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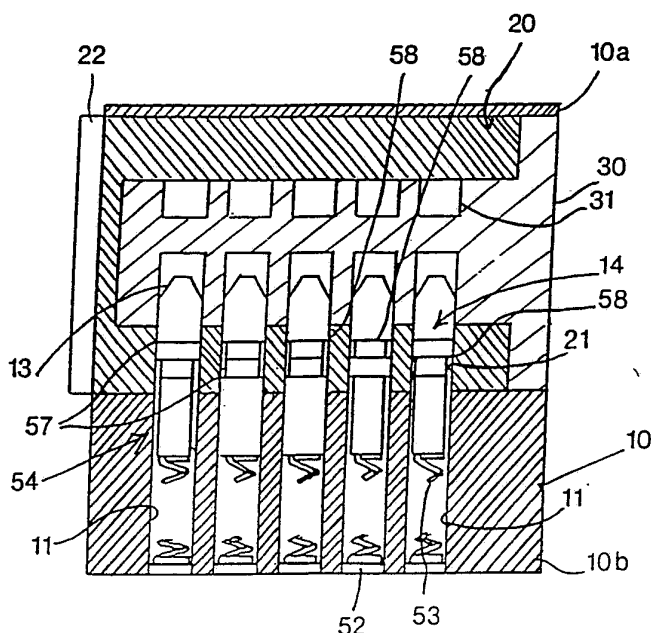
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(57) Abstract

A cylinder lock is provided with an outer rotor (20) which is rotatable when a plurality of tumbler assemblies (54) are in their correct positions, to rotate a throw bar (22) which unlocks a door or other member which is secured by the lock. If the lock is forced, for example by rotation of an incorrect key, an inner rotor (30) simply rotates harmlessly within the stationary outer rotor (20). The operating pins (13) of the tumbler pin assemblies (54) are not harmed, because they are received within circumferential grooves (31) in the inner rotor (30). The preferred embodiment also incorporates an antipick mechanism, whereby if one of the tumbler assemblies (54) is picked at a false or secondary breakpoint (58), on rotation of the outer rotor (20) that assembly is forced by a biasing spring (53) into a secondary bore (23), so disabling the lock. If the tumbler assembly (54) is split at a true or primary point (57), however, the greater cross-sectional area of the tumbler pin at this point ensures that as the outer rotor (20) rotates, the pin is too large to snap into the bore (23), thereby allowing the rotor to be rotated to its unlocked position.

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CYLINDER LOCK

The present invention relates to a cylinder lock;
5 and in particular to antipick and antiforce security
systems for pin tumbler locks. Pin tumbler locks are
available in a wide variety of types. Typically, a pin
tumbler lock includes a core housing or stator, having an
10 internal pin tumbler mechanism, and a cylindrical plug or
rotor within the stator that has a keyway for receiving
a key. The key is notched to cooperate with the
stator's pin tumbler mechanism, in such a way that when
the correct key is inserted rotation of the plug within
15 the stator is enabled, so rotating a throw bar which is
attached to the rear end of the plug. The throw bar then
normally unlatches the door or other structure which is
being secured by the lock.

Unfortunately, the pin tumbler lock has a number of
short comings. In its most basic form, it is susceptible
20 to picking or to excessive force. Many locks have been
developed in an effort to combat these shortcomings.
Methods of deterring picking include the provision of
false break points in the tumblers (for example as is
shown in GB-A-1590090, and in GB 2222201). Conventional
25 methods of preventing forcing generally concentrate upon
strengthening the system, for example by increasing the
number of pins, strengthening the pins and so.

It is an object of the present invention in its
various forms to provide a pin tumbler lock having
30 antipick and/or antiforce protection in a simplified
manner, so reducing manufacturing costs.

According to a first aspect of the present invention
there is provided a cylinder lock comprising a lock
housing, an outer rotor mounted within the housing for

rotation between a locked position and an unlocked position; an inner rotor, having a keyway for reception of a key, mounted within the outer rotor; and a plurality of biased tumbler pin assemblies extending through the outer rotor, each pin assembly having a break line whereby when a correct key is inserted into the keyway the pin assemblies split at the break lines to permit the outer rotor to rotate, as a unit with the inner rotor, to the unlocked position; and when an incorrect key is inserted, and force is applied, the inner rotor is arranged to rotate within the outer rotor, the outer rotor remaining stationary.

Normally, rotation of the rotor cannot be achieved because the pin assemblies are received within individual bores within the rotor. In such an arrangement, a small amount of force has no effect on the rotor, and a large amount of force may irreparably damage the lock by shearing or otherwise damaging the pin assemblies. This may not be desirable if the "forcing" is inadvertent, by a legitimate user of the lock who has accidentally inserted the wrong key.

