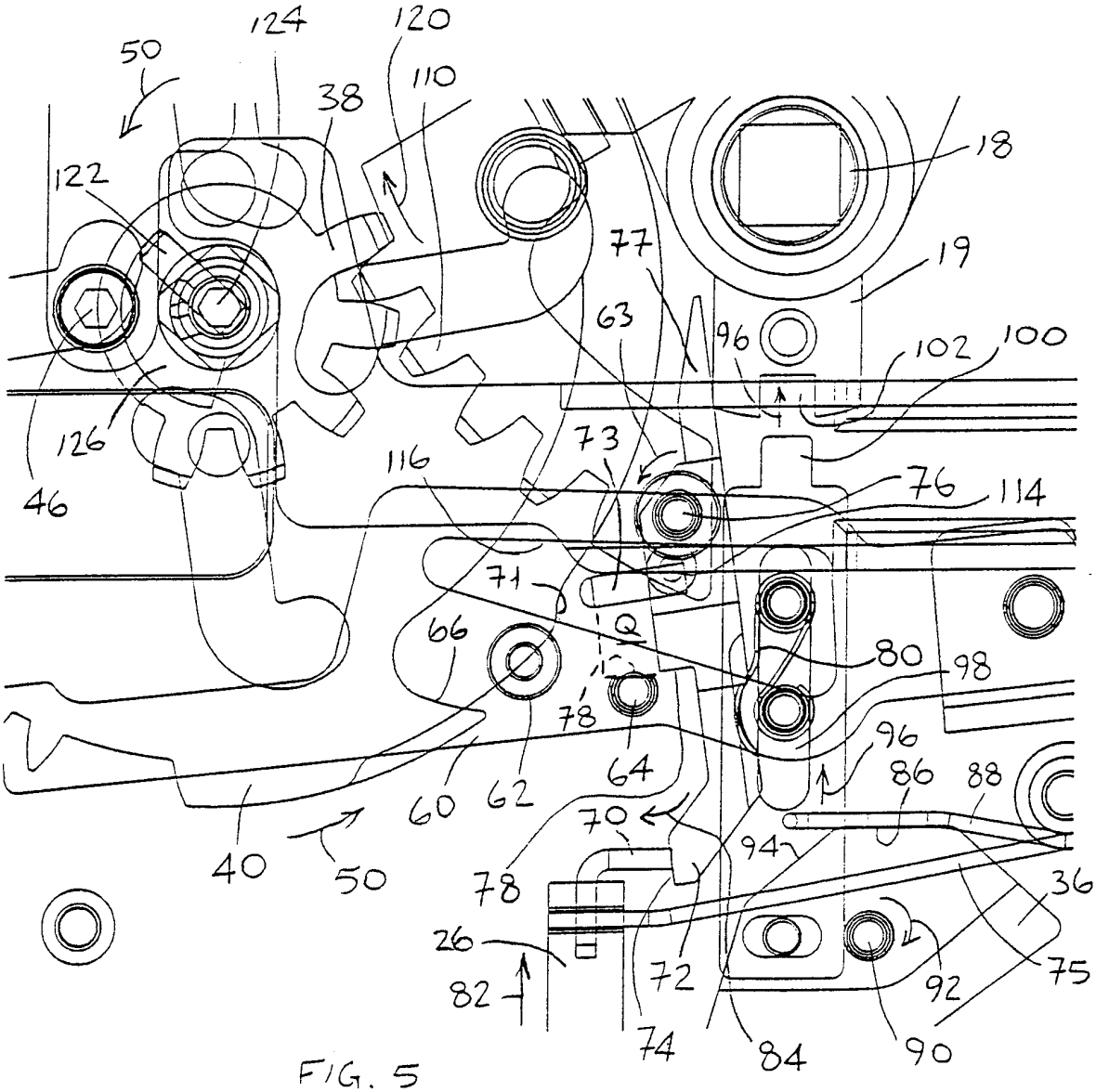

110
10
120
108
34
40
44
104
12
50
112
42
106
48
38
118
19
44
18
30
32
58
65
e
82
28
22
20
56
52
60
24
26
36

FIG. 4


50
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126
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19
77
63
96
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73
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114
71
Q
66
80
98
78'
64
96
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72
75
82
92
74
84
90

FIG. 5

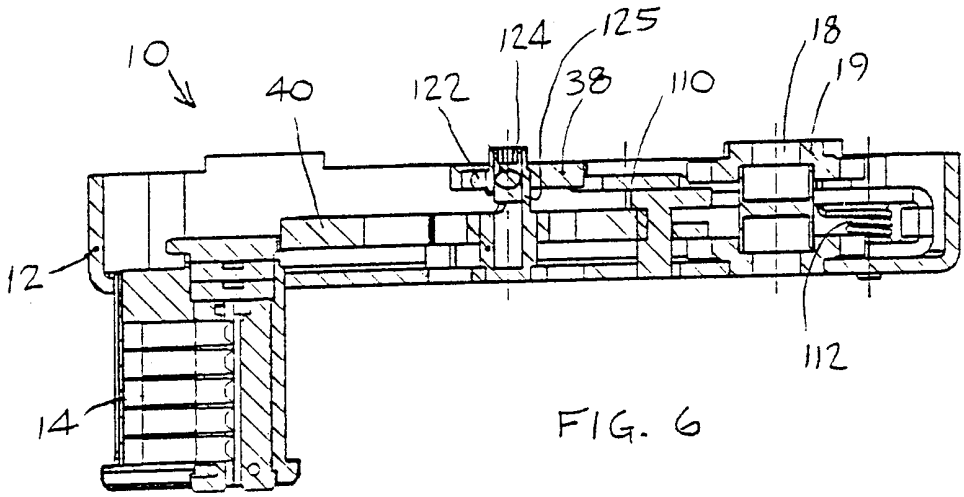


FIG. 6

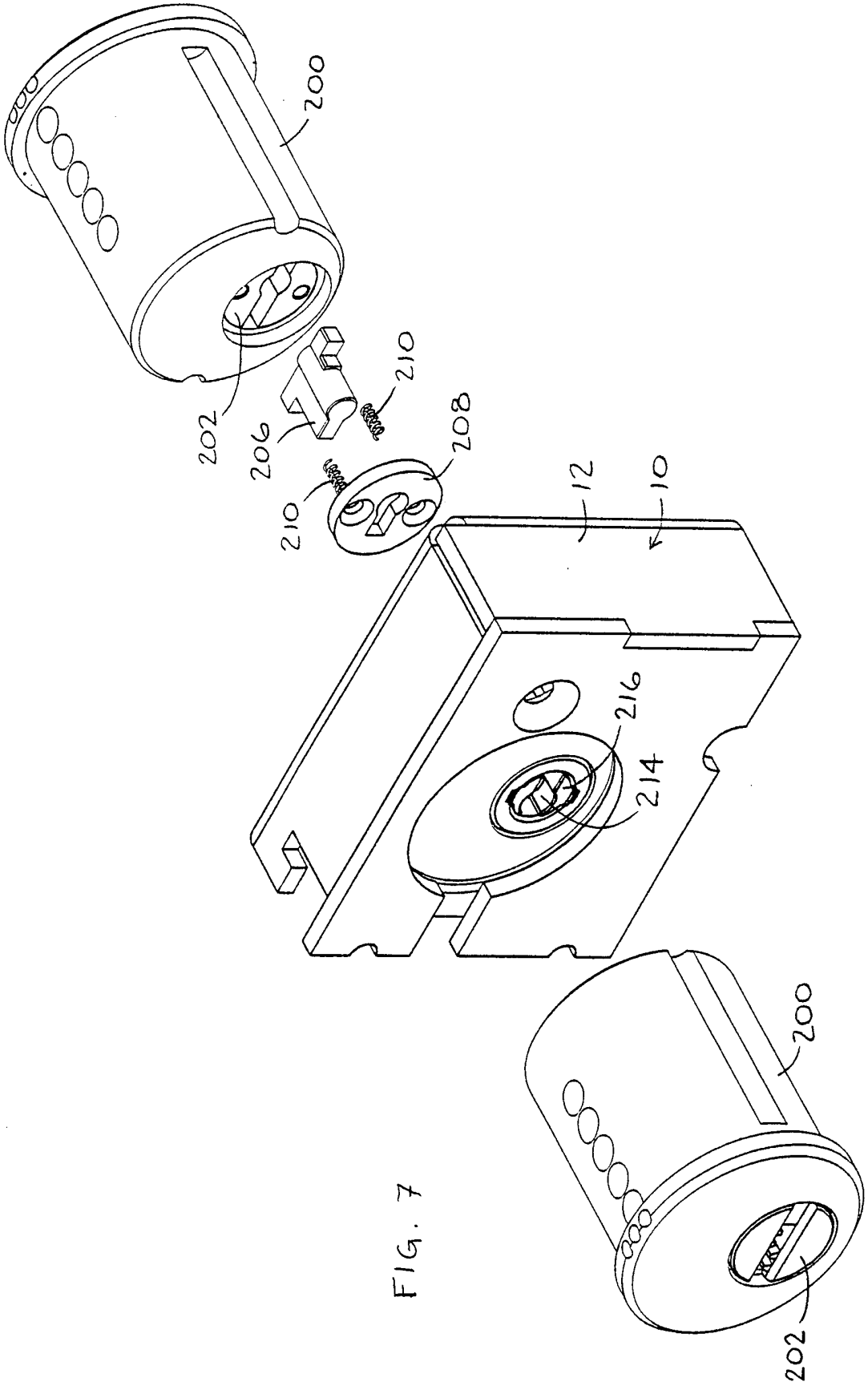


FIG. 7

FIG. 8A

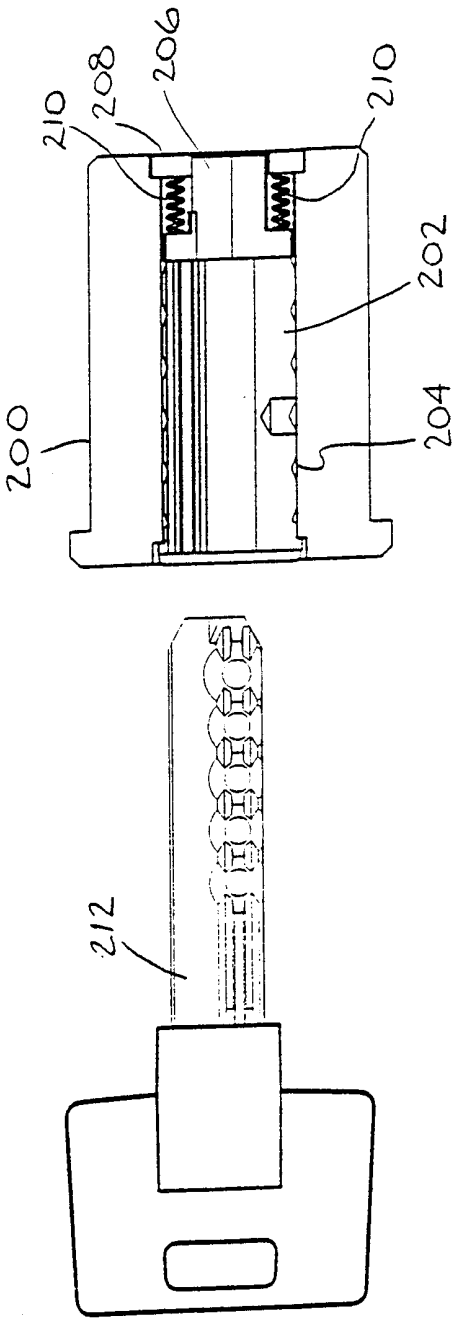
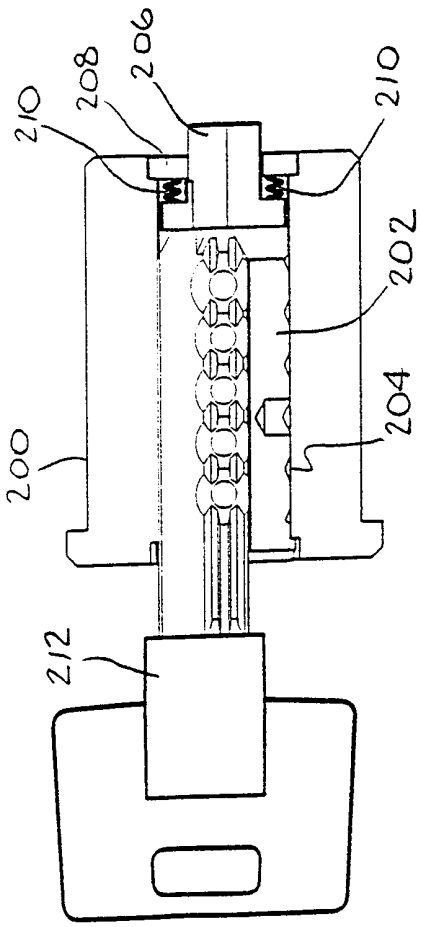


FIG. 8B



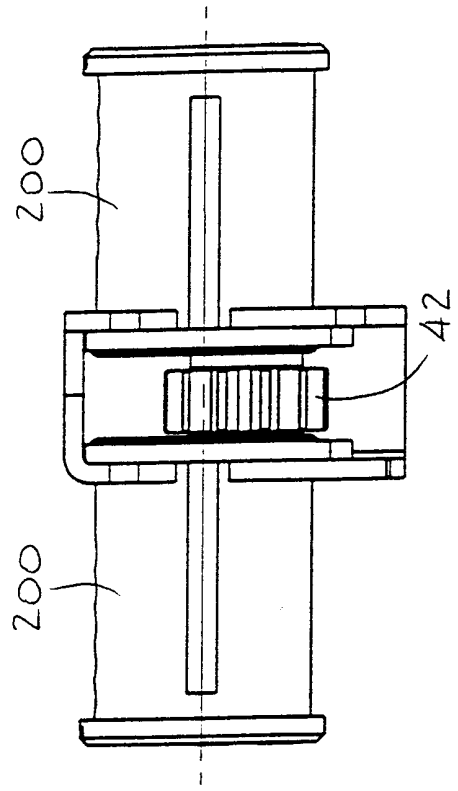


FIG. 11

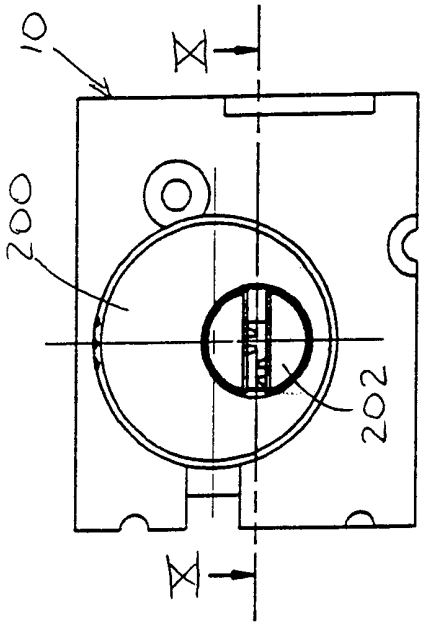


FIG. 9

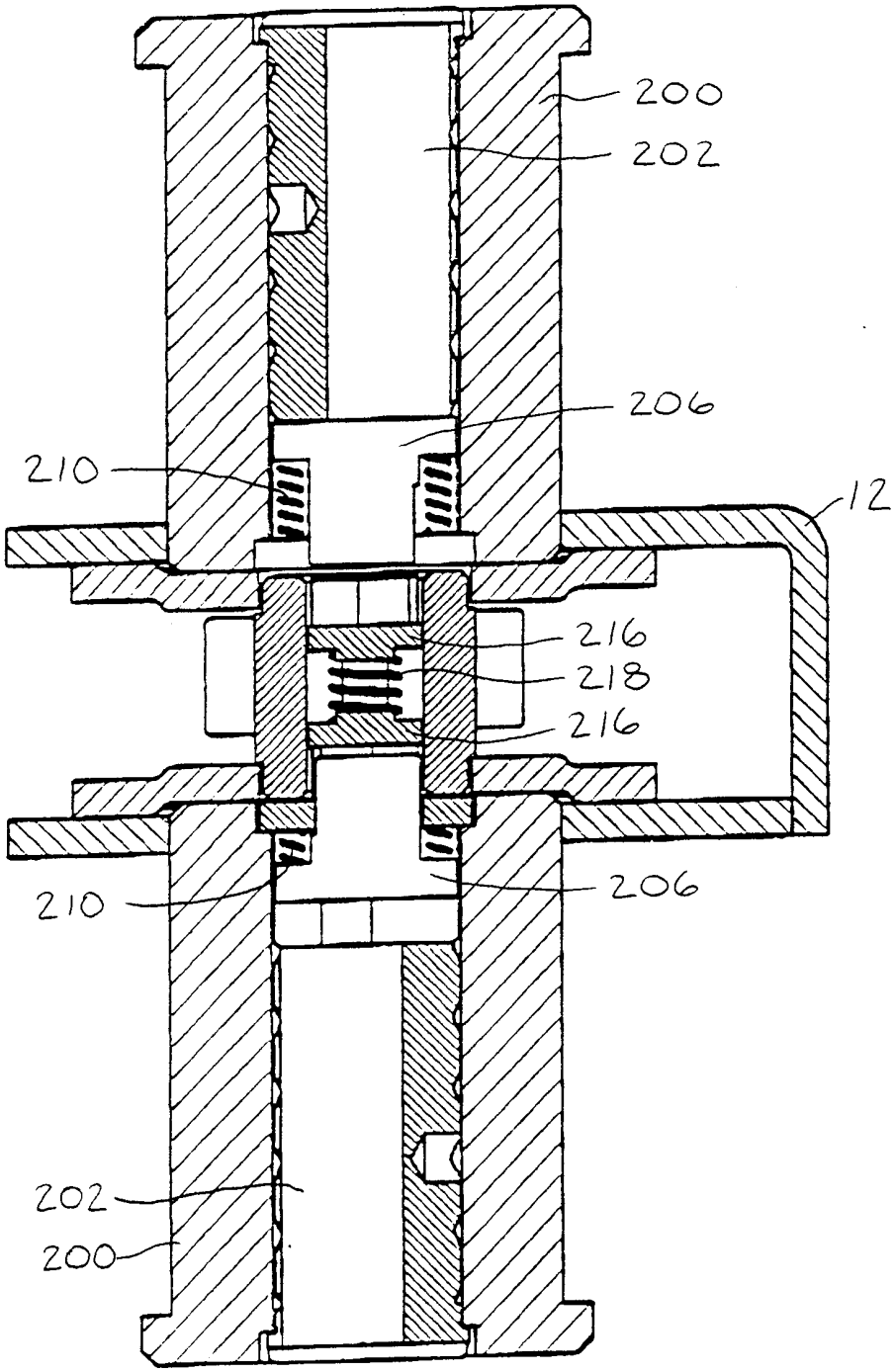


