

Cylinder lock and key combination

Technical field

This invention relates to a cylinder lock and key combination. Specifically, the invention relates to a disc tumbler cylinder lock and key combination, in which the disc tumbler cylinder lock is provided with a rotation limiter.

Technical background

In disc tumbler cylinder locks, tumbler discs are used to resolve a key-specific code and open the lock. The Insertion of a key into a disc tumbler cylinder lock does not yet bring about clearing of the code, but it is only turning of the key that initiates rotation of the tumbler discs according to cuts (also called combination cuts) of the key and thereby clearing of the key code. Once the key code is cleared and turning of the key continues, the disc tumbler cylinder lock is unlocked. Namely, the continued turning of the key after clearing a key code brings about rotation of the disc tumbler cylinder lock's rearward end, which can be associated with a locking bar or linked to the locking bar via a lock mechanism.

The rotation limiter is a mechanism which prevents a wrong key, which has been inserted into a disc tumbler cylinder lock, from turning in the disc tumbler cylinder lock, the disc tumblers thereby not rotating essentially out of the basic position. The rotation limiter also prevents the turning of a lock-matching key unless it has been fully inserted into the lock cylinder. In this case, turning of the key may cause rotation of tumbler discs out of a joint basic position of the tumbler discs, even without releasing the lock. The basic position refers to a condition in which a key is insertable into a cylinder lock (and also can be pulled away from the cylinder lock). In the basic position the cylinder lock is at the locked state.

The rotation limiter allows the turning of a correct key in a cylinder lock as long as the key has been fully inserted therein. For example, patent publication FI 108308 discloses a known rotation limiter for a disc tumbler cylinder lock. The rotation limiter

comprises a body and a casing. The casing is integrated with an inner cylinder of the disc tumbler cylinder lock. The body is provided in the middle with a key profile opening by way of which the key can be inserted into the cylinder lock. On each side of the key profile opening is a limiter mechanism along the same in line. The limiter mechanism
5 consists of a spring and balls at both ends thereof.

The key matching a disc tumbler cylinder lock has counter-surfaces for the balls of a limiter mechanism. The counter-surfaces are recesses in the key's surface. When a correct key is present in the key cylinder, the key can thereby be turned for displacing the tumbler discs to a correct position for releasing the locking. Hence, the inner cylinder
10 der is able to rotate as turning of the key is continued. Thus, the rotation limiter improves operational reliability of the disc tumbler cylinder lock.

The lock can also be provided with a guiding element, placed in a key channel which is established jointly by key openings comprised in the discs as described in FI 108308. The guiding element comprises two rails and a yoke between the rails. The yoke is
15 located at an inner end of the disc tumbler cylinder lock and thus joins the rails fixedly to each other. In other words, the guiding element can be a rail bent in the middle by 180 degrees. The guiding element is conventionally propped on rotation limiting means in such a way that the guiding element is also rotating continuously as the key is turned in the lock. The guiding element controls the insertion and removal of a key into and
20 out of the lock and also functions as a casing against manipulation. In addition, it also contributes for its part to the profile of a lock-matching key.

A publication FI 124224 discloses another rotation limiter for a disc tumbler cylinder lock. The rotation limiter comprises a limiting mechanism and a locking mechanism, which are situated in a line. The limiting mechanism and the locking mechanism are
25 disposed in the line such that the limiting mechanism is on the other side of the key profile opening and the locking mechanism is on the opposite side of the key profile opening. The key used with this lock has a moving element, which is in the same line with the limiting mechanism and the locking mechanism, when the key has been inserted into the lock.

Pin tumblers are used in pin tumbler cylinder locks. The pin tumblers provides a key specific code, and prevents rotation of an inner cylinder in relation to an outer structure of the pin tumbler cylinder lock in case a correct key is not used.

The prior known disc tumbler cylinder lock solutions and pin tumbler cylinder locks
5 provide, as such, a good safeguard against manipulation but it is still desirable to improve protection solutions.

Brief description of the invention

It is an objective of the invention to improve the qualities of a cylinder lock against
10 manipulation and to improve the safety of a cylinder lock and key combination. The objective is attained as presented in the independent claim. Various embodiments of the invention are presented in the dependent claims.

A cylinder lock 1, 40 and key 2, 46 combination according to the invention has the cylinder lock 1, 40 comprising an inner structure arrangement, which comprises a key
15 profile opening 21, 43. The key 2, 46 comprises a moveable element 5. The key 2, 46 comprises also a slot 16 which is transverse in relation to a longitudinal axis of a shaft of the key 2, 46, and the moveable element 5 is arranged to move along the slot 16.

The inner structure arrangement comprises a locking mechanism comprising a roller 26, a locking piece arrangement 25, and a return spring arrangement 27. The roller 26
20 comprises a guiding surface 35 on an end 35A of the roller, which end is in the key profile opening 21, 43. The roller 26 is also in connection with the locking piece arrangement 25 and the return spring arrangement 27.

The return spring arrangement is arranged to turn the roller 26 towards a locking position of the roller, which roller in its locking position is arranged in cooperation with
25 the locking piece arrangement 25 to prevent the inner structure arrangement from turning.

The inner structure arrangement has at least one second guiding surface 29 on at least one side of the key profile opening 21 to move the moveable element 5 along the slot 16 when inserting the key 2 into the cylinder lock 1 in order that the moveable

element 5 is in a position for contacting the guiding surface 35 and turning the roller 26 when the key is further pushed into cylinder lock.

The inner structure arrangement further comprises at least one third guiding surface 36 on at least one side of the key profile opening 21 to move the moveable element 5
5 along the slot 16, and with the guiding surface 35, to turn the roller 26 to an open position when the key is yet further pushed into cylinder lock.

The guiding surface 35 is further arranged to move the moveable element 5 along the slot 16 when pulling the key 2 away from the cylinder lock 1 and as response to this movement of the moveable element 5 the roller 26 is arranged to turn towards its
10 locking position.

List of figures

The invention will now be described in more detail with reference to the accompanying drawing figures, in which

- 15 Fig. 1 shows an example of a disc tumbler cylinder lock and a key of the invention,
Fig. 2 shows an example for a key of the invention,
Fig. 3 shows the example of the cross-section view of the key in fig 2,
Fig. 4 shows an example of a partial view of the shaft of the key in fig. 2,
Fig. 5 shows an example of a rotation limiter and guiding element according to the
20 invention,
Fig. 6 shows the rotation element of fig. 5 in a section view,
Fig. 7 shows a section view of the rotation limiter in a position wherein the roller is turning towards an open position,
Fig. 8 shows a section view of the rotation limiter in a position wherein the roller is
25 in an open position,
Fig. 9 shows a working example of rotation limiter for a disc tumbler cylinder lock of the invention when the key is pushed into the disc tumbler cylinder lock

- Fig. 10 shows an example of fig. 9 in a section view,
- Fig. 11 shows an example wherein the key has been further pushed into the disc tumbler cylinder lock,
- Fig. 12 shows an example wherein the rotation limiter is in an open position,
- 5 Fig. 13 shows an example of a pin tumbler cylinder lock according to the invention,
- Fig. 14 shows another view of the pin tumbler cylinder lock according to the invention,
- Fig. 15 shows an example of a side section view of the pin tumbler cylinder lock according to the invention,
- 10 Fig. 16 shows an example of a key according to the invention to be used with the pin tumbler cylinder lock according to the invention, and
- Fig. 17 shows an example of fig. 16 in a section view.

Description

- 15 Fig. 1 shows an example of a disc tumbler cylinder lock 1, as well as its key 2, of the invention in an exploded view. Fig. 2 shows the key 2 in more detail. Fig. 3 shows a section view of the key. Fig. 4 shows a cutting view of the shaft 18 of the key. The disc tumbler cylinder lock comprises a body part 6, on which other parts are assembled as the lock is constructed. The body part has a hole 6A for the key at its forward end.
- 20 Together with holes in other parts, the hole constitutes a key channel into which the key is to be inserted for unlocking the disc tumbler cylinder lock. As can be seen from fig. 1, the disc tumblers 8, intermediate discs 9, as well as other possible components such as a drill protection disc 14, comprise holes for the key and the key channel. The disc tumblers and intermediate discs alternate in succession in the disc tumbler lock
- 25 cylinder. The intermediate discs enable each tumbler disc to be rotatable in such a way that other tumbler discs 8 do not rotate along as a result of friction. The intermediate discs comprise abutting formations placed against an inner structure 7 of the disc tumbler cylinder lock.

Fig. 1 illustrates the inner structure of a disc tumbler cylinder lock, which is an inner cylinder 7, yet it is also possible to construct some other type of inner structure in which, for example, the intermediate discs are connected to each other and to a separate bottom element. For example, WO2016075363 proposes this type of inner structure, which can be modified/applied as an inner structure for the disc tumbler cylinder lock comprised in a combination according to the invention.

The inner structure/cylinder 7 has a rearward end, which comprises an attachment element for attaching a locking bar or for example a torsion bar to the disc tumbler cylinder lock. The rearward end and its parts are not illustrated in detail in fig. 1 because their structures are known as such.

The inner cylinder has a slot for a tumbler pin 10. The tumbler pin prevents turning of the key 2 unless the tumblers have been rotated in such a way that the tumblers' peripheral notches 8A make up a continuous groove with respective notches of the intermediate discs 9. The continuous groove enables an inward movement of the tumbler pin 10 in the disc tumbler cylinder lock and turning of the key 2 after clearing a key-specific code. Inward, in this disclosure, represents a direction towards a central area of the disc tumbler cylinder lock's key channel, the area comprising a center axis B (fig. 5) in the disc tumbler cylinder lock. Outward from the disc tumbler cylinder lock represents an opposite direction, i.e. away from the key channel's central area. Springs 12 ensure operation of the tumbler pin as desired. A saddle part 11 can be used between the springs and the tumbler pin 10.

The disc tumbler cylinder lock 1 and key 2 combination according to the invention comprises rotation limiting means 3, also called as rotation limiter, for the key and a guiding element 4 in the disc tumbler cylinder lock 1. The cylinder lock may also have return pins 13 in order to guide the tumbler discs 8 back to the basic position, when the key is turned back the basic position also. The rotation limiting means is illustrated in figures 5 – 12.

The rotation limiting means comprises a body 3B having a key profile opening 21, and a casing 3A, which at least partially surrounds the body. The disc tumbler cylinder lock 1 comprises also a guiding element 4, and the key 2 comprises a moveable

element 5. The key has also combination cuts 15 constituting a key code in a known manner.

As can be noted, especially in fig. 1, the inner structure arrangement of the cylinder lock can comprise different parts like the inner cylinder 7, disc tumblers 8, the rotation
5 limiter 3, the guiding element 4, the tumbler pin 10 etc.

The key 2 comprises a slot 16, which is transverse in relation to a longitudinal axis A of a shaft 18 of the key 2 and also through the shaft of the key. The moveable element 5 is arranged to move along the slot 16. So, the moveable element can move in transverse direction in relation to the longitudinal axis A.

10 The body 3B comprises a locking mechanism comprising a roller 26, a locking piece arrangement 25, and a return spring arrangement 27. The roller 26 comprises a guiding surface 35 on an end 35A of the roller. This end is in the key profile opening 21. The roller 26 is also in connection with the locking piece arrangement 25 and the return spring arrangement 27.

15 The return spring arrangement is arranged to turn the roller 26 towards a locking position of the roller. The locking piece arrangement 25 is also in connection with the casing 3A. The roller, in its locking position, is arranged, in co-operation with the locking piece arrangement 25 and the casing 3A, to prevent the body 3B from turning. The casing has a hole 3C for the key and also for the guiding element 4. The casing is
20 connected to the inner cylinder 7 in a non-rotatable manner utilizing grooves 3D.

The body 3B has second guiding surfaces 28, 29 on sides of the key profile opening 21 to move the moveable element 5 along the slot 16 when inserting the key 2 into the cylinder lock 1 in order that the moveable element 5 is in a position for contacting the guiding surface 35 and turning the roller 26 when the key is further pushed into the
25 cylinder lock. The moveable element 5 may be in any location at the slot 16 before the key is pushed into the lock cylinder. Figures 9, 10 and also 6 illustrate a situation wherein the key shaft has been partly pushed into the lock cylinder, and the shaft part, wherein the moveable element 5 locates, is just inserting into the lock cylinder 1. The second guiding surfaces 28, 29 drive the moveable element to the position wherein it

can contact the guiding surface 35 of roller when the key is further inserted into the lock cylinder.

When the moveable element 5 pushes the guiding surface 35 by the pushing motion of the key, and the roller 26 begins to turn against the force of the return spring arrangement 27. Figures 7 and 11 illustrate a situation wherein the roller 26 has been
5 turned partly.

The body 3B further comprises third guiding surfaces 36 on sides of the key profile opening 21 to move the moveable element 5 along the slot 16, and with the guiding surface 35, to turn the roller 26 to an open position when the key is yet further pushed
10 into cylinder lock. The open position is illustrated in figs. 8 and 12. It is worth to note that the third guiding surfaces 36 drives the moveable element 5 along the slot 16, i.e. in the transverse direction in relation the longitudinal axis A of the shaft of the key 2.

The body 3B further comprises fourth guiding surface 28B (figure 5), which is arranged to work together the guiding surface 35 to move the moveable element 5 along
15 the slot 16 when pulling the key 2 away from the cylinder lock 1, and as response to this movement of the moveable element 5 the roller 26 is arranged to turn towards it's locking position. The return spring arrangement secures the turning of the roller to the locking position.

The moveable element 5 has a round profile at least at its ends. The ends provide
20 projections at sides of the key shaft 18, and are capable to contact the guiding surfaces 35, 28, 28B, 29, 36 as described above. The embodiments of the figures show that moveable element has a round profile. However, the profile of moveable element may also be another, especially in the middle part of the moveable element, like a rectangular profile. As can be seen, the basic shape of the moveable element 5 can be a
25 short pin.

The slot 16 may have grooves 19 in the middle of the slot, and the moveable element 5 has a boss 20, which is aligned with the grooves. In this way the moveable element remains in the slot 16 and does not release from the key 2. In order to make an installation convenient the key 2 may comprise an insert body 17, which has been installed

into a through hole. The insert body 17 comprises said slot 16 wherein the moveable element 5 is.

The second guiding surfaces 28, 29 are slopes in relation to a longitudinal axis B of the key profile opening 21 and sloping towards an end side 21A of the key profile opening from a view outside the key profile opening. The third guiding surfaces 36 are slopes in relation to a longitudinal axis B of the key profile opening 21 and sloping towards a second end side 21B of the key profile opening from a view outside the key profile opening. So, when inserting the key 2 into the lock cylinder 1, the moveable element 5 is driven first towards the end side 21A of the key profile opening, and later towards the second end side 21B of the key profile opening. It means that the moveable element 5 is driven to move back and forth in the slot 16 when inserting the key into the lock cylinder.

The third guiding surfaces 36 can be formed by ends of rails 4A of the guiding element 4 as illustrated in figures 10 – 12. The guiding element is connected to the body 3B. Another way to provide the third guiding surfaces is to have separate projection on the sides of key profile opening, but also in this embodiment it is convenient that the surface of the projection, which is towards the center of the key profile opening 21, matches with the inner surface 4C of the rail 4A. A yoke 4B connected the rails 4A of the guiding element 4 at an inner end of the disc tumbler cylinder lock.

The fourth guiding surface 28B is a slope in relation to a longitudinal axis of the key profile opening 21 and sloping towards a second end side 21B of the key profile opening from a view outside the key profile opening and being an opposite side of the key profile opening 21 than the end 35A of the roller 26. The fourth guiding surface 28B works together with the guiding surface 35 when the key 2 is pulled out of the lock cylinder 1.

The guiding surface 35 on the roller 26 has a concave shape, so it has rounded edges 35B up in relation to the middle part 35C of the guiding surface 35 as illustrated in the figures. This kind of shape is convenient to drive the moveable element 5. As illustrated in the figures the guiding surface 35 is a side of a cutting 34 on the end 35A of the roller.

The roller 26 has also a recess 32, which is towards the locking piece arrangement 25 in the open position of the roller 26. In the open position the recess 32 allows the locking piece arrangement 25 to move away from the casing part 3A in which case the body 3B is rotatable with the inner cylinder 7 in relation to the casing part 3A and the body part 6. When the roller is in the locking position the recess is not with the same line with the locking piece arrangement 25, in which case the locking piece arrangement 25 is partly in a recess 3E of the casing part, and the body 3B is not rotatable in relation to the casing part, and therefore the inner cylinder 7 cannot be turned for clearing the key code. The locking piece arrangement 25 may comprise at least two balls 25, but it can also be made in a different way. It may, for example, comprise a pin with rounded ends.

The roller may have a stopper 33 to limit turning of the roller with the body 3B. Further, the roller 26 may also have a circling groove 31 on its surface in connection with the recess 32. The circling groove provide more guiding to the locking piece arrangement 25. In addition, the roller may have a groove 30 for the return spring arrangement 27.

The return spring arrangement 27 may comprise a torsion spring as in the embodiments of the figures. Another embodiment of the return spring arrangement 27 comprises a return ball and a pressure spring. So, there are many ways to fabricate the return spring arrangement.

In addition to the above said parts of body 3B, like the roller 26, the locking piece arrangement 25, and the return spring arrangement 27, the body 3B may comprise an indicator arrangement 22 to indicate a locking state of the cylinder lock. The locking state refers to a condition wherein the inner cylinder 7 cannot be turned. So, the key 2 may have a recess 5A for the indicator arrangement 22.

The indicator arrangement 22 works also as a limiting arrangement to limit the rotation of the body 3B. The indicator arrangement 22 may comprise two balls 23 and a spring 24 between the balls. One of the ball lies against the casing 3A. The casing has a recess 3F for the ball. If the key is fully inserted into the cylinder lock, then the ball on

the casing side is able to move away from the recess 3F of the casing as the key is turned.

Figures 13, 14 and 15 illustrate an example of the pin tumbler cylinder lock 40 according to the invention. Figures 16 and 17 show an example of the key used with the pin tumbler cylinder lock according to the invention. The pin tumbler cylinder lock 40 has an outer structure 41 wherein an inner cylinder 42 has been installed. The inner cylinder has also said key profile opening 43 where to the key 46 is inserted when opening the lock. Part of pin tumblers 45 are inside the inner cylinder, as figure 15 shows. So, the inner structure arrangement comprises at least the inner cylinder 42 with the key profile opening 43, and the parts of pin tumblers 45 in embodiments of pin tumbler cylinder locks.

The key 46 has the similar part as in the example of figures 2 – 4, i.e. the moveable element 5, and the slot 16. Further the key 46, 2 may have the grooves 19 and the insert body 17, and the moveable element may have the boss 20.

The inner cylinder 42 (and therefore the inner structure arrangement) according to the invention comprises said roller 26, a locking piece arrangement 25, and a return spring arrangement 27. Here, the locking piece arrangement 25 is also in connection with the outer structure 41. So, the roller, in it's locking position, is arranged, in cooperation with the locking piece arrangement 25 and the outer structure to prevent the inner cylinder from turning. The bore of the outer structure 41 where to the inner cylinder is installed has a recess 44 for the locking piece arrangement in order to keep the roller in it's locking position. The pin tumbler cylinder has also the above said guiding surface 35, at least one second guiding surface 29, and at least one third guiding surface 36.

The guiding surface 35 is further arranged to move the moveable element 5 along the slot 16 when pulling the key 46 away from the pin tumbler cylinder lock 40 and as response to this movement of the moveable element 5 the roller 26 being arranged to turn towards it's locking position.

Figure 17 shows an embodiment wherein the slot 16 is through the shaft of the key 46. In this case the pin tumbler cylinder can have fourth guiding surface 28B on one side of the key profile opening, which fourth guiding surface is arranged to work

together the guiding surface 35 to move the moveable element 5 along the slot 16 when pulling the key 2 away from the cylinder lock 1. Another embodiment is that the slot is not through the shaft of the key. So the moveable element 5 provides a projection on one side of the shaft of the key. Any case it is convenient that the profile of the key 5 46 is such a kind that it has a longitudinal groove wherein the projecting part of the moveable element is. In this way, external wearing the moveable element 5 is lesser. A further yet embodiment is that the moveable element 5 has flanges for keeping it in the slot 16, which is through the shaft of the key 2, 46. So, this embodiment of the key is useable with the disc tumbler and pin tumbler cylinders. As can be noted, at least 10 some parts of the pin tumbler cylinder lock and the key, and their functions according to the invention are similar as the corresponding parts and functions in the disc tumbler cylinder lock and the key as illustrated above.

The invention improves the security features of the disc tumbler cylinder lock / pin tumbler cylinder lock and key combination. Manipulation is more difficult due to the 15 roller 26 and its turning, and the moveable element 5 in the key is driven to move back and forth in the slot 16 in transverse direction in relation to the longitudinal axis A of the key 2 when inserting the key into the lock cylinder. A key security is also improved because it is very difficult to copy a workable key.

The body 3B or the inner cylinder 42 has bores and cavities for the parts said in this 20 description. As named the key profile opening 21 follows the profile of the key 2, 46. It is obvious that the invention is not limited to the examples presented in this disclosure, but the invention can be implemented with a multitude of various embodiments within the scope of the appended claims.

Claims

1. A cylinder lock (1, 40) and key (2, 46) combination, wherein the cylinder lock (1, 40) comprises an inner structure arrangement, which comprises a key profile opening (21, 43), and the key (2, 46) comprises a moveable element (5), **characterized** in that

5 the key (2, 46) comprises a slot (16) which is transverse in relation to a longitudinal axis of a shaft of the key (2, 46), and the moveable element (5) is arranged to move along the slot (16),

the inner structure arrangement comprises a locking mechanism comprising a roller (26), a locking piece arrangement (25), and a return spring arrangement (27), the roller (26) comprising a guiding surface (35) on an end (35A) of the roller, which end is in the key profile opening (21, 43), the roller (26) being also in connection with the locking piece arrangement (25) and the return spring arrangement (27),

15 the return spring arrangement being arranged to turn the roller (26) towards a locking position of the roller, which roller in its locking position is arranged in cooperation with the locking piece arrangement (25) to prevent the inner structure arrangement from turning,

the inner structure arrangement having at least one second guiding surface (29) on at least one side of the key profile opening (21) to move the moveable element (5) along the slot (16) when inserting the key (2) into the cylinder lock (1) in order that the moveable element (5) is in a position for contacting the guiding surface (35) and turning the roller (26) when the key is further pushed into cylinder lock,

20 the inner structure arrangement further comprising at least one third guiding surface (36) on at least one side of the key profile opening (21) to move the moveable element (5) along the slot (16), and with the guiding surface (35), to turn the roller (26) to an open position when the key is yet further pushed into cylinder lock,

25 the guiding surface (35) being further arranged to move the moveable element (5) along the slot (16) when pulling the key (2) away from the cylinder lock (1) and as response to this movement of the moveable element (5) the roller (26) being arranged to turn towards its locking position.

2. A combination according to claim 1, **characterized** in that the slot (16) is through the shaft of the key.

3. A combination according to claim 1 or 2, **characterized** in that the moveable element (5) has a round profile at least at its one end, which end/s provide projection/s at
5 side/s of the key shaft (18).

4. A combination according to claim 3, **characterized** in that the slot (16) has grooves (19) in the slot, and the moveable element (5) has a boss (20), which is aligned with the grooves.

5. A combination according to claim 3, **characterized** in that the moveable element
10 (5) has flanges for keeping it in the slot (16), which is through the shaft of the key.

6. A combination according to claim 3, 4 or 5, **characterized** in that the key (2) comprises an insert body (17), installed into a through hole, the insert body (17) comprising said slot (16) wherein the moveable element (5) is.

7. A combination according to any of claims 1 - 6, **characterized** in that the second
15 guiding surface/s (28, 29) is/are a slope/s in relation to a longitudinal axis of the key profile opening (21) and sloping towards an end side (21A) of the key profile opening from a view outside the key profile opening.

8. A combination according to claim 7, **characterized** in that the third guiding surface/s (36) is/are a slope/s in relation to a longitudinal axis of the key profile opening
20 (21) and sloping towards a second end side (21B) of the key profile opening from a view outside the key profile opening.

9. A combination according to any of claims 1 - 8, **characterized** in that the roller (26) has a recess (32), which is towards the locking piece arrangement (25) in the open position of the roller (26).

25 10. A combination according to claim 9, **characterized** in that the roller has a stopper (33) to limit turning of the roller.

11. A combination according to claim 9 or 10, **characterized** in that the roller (26) has a circling groove (31) on its surface in connection with the recess (32).

12. A combination according to any of claims 1 - 11, **characterized** in that the guiding surface (35) is a side of a cutting (34) on the end (35A) of the roller.

13. A combination according to any of claims 1 - 12, **characterized** in that the locking piece arrangement (25) comprises at least two balls.

5 14. A combination according to any of claims 1 - 12, **characterized** in that the locking piece arrangement (25) comprises a pin with rounded ends.

15. A combination according to any of claims 1-14, **characterized** in that the return spring arrangement (27) comprises a torsion spring.

10 16. A combination according to any of claims 1 - 14, **characterized** in that the return spring arrangement (27) comprises a return ball and a pressure spring.

17. A combination according to any of claims 1 - 16, **characterized** in that the cylinder lock (1) is a disc tumbler cylinder lock, wherein the inner structure arrangement comprises rotation limiting means (3) for the key, which rotation limiting means comprise a body (3B) having a key profile opening (21), and a casing (3A), which at least
15 partially surrounds the body, the disc tumbler cylinder lock (1) comprising also a guiding element (4), the slot (16) of said key being through the shaft of the key,

the body (3B) comprises said locking mechanism comprising a roller (26), a locking piece arrangement (25), and a return spring arrangement (27), the locking piece arrangement (25) being also in connection with the casing (3A), which roller, in its locking
20 position, is arranged, in cooperation with the locking piece arrangement (25) and the casing (3A), to prevent the body (3B) from turning,

the body (3B) having said second guiding surfaces (28, 29) and third guiding surfaces (36) on the sides of the key profile opening (21), and the body (3B) further comprising fourth guiding surface (28B), which is arranged to work together the guiding
25 surface (35) to move the moveable element (5) along the slot (16) when pulling the key (2) away from the cylinder lock (1).

18. A combination according to claim 17, **characterized** in that the third guiding surfaces (36) are formed by ends of rails (4A) of the guiding element (4), which guiding element is connected to the body (3B).

19. A combination according to any of claims 17 - 18, **characterized** in that the fourth guiding surface (28B) is a slope in relation to a longitudinal axis of the key profile opening (21) and sloping towards a second end side (21B) of the key profile opening from a view outside the key profile opening and being an opposite side of the key profile opening (21) than the end (35A) of the roller.

20. A combination according to any of claims 17-19, **characterized** in that it comprises an indicator arrangement (22) to indicate a locking state of the cylinder lock.

21. A combination according to claim 20, **characterized** in that the indicator arrangement (22) comprises a spring (24) and two balls (23).

22. A combination according to any of claims 1 - 16, **characterized** in that the cylinder lock (1) is a pin tumbler cylinder lock wherein the inner structure arrangement comprises an inner cylinder, which comprises said locking mechanism comprising the roller (26), the locking piece arrangement (25), and the return spring arrangement (27), the inner cylinder also comprising said key profile opening.

23. A combination according to claim 22, **characterized** in that it comprises a fourth guiding surface (28B) on one side of the key profile opening, which fourth guiding surface is arranged to work together the guiding surface (35) to move the moveable element (5) along the slot (16) when pulling the key (2) away from the cylinder lock (1).