Preferably, the outer rotor or outer shell comprises a hollow cylinder having tumbler bores. Attached at the rear end of the outer rotor is a throw bar. Within the outer rotor is a cylindrical plug, plug keyway or inner rotor which defines a keyway for receiving a key, the notched edge of which is in contact with the inner surface of the outer rotor and is arranged to operate tumbler assemblies which are movable in tumbler bores formed in the housing and in the outer rotor to allow rotation of the throw bar. The inner rotor is held in position in the outer rotor by means of friction or a relatively weak shearing material, so that in normal operation the inner and outer rotors move together as one

unit. The outer surface of the inner rotor is shaped so that if the wrong key or another implement is used to rotate the inner rotor forcibly, the inner rotor will turn independently of the outer rotor and the housing, protecting the tumblers from shearing. As the inner rotor rotates, the outer rotor is held stationary, and accordingly the throw bar cannot be operated.

According to a second aspect of the present invention there is provided a cylinder lock comprising a housing, a rotor mounted within the housing for rotation between a locked position and an unlocked position, the rotor having a keyway for reception of a key; a plurality of biased tumbler pin assemblies extending between the housing and the rotor and preventing rotation of the rotor unless a correct key is inserted into the keyway, each pin assembly having a true breakpoint whereby when a correct key is inserted each pin assembly splits at its respective true breakpoint to permit the rotor to be rotated to its unlocked position; at least one tumbler assembly having a false breakpoint; and a void in the rotor or in the housing shaped for reception, under the biasing force, of a pin assembly which has been split at a false breakpoint, but not a pin assembly which has been split at its true breakpoint, reception of a pin assembly within the said void preventing rotation of the rotor to the unlocked position.

This system, which allows the rotor to discriminate between primary and secondary breakpoints, may be used in locking systems with a one part rotor, so simplifying construction. Other antipick systems generally require both an inner rotor and a separate outer rotor or outer sleeve.

In a preferred embodiment of this aspect of the invention, each of the pin tumblers (tumbler pin

assemblies) are provided with at least one secondary breakpoint, allowing the outer rotor to be rotated when all the tumblers are aligned with either primary or secondary breakpoints along the shear line between the housing and the outer rotor. On rotation of the rotor, the section of each tumbler remaining in the housing is held against the outer surface of the rotor by means of the tumbler assembly spring. At each of the secondary breakpoints the cross-section of the tumbler at the point at which it is held against the rotor is shaped so as to have a smaller cross-sectional area in comparison with the corresponding cross-sectional area at the primary breakpoint of the tumblers. When the rotor is rotated, the section of the tumbler with the lesser cross-sectional area (in other words at a secondary breakpoint) relocates in a secondary bore drilled in the rotor which prevents any further rotation. If, on the other hand, the tumbler is aligned at the primary breakpoint, the cross-sectional area of the tumbler at that point is larger than that of the secondary bore, so that the forward edge of the tumbler simply passes over the secondary bore, effectively ignoring it, and allowing the rotor to continue to rotate.

It is envisaged that both of the above aspects of the invention may be used together. In such an arrangement, it is preferable that the grooves in the inner rotor be fully circumferential and deep enough so as not to interfere with the section of the tumbler which protrudes from the tumbler bore in the outer rotor when the tumbler is split at its secondary breakpoint and so is received into the secondary bore. This ensures that the antforce feature still remains operational after an attempt has been made to pick the lock.

The invention may be carried into practice in a

number of ways and several specific embodiments will now be described, by way of example, with reference to the drawings, in which:

5 Figure 1 is a longitudinal section through a cylinder lock embodying the present invention, and incorporating both the antipick and antiforce features;

Figure 2 is a transverse section through the lock of Figure 1;

10 Figure 3 is a transverse section, corresponding to Figure 2, of an alternative embodiment;

Figure 4 is a further transverse section, corresponding to Figures 2 and 3, of another alternative embodiment incorporating only the antiforce feature;

15 Figure 5 is a schematic view of the external surface of the rotor, showing the possible relative shapes and positions of the primary and secondary bores in the rotor, for use in embodiments incorporating the antipick feature;

20 Figure 6 shows a cross section of an alternative embodiment, incorporating the antiforce feature, in which the inner rotor is provided with one extended groove instead of one groove for each tumbler;

25 Figure 7 is a transverse section, corresponding to Figures 2 to 4, of yet another embodiment, incorporating the antipick feature, in which the secondary bore is placed in the lock casing rather than in the rotor;

Figure 8 is a longitudinal section of a final embodiment, incorporating the antiforce feature, in which the inner rotor comprises a plurality of disks.

30 Figures 1 and 2 show a preferred embodiment of the invention incorporating both the antiforce and antipick features.

The embodiment shown in Figures 1 and 2 comprises a core assembly or rotor 40 retained within a lock outer

casing 10 which also houses a plurality of tumbler assemblies, generally indicated at 54. The lock case 10 has a generally cylindrical portion 10a having relatively thin walls, in which the rotor is received via an off-centre rearward opening. The casing 10 also has a moulded downwardly-extending lobe 10b which contains the plurality of tumbler assemblies 54. For purposes which will be described in more detail below, the rotor in this embodiment comprises an outer cylindrical shell portion or outer rotor 20 and a core plug or inner rotor 30. The inner rotor defines a longitudinally extending keyway 33.

The lobe 10b of the lock casing 10 has within in a plurality of vertical tumbler bores 11, which are arranged to be alienable with corresponding bores 21 in the outer rotor 20. Each composite ironed bore 11,21 contains one of the tumbler assemblies 54.

Each tumbler assembly 54 comprises a shaped operating pin 13, a stack of tumbler pins generally indicated at 14, a biasing spring 53 and a bore closure plug 52. The plug 52 is sized to provide a forced fit at the lower end of the bore so securing the assembly 54 in place.

In normal operation of the lock a key is inserted into the keyway 33, this key bearing down on the individual operating pins 13, so pushing the tumbler pins downwardly against the biasing force provided by the springs 53. In this position, a primary breakpoint 57 on each of the assemblies 54 (this breakpoint being different for each assembly) lines up with the interface between the bore 11 and the bore 21. In this position, the entire rotor 40 can be rotated, with the inner rotor 30 and the outer rotor 20 rotating together as a unit. This rotates a throw bar 22 which is coupled to the outer rotor 20, so unlocking the door or other structure to

which the lock is attached.

The antforce feature of the lock shown in Figures 1 and 2 will now be described. The inner rotor 30 differs from conventional rotors in that it has no tumbler bores, but instead is cut with a plurality of deep transverse grooves 31 around its circumference, each groove 31 being aligned with the tumbler bores 11,21. The keyway 33 is shaped so as to guide the key along the inner surface of the outer rotor 20, so pressing down on the shaped operating pins 13. The key is kept on track by a longitudinal groove (not shown) which runs rearwardly through the slightly off-centre core of the inner rotor 30. The inner rotor 30 is held within the outer rotor 20 preferably by means of a friction fit, although it could alternatively be held in place by means of a relatively weak shearing material.

If an attempt is made to force the lock, either by means of an incorrect key or without any key at all, it may be seen that the inner rotor 30 simply rotates harmlessly within the outer rotor 20 without damaging the pins. The tumbler pin assemblies 54 simply remain in the extended position shown in Figures 1 and 2, with the operating pins 13 remaining stationary within the rotating slots 31. The inner rotor 30 may (but need not) slightly push the pins down as it rotates, and Figure 2 shows an arrangement in which the pin to be pushed downwards when the inner rotor approaches 90° from its original position.

An alternative embodiment, shown in Figure 4, is particularly desirable where the antforce feature is to be used independently of the antipick feature. (Which will be described in more detail below). In the embodiment of Figure 4, the grooves 31 do not extend all the way round the circumference of the inner rotor 30,

but instead they are shaped in such a way that when the inner rotor 30 rotates in relation to the outer rotor 20, the edges of the grooves 31 bear upon the operating pins 13 to push the pins down into the bores 33 of the outer rotor 20. This then allows free rotation of the inner rotor 30.

In a further embodiment of the invention, which may be used either with the fully circumferential grooves of Figure 1, or the partially circumferential grooves of Figures 4, the individual grooves for each of the assemblies 54 may be replaced by one single groove 30,31a, as shown in Figure 6. The single groove 31a encloses all of the operating pins 13. As before, the key is kept on track by the longitudinal groove (not shown) which runs rearwardly through the slightly off-centre core of the inner rotor.

In yet another embodiment, shown in Figure 8, the inner rotor 30 could comprise a series of disks 34, grooved (not shown) to allow passage of the key. Each individual disk 34 would be held in position within the outer rotor 20 by means of friction, or by means of a weak shearing material. If an attempt were to be made to force the lock using an incorrect key, the individual disks 34 would all rotate together, independently of the outer rotor 20, by virtue of their all being held together by the key. The front of the lock would be suitably armoured to prevent removal of the front disk.

Turning back again to Figures 1 and 2, the antipick feature of the preferred embodiment will now be described. A standard pin tumbler lock may be picked by the method of progressively ascertaining the breakpoints of the individual tumblers, so that eventually the correct combination is achieved and the rotor may be turned. In the preferred embodiment, each of the tumbler

assemblies 54 is provided with a plurality of pins so as to provide a plurality of breakpoints. Only one of these breakpoints is the true, or primary breakpoint 57 - the remainder being false or secondary, breakpoints 58. The
5 breakpoints are so designed that, while the lock is being picked, it is difficult to ascertain whether a primary or a secondary breakpoint has been selected. Unless the person picking the lock manages to select each of the individual primary breakpoints, the lock will not
10 operate. The method whereby this is achieved will now be described.

Under normal operation of the lock, that portion of the tumbler which is immediately behind the primary breakpoint is held against the outer surface of the outer
15 rotor 20, as the outer and inner rotor (the core assembly) rotates. That portion which is above the primary breakpoint 57, of course remains within the core assembly 40 and rotates with it. A person who has picked the lock may have inadvertently have selected one or more
20 of the secondary breakpoints 58, rather than the primary breakpoints 57, and in that event it will be appreciated that it will be that portion of the tumbler assembly 54 behind the secondary breakpoint 58 which is biased by the spring 53 against the outer rotor 30 as the core assembly
25 40 rotates.

The difference between the primary and secondary breakpoints is that the cross-sectional area of the tumbler immediately below a primary breakpoint is greater than that immediately below one of the secondary
30 breakpoints. In the embodiment shown, the portion of the pin assembly immediately below a secondary break point is of a flattened oval shape, so that on its long axis (perpendicular to the page in Figure 1) it fits snugly into the bore 21. If one of the secondary breakpoints

has been selected, the core assembly 40 will rotate only for a certain distance before that part of the assembly 54 behind the secondary breakpoint 58 slots into a secondary blind bore 23 (Figure 2) in the outer rotor 20.

5 If a primary breakpoint is chosen however, by means of the appropriate key, that portion of the assembly 57 behind the primary breakpoint is of too large a cross-sectional area to be forced into the bore 23. Accordingly, in that case the uppermost part of the

10 assembly 57 will simply pass over the entrance to the bore 23, without suffering any interruption.

In the preferred embodiment of the invention, there is a single primary breakpoint 57 for each of the assemblies 54, and there are a plurality of secondary

15 breakpoints 58. This makes it more difficult for a person attempting to pick the lock to select the correct breakpoints. There could be a plurality of individual blind bores 23, one for each of the assemblies 54, or alternatively there could instead simply be a

20 longitudinal recess extending from front to back of the outer rotor 20. Figure 5 shows schematically how, in the preferred embodiment, the individual bores 21 are circular in section, with the individual blind bores 23 being slightly flattened and of a smaller section.

25 Although a difference in the cross-sectional area is suggested as the best method for differentiating between primary and secondary breakpoints, it could also be achieved by using incompatible shapes.

To avoid a person attempting to pick the lock being

30 able to distinguish easily between primary and secondary breakpoints, it is preferred that any reduction in cross-sectional area at the secondary breakpoints, as compared with the primary breakpoints, should be effected along the longitudinal axis. In other words, as may most

clearly be seen in Figure 5, a person attempting to pick the lock by inserting a tool along the longitudinal axis will be presented effectively with a similar apparent cross-section both for those parts of the assembly 54 immediately behind the primary breakpoints 57, and immediately behind the secondary breakpoints 58. The difference in cross-section, which is quite clearly visible in Figure 1, will not be at all visible to a person attempting to gain access in a longitudinal direction, via the keyway 33. If the bore 23 is, as previously discussed, replaced with a longitudinal recess, this would only work if the difference in cross-section were to be made on the transverse axis. Hence, such an arrangement is not preferred.

To prevent any accidental rotation of the tumblers about their own axis, means preventing such rotation may be provided. For example, all tumbler bores and pins may be of an oval or other shaped cross-section (not shown).

The embodiment shown in Figures 1 and 2 allows for a clockwise unlocking rotation of the rotor 40. It will be appreciated, of course, that if a counterclockwise unlocking rotation is needed, the position of the secondary bores 23 would change accordingly.

In the preferred embodiment, there is no mechanism to remove a tumbler 50 from the secondary bore (23) after an attempted breach of the lock security. This means that the lock would have to be forced in order to operate the throw bar 22, thus alerting a legitimate user of the lock who attempts to use it subsequently, that there has been an attempted breach of security. During the attempted picking of the lock, once the tumbler has been forced into the secondary bore 23, no further picking of the lock will be of any effect, and if the antiforce mechanism described earlier is employed at the same time,

forcing of the lock also becomes difficult. It is likely in such circumstances that the attacker would be forced to abandon his efforts to gain access.

Figure 3 shows an alternative embodiment of the lock in which, after an attempted security breach, the lock can be returned to the position in which all the tumbler bores 11,21 are in alignment. This is achieved by providing a camming surface 23a on the entry side of the secondary bores 23, tapering back towards the tumbler bores 21, so that when it is attempted to turn the rotor back to realign the tumbler bores, the tumblers are forced to retract into the housing bores 11,21 until the tumbler bores realign, when the tumblers will reset into the locked position. It will be obvious that this embodiment allows the attacker repeatedly to recommence the attack; however, if a large number of secondary breakpoints 58 are provided on each tumbler assembly 54, then in some circumstances the risk may be deemed preferable to the necessity of having to destroy the lock after a failed attack on the lock of Figure 2.

It would also be possible effectively to combine the concepts illustrated in Figures 2 and 3 by providing a first set of secondary breakpoints having a smaller cross-sectional area than the primary breakpoints, and a second set of secondary breakpoints having a yet smaller cross-section. The first set of secondary breakpoints would be arranged to snap into secondary bores 23 of the type shown in Figure 3, from which they could subsequently be removed, and the second set of secondary breakpoints could be sized to snap into a second set of secondary bores, such as shown in Figure 2, from which they could not be removed. With such an arrangement, if a single attempt is made to pick the lock, there is quite a chance that one of the first set of secondary

breakpoints would be chosen, so that the lock could be easily reinstated back to its locked position shown in Figure 1. If many repeated efforts were made to pick the lock however, it is probable that at some stage one of the second set of secondary breakpoints would be chosen, in which case the lock would subsequently have to be forced. By choosing the respective numbers of first and second types of secondary breakpoints, the requirement of additional security can be balanced according to the circumstances with the disadvantage of having to force the lock if repeated efforts to pick it are made.

Figure 7 shows yet another embodiment in which a weak counterspring 61 is placed within the outer rotor 20, in such a way as to exert an outward pressure on the portion of the tumbler remaining in the outer rotor 20 once that portion has been rotated away from the stronger regime of the assembly biasing spring 53. Any secondary points on the shear line would then insert the tumblers into secondary bores 23b situated in the lock housing 10. As with the previous embodiments, the secondary bores 23b could either have shear or sloping edges, and there could either be one bore through each of the tumbler assemblies 54, or there could be one longitudinal groove of an appropriate width.

Where the antipick feature is used independently of the antiforce feature, there is of course no need to have a rotor of two-part form 20,30. Instead, a single, integral rotor (not shown) may be used.

It is envisaged that compatible combinations of the features described and/or shown with respect to the individual embodiments may where appropriate be used together.

CLAIMS:

1. A cylinder lock comprising a lock housing, an outer
5 rotor mounted within the housing for rotation between a
locked position and an unlocked position; an inner
rotor, having a keyway for reception of a key, mounted
within the outer rotor; and a plurality of biased
10 tumbler pin assemblies extending through the outer rotor,
each pin assembly having a break line whereby when a
correct key is inserted into the keyway the pin
assemblies split at the break lines to permit the outer
rotor to rotate, as a unit with the inner rotor, to the
15 unlocked position; and when an incorrect key is
inserted, and force is applied, the inner rotor is
arranged to rotate within the outer rotor, the outer
rotor remaining stationary.
2. A cylinder lock as claimed in Claim 1 in which the
20 inner rotor is shaped so that, on rotation within the
outer rotor, it does not bear against the biasing force
upon the pin assemblies.
3. A cylinder lock as claimed in Claim 2 in which the
25 ends of the pin assemblies extend into a void in the
inner rotor.
4. A cylinder lock as claimed in Claim 2 in which the
ends of the pin assemblies extend into a single
30 circumferentially extending groove in the inner rotor.
5. A cylinder lock as claimed in Claim 2 in which the
end of each of the pin assemblies extends into a
respective circumferentially extending groove in the

inner rotor.

6. A cylinder lock as claimed in Claim 4 or Claim 5 in which the groove or grooves extend fully around the circumference of the inner rotor.

7. A cylinder lock as claimed in Claim 2 in which the inner rotor comprises a plurality of parallel plates, the ends of the pin assemblies extending into the respective spaces between the parallel plates.

8. A cylinder lock as claimed in Claim 1 in which the inner rotor is shaped so that, on rotation of the inner rotor with respect to the outer rotor, the inner rotor bears upon the pin assemblies, against the biasing force, to push them out of the envelope of rotation of the inner rotor.

9. A cylinder lock as claimed in Claim 8 in which the ends of the pin assemblies extend into a void in the inner rotor.

10. A cylinder lock as claimed in Claim 8 in which the ends of the pin assemblies extend into a single circumferentially extending groove in the inner rotor.

11. A cylinder lock as claimed in Claim 8 in which the end of each of the pin assemblies extend into a respective circumferentially extending groove in the inner rotor.

12. A cylinder lock as claimed in any one of the preceding claims in which the inner rotor is a friction fit within the outer rotor.

13. A cylinder lock as claimed in any one of the preceding claims in which the inner rotor is held against rotation within the outer rotor by a securing means, the securing means being arranged to break if force of greater than a predetermined amount is applied.

14. A cylinder lock as claimed in Claim 13 in which the securing means comprising a shearing material.

15. A cylinder lock comprising a housing, a rotor mounted within the housing for rotation between a locked position and an unlocked position, the rotor having a keyway for reception of a key; a plurality of biased tumbler pin assemblies extending between the housing and the rotor and preventing rotation of the rotor unless a correct key is inserted into the keyway, each pin assembly having a true breakpoint whereby when a correct key is inserted each pin assembly splits at its respective true breakpoint to permit the rotor to be rotated to its unlocked position; at least one tumbler assembly having a false breakpoint; and a void in the rotor or in the housing shaped for reception, under the biasing force, of a pin assembly which has been split at a false breakpoint, but not a pin assembly which has been split at its true breakpoint, reception of a pin assembly within the said void preventing rotation of the rotor to the unlocked position.

16. A cylinder lock as claimed in Claim 15 in which the size or shape of the pin assembly at its true breakpoint prevents the assembly, when split at that point, being pushed under the biasing force into the said void; and in which the size or shape of the pin assembly at a false breakpoint allows it to be so pushed.

17. A cylinder lock as claimed in Claim 16 in which the pin assembly is of a first circular cross-section at its true breakpoint and of a second, smaller cross-section at its second breakpoint.

5

18. A cylinder lock as claimed in any one of Claims 15 to 17 in which the void is in the rotor.

10

19. A cylinder lock as claimed in any one of Claims 15 to 17 in which the void is in the housing.

20. A cylinder lock as claimed in any one of Claims 15 to 19 in which the void comprises a bore.

15

21. A cylinder lock as claimed in Claim 20 in which the bore is of non-circular section.

20

22. A cylinder lock as claimed in any one of Claims 15 to 19 in which the void comprises a longitudinal peripheral groove.

25

23. A cylinder lock as claimed in any one of Claims 15 to 22 in which the void has a lead-out portion, enabling the rotor to be rotated back to its original position after a pin assembly has entered the void.

30

24. A cylinder lock as claimed in any one of Claims 15 to 22 in which the void is shaped to prevent rotation of the rotor back to its original position after a pin assembly has entered the void.

25. A cylinder lock as claimed in any one of Claims 15 to 24 in which each pin assembly has a plurality of false breakpoints.

26. A cylinder lock as claimed in any one of Claims 15 to 25 in which the true and false breakpoints appear substantially identical from the longitudinal direction in which a key is inserted into the keyway.

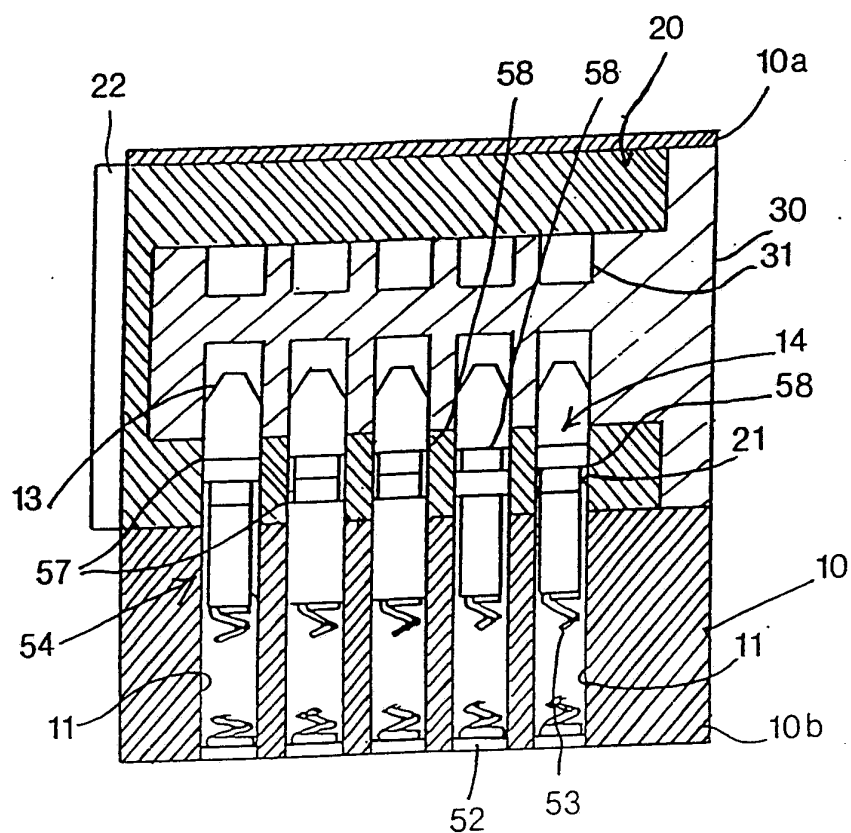
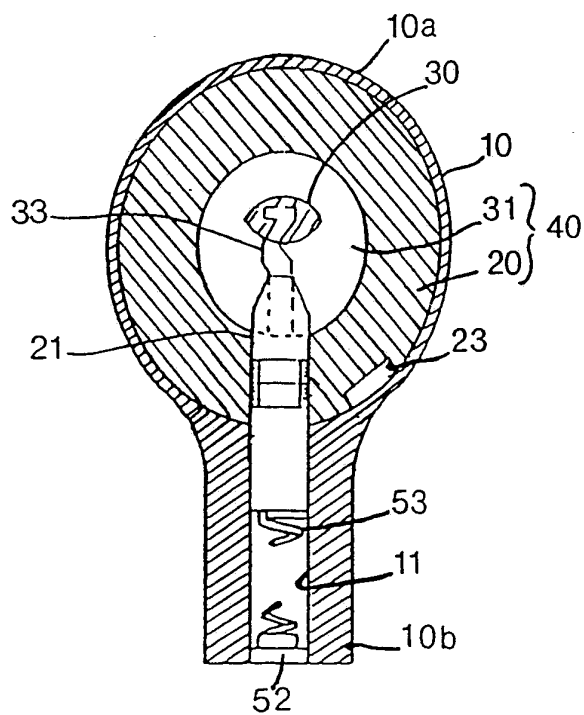
27. A cylinder lock as claimed in any one of Claims 15 to 26 including means for preventing rotation of the pin assemblies about their own axes.

28. A cylinder lock as claimed in Claim 27 when dependent upon Claim 15 or Claim 16 in which the means for preventing rotation of the pin assemblies comprises the fact that the pin assemblies are non-circular and they are received in non-circular bores.

29. A cylinder lock as claimed in any one of Claims 15 to 28 in which the housing or the rotor has a further peripheral void, of different shape from the said peripheral void, the further peripheral void being arranged to receive a pin assembly only when split at a further false breakpoint, the shape or size of the pin assembly at the further false breakpoint being different from that at the said false breakpoint.

30. A cylinder lock as claimed in any one of Claims 1 to 14 and as claimed in any one of Claims 15 to 29.

31. A cylinder lock substantially as specifically described with reference to Figures 1 and 2, or with reference to Figure 3 or Figure 4 or any one of Figures 6 to 8.

1 / 5FIG. 1FIG. 2**SUBSTITUTE SHEET**

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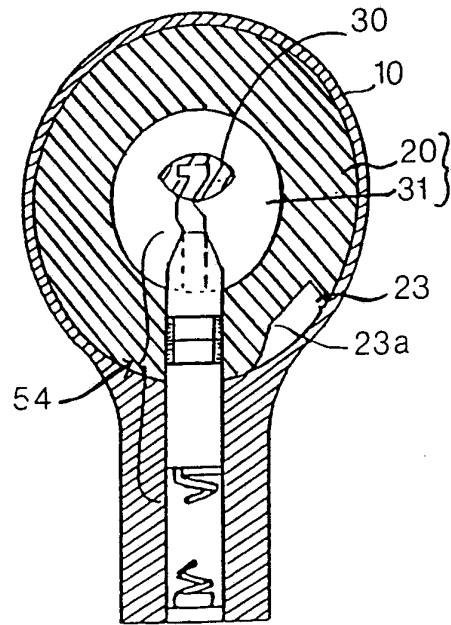


FIG. 3

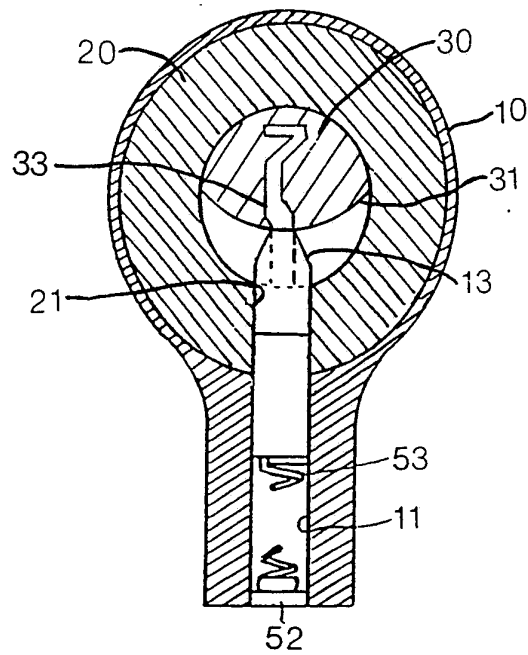
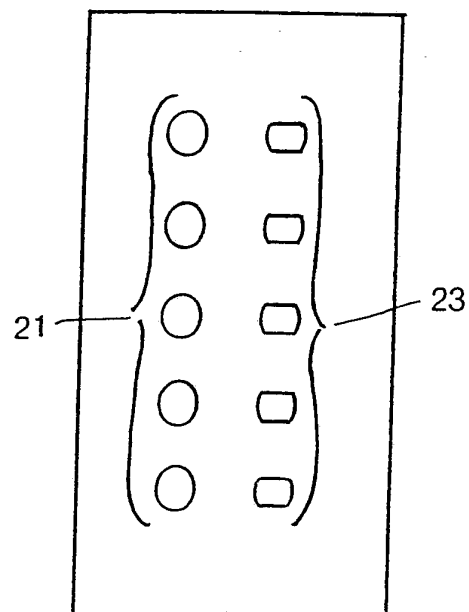
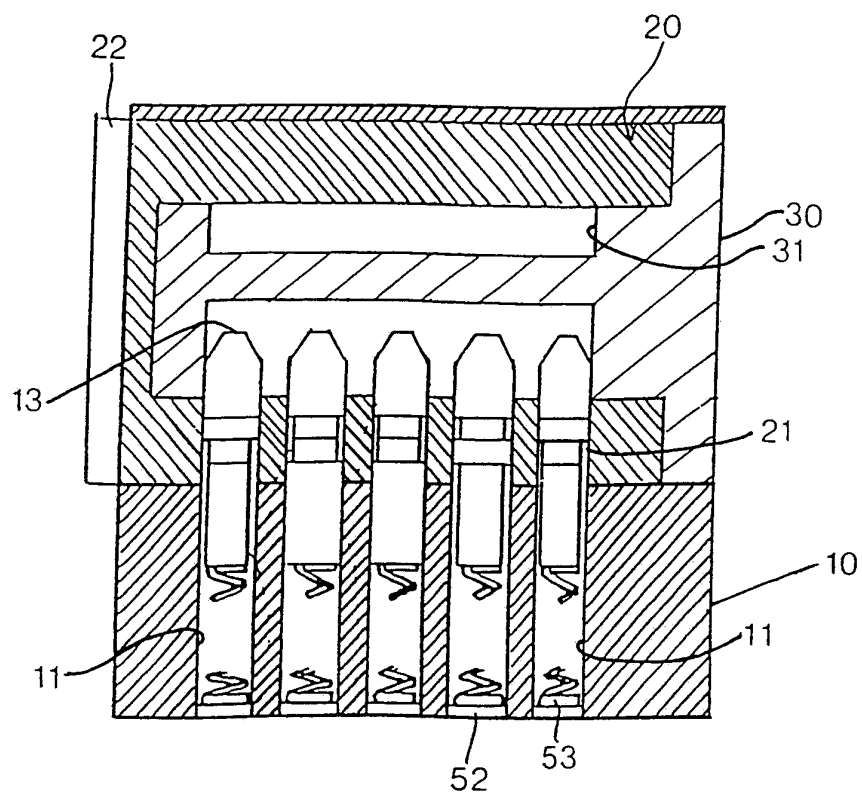


FIG. 4

3 / 5FIG. 5FIG 6

4 / 5

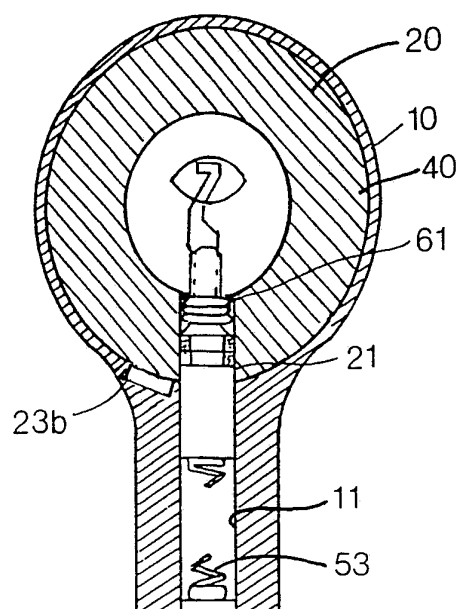


FIG 7

5 / 5

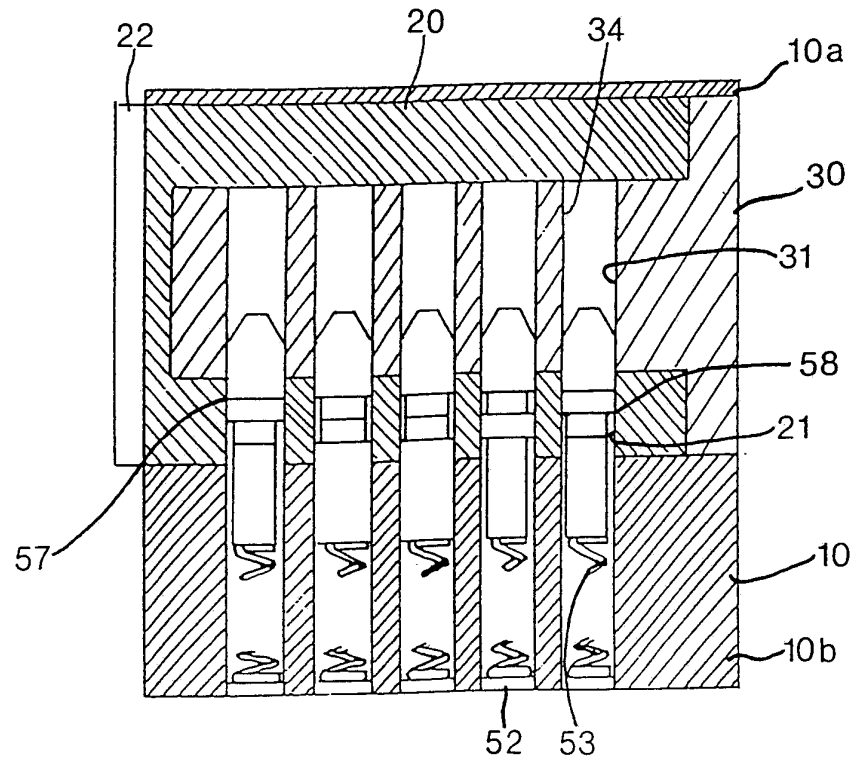


FIG. 8