FIG. 10

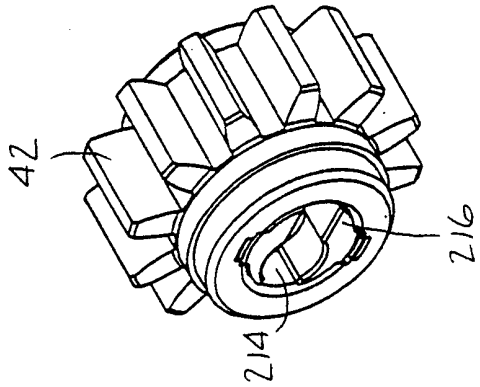


FIG. 14

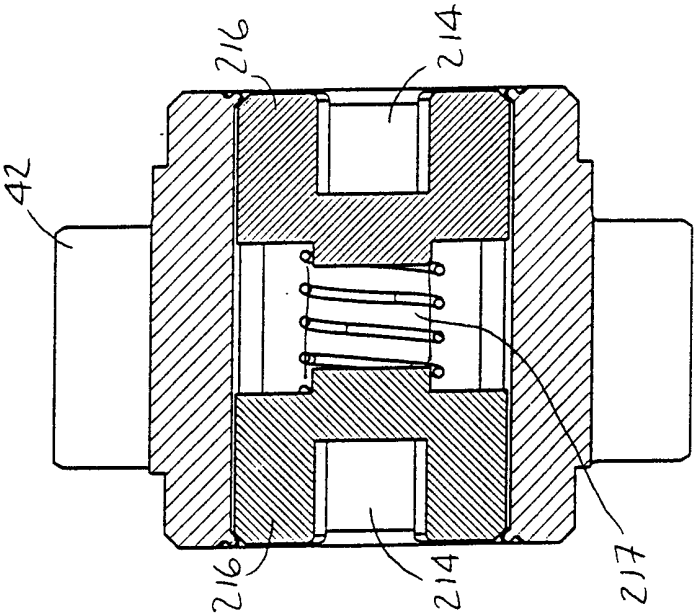


FIG. 13

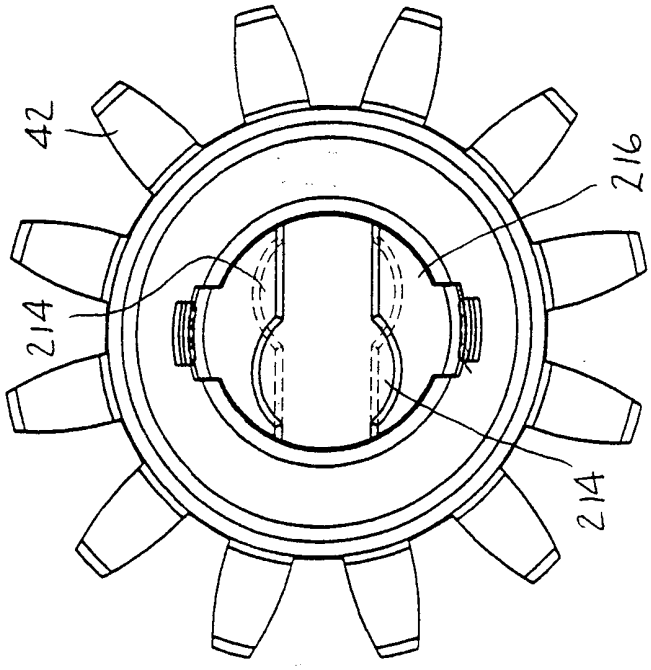


FIG. 12