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Hakija(t)
Sökande
Applicant(s)

Abloy Oy

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Disc tumbler cylinder lock and key combination

Technical field

This invention relates to a disc tumbler cylinder lock and key combination. Specifically, the invention relates to a 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 81429 discloses a known rotation limiter for a disc tumbler cylinder lock. The rotation limiter

comprises a body and a casing ring. The casing ring is connected to an inner cylinder of the disc tumbler cylinder lock. The body is provided with a key profile opening in the middle of the body, by way of which the key can be inserted into the cylinder lock. On each side of the key profile opening are limiting plates.

5 The key matching a disc tumbler cylinder lock has a groove for the limiting plates. When a correct key is present in the key cylinder, the groove is in line with the limiting plates, and the key can thereby be turned for displacing the tumbler discs to a correct position for releasing the locking. Hence, the inner cylinder is able to rotate as turning of the key is continued. Thus, the rotation limiter improves operational reliability of the
10 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 81429. The guiding element comprises two rails and a yoke between the rails. The yoke is located at an inner end of the disc tumbler cylinder lock and thus joins the rails fixedly
15 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 out of the lock and also functions as a casing against manipulation. In addition, it also
20 contributes for its part to the profile of a lock-matching key.

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

25 **Brief description of the invention**

 It is an objective of the invention to form an alternative solution and also to improve the operational reliability and the safety of a disc tumbler 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.

An invention concerns a disc tumbler cylinder lock 3, 3A and key 2, 2B combination, wherein the disc tumbler cylinder lock 3, 3A comprises rotation limiting means 10 10A for the key. The rotation limiting means comprise a body 13, 131 having a key profile opening 34, 341, a guiding element 12, 12A connected to the body. The key 2, 2A
 5 comprises guiding grooves 21, 211 at both sides of the key in a longitudinal direction of a key shank 2A, 2A1, and a transversal groove 19, 191, which is transverse in relation to a longitudinal axis of the shank 2A, 2A1 of the key 2, 2B. The rotation limiting means 10, 10A comprises a plate 14, 14A, which is in moveable connection with the body. The plate comprises projections 31, 133 towards each other, the projections 31,
 10 133 are in the guiding grooves 21, 211 when the key 2, 2B is inserted into the cylinder lock. The plate also has a limiting surface 40, 32A, and the disc tumbler cylinder lock comprises a counter surface 41, 25A.

The rotation limiting means 10, 10A are arranged to be in its locking position wherein the limiting surface 40, 32A is against the counter surface 41, 25A, and the rotation
 15 limiting means are arranged to rotate in case the key 2, 2B is inserted into the cylinder lock and turned. Therefore the transversal groove 19, 191 is in line with the projections 31, 133 allowing the plate 14, 14A to move along the transversal groove 19, 191, and the turning the key moves the limiting surface 40, 32A away from the counter surface 41, 25A.

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List of figures

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

- Fig. 1 shows an example of a disc tumbler cylinder lock and a key of the invention,
- 25 Fig. 2 shows an example of a key of the invention,
- Fig. 3 shows an example of a casing,
- Fig. 4 shows an example of a plate,
- Fig. 5 shows the plate of fig. 4 from the other side,

Fig. 6 shows an example of a body,

Fig. 7 shows the plates of a rotation limiting means in the locking position from a key opening side,

Fig. 8 shows positions of the taps of the plates in a locking position viewed from a
5 guiding element side,

Fig. 9 shows the plates of a rotation limiting means turned from the locking position, viewed from the key opening side,

Fig. 10 shows positions of the taps of the plates turned from the locking position, viewed from a guiding element side,

10 Fig. 11 shows the plates of a rotation limiting means turned 90 degrees from the locking position, viewed from the key opening side,

Fig. 12 shows positions of the taps of the plates turned 90 degrees from the locking position, viewed from a guiding element side,

Fig. 13 shows an example of a section view of the key,

15 Fig. 14 shows another example of a disc tumbler cylinder lock and a key of the invention,

Fig. 15 shows another example of a key of the invention,

Fig. 16 shows the plate of a rotation limiting means of figure 14 in the locking position from a key opening side,

20 Fig. 17 shows the plates of the rotation limiting means of figure 14 turned from the locking position, viewed from the key opening side, and

Fig. 18 shows the plates of a rotation limiting means of figure 14 turned 90 degrees from the locking position, viewed from the key opening side.

25 **Description**

Figures 1 and 14 illustrate different embodiments of the invention. As said the invention concerns a disc tumbler cylinder lock 3, 3A and key 2, 2B combination, wherein

the disc tumbler cylinder lock 3, 3A comprises rotation limiting means 10 10A for the key. The rotation limiting means comprise a body 13, 131 having a key profile opening 34, 341, a guiding element 12, 12A connected to the body. The key 2, 2A comprises guiding grooves 21, 211 at both sides of the key in a longitudinal direction of a key shank 2A, 2A1, and a transversal groove 19, 191, which is transverse in relation to a longitudinal axis of the shank 2A, 2A1 of the key 2, 2B. The rotation limiting means 10, 10A comprises a plate 14, 14A, which is in moveable connection with the body. The plate comprises projections 31, 133 towards each other, the projections 31, 133 are in the guiding grooves 21, 211 when the key 2, 2B is inserted into the cylinder lock. The plate also has a limiting surface 40, 32A, and the disc tumbler cylinder lock comprises a counter surface 41, 25A.

The rotation limiting means 10, 10A are arranged to be in its locking position wherein the limiting surface 40, 32A is against the counter surface 41, 25A, and the rotation limiting means are arranged to rotate in case the key 2, 2B is inserted into the cylinder lock and turned. Therefore, the transversal groove 19, 191 is in line with the projections 31, 133 allowing the plate 14, 14A to move along the transversal groove 19, 191, and the turning the key moves the limiting surface 40, 32A away from the counter surface 41, 25A. The locking position means already said basic position.

Figures 2 and 15 show different embodiments of the key according to the invention. The transversal groove 19 can have a bottom 19A, which is at the same level than the highest section 21A of a bottom of the guiding groove 21 as can be seen in figure 2. The transversal groove 191 can have a concave bottom as well as shown in figure 15. As can be noticed different keys according to the invention can be made, like different shapes of the groove 19, 191. Although, the key of figure 2 is illustrated to be used with the cylinder lock of figure 1, it is also possible to form another embodiment of figure 1 which uses the key that corresponds figure 15. Similarly, it is possible to make another embodiment of figure 14, which uses a key that corresponds figure 15 embodiment. To be accurate figure 15 shows a key blank whereto combination cuts can be made on the shank 2A1 of the key. A skilled reader understands this, so it is clear that figure 15 illustrates the key as well, at least implicitly.

So, fig. 1 shows an example of a disc tumbler cylinder lock and a key of the invention. The invention relates to a disc tumbler cylinder lock 3 and key 2 combination 1, wherein the disc tumbler cylinder lock 3 comprises rotation limiting means 10 for the key. The rotation limiting means comprise a body 13 having a key profile opening 34,
 5 a guiding element 12 connected to the body, and a casing 11, which at least partially surrounds the body.

As can be seen in fig. 1 the cylinder lock comprises also an outer cylinder 4 having a key hole 18, and an inner cylinder 5. Disc tumblers 6 and intermediate discs 7 are inside the inner cylinder 5. The intermediate discs 7 are fixed to the inner cylinder in an
 10 nonrotatable manner, so the turning movement of a single disc tumbler 6 is not transmitted to an adjacent disc tumbler.

The inner cylinder may also comprise a support plate 16 inside the inner cylinder. As said, in the basic position the cylinder lock is at the locked state. The key 2 is inserted into the lock cylinder 3 through the key hole 18. If the key 2 is right for the cylinder
 15 lock 3, the rotation limiting means 10 allows the turning of the key. When turning the key, the disc tumblers 6 turn, driven by the combination cuts 20 of the key. After 90 degrees turning the disc tumblers 6 are in positions wherein their outer slots are in line with each other and also in line with the locking bar 8. The locking bar prevents the turning of the inner cylinder 5 in relation to the outer cylinder 4 in the basic position.
 20 When the disc tumblers 6 are in line with the locking bar in a manner said above, and the turning of the key 2 is continued, the locking bar 8 moves into the inner cylinder in a bar slot 17 of the inner cylinder, and into the aligned outer slots of the disc tumblers. Thus, the inner cylinder 5 can rotate in relation to the outer cylinder 4, and the lock can be unlocked/opened. The lock is locked when the key 2 in the cylinder lock is turned at
 25 the opposite direction to the basic position. Return rods 9 help the rotation of the tumbler discs back to the basic position.

Fig. 2 shows an example for a key 2 according to the invention. The key 2 comprises guiding grooves 21 at both sides of the key in a longitudinal direction of a key shank 2A. The guiding grooves 21 are for the guiding element 12, having matching
 30 contours with the shapes in the rails of the guiding element 12. The key has also a

transversal groove 19, which is transverse in relation to a longitudinal axis of a shank 2A of the key 2.

The rotation limiting means 10 comprises also one or two plates 14 having an U-form comprising two side parts 29 and a connecting part 33 connecting the side parts.

5 The connecting part has a tap 32, and the side parts 29 have projections 31 towards each other. The projections 31 are arranged to be in the guiding grooves 21 when the key 2 is inserted into the cylinder lock. Figures 4 and 5 show the plate 14. Figure 13 shows a section view of the key 2 in the place of the transversal groove 19. So, when the key is inserted into the cylinder lock 3, the projections of the plate/s are in the guiding
10 ing grooves, and the key is allowed to be pushed into the lock. When the key 2 has been pushed to the bottom, the transversal groove/s 19 are in line with the projections 31. In other words, the place of the shank 2A of the key having the transversal grooves 19 is at the same level than the plate/s 14 and their projections 31.

Figure 6 shows the body 13 of the rotation limiting means 10. The body 13 comprises one or two slots 35 on an outer edge 13A of the body, and guiding projections
15 37 on a side of the body. The plate/s 14 are between the guiding projections 37, and the tap/s 32 are through the slots 35, which can be noted in figures 1 and 7 - 12. As can be noted the body has a basic shape of a plate. The guiding element 12 is at another side of the body than the guiding projections 37. In addition, it can be noted in
20 figure 1 that the rotation limiting means 10 may comprise a drilling cover 15 placed on another side of the plate/s 14 than the guiding element 12.

Figure 3 shows an embodiment of the casing 11. The casing 11 comprises a central hole 22 and a circle groove 24 around the central hole. The circle groove has one or two sectors 27 being nearer the central hole 22 than the rest of the circle groove. At
25 said sector/s 27 an outer edge of the circle groove has a projection 25 towards the central hole 22, and an inner edge of the circle groove 24 has a cavity 26. An outer edge of the casing 11 is wider than the middle part the casing having said circle groove 24. The outer edge may have a cut 23 for providing a turning area for the drilling cover 15 having a peripheral projection. The casing 11 is arranged to be connected to the
30 inner cylinder 5 in a nonrotatable manner utilizing shapes 11A.

The rotation limiting means 10 are arranged to be in its locking position wherein the tap/s 32 is/are in said sector/s 27 against the projection/s 25 and the cavity/s 26. The rotation limiting means are arranged to rotate in case said key 2 is inserted into the cylinder lock and turned, when the transversal groove 19 is in line with the projections 31 allowing the plates 14 to move along the transversal groove 19, and the turning of the key at the same time moves the tap/s in the circle groove 24 away from said sector/s 27.

Figures 7 – 12 illustrate the function of the rotation limiting means 10 when the cylinder lock 3 is opened from its locked position (basic position). These figures do not show the key in the cylinder, but it is assumed that the key 2 is fully inserted into the cylinder lock.

Fig. 7 shows the plates 14 of the rotation limiting means in the locking position, viewed from the key opening side 18. Fig. 8 shows positions of the taps 32 of the plates in a locking position, viewed from the guiding element 12 side. Since the projections 31 of the plate/s are in the guiding groove 21 (See also Fig. 13) the insertion of the key into the cylinder lock 3 has been allowed. The tap/s 32 is/are in said sector/s 27 against the projection/s 25 and the cavity/s 26. So, the plate/s 14 are kept in the basic position. The plate/s are not allowed to move freely in the basic position. The plate/s 14 are between the guiding projections 37, more precisely between the guiding surfaces 38 of the guiding projections 37. The guiding projections 37 may also have an additional projection 39 for attaching the body 13 with the drilling cover 15.

The connecting part 33 of the plate has an internal side 33A, which provides a bottom of a slot 30, the slot being between said two side parts 29. The internal side 33A can be arranged to be at the same level with an edge 34A of the key profile opening 34, or near enough. See also figures 4 – 6. So, the plate/s follow the shape of the key profile opening 34 as close as convenient. When the plate/s are not allowed to move freely in the basic position as well, the plate/s improve the operational reliability of the disc tumbler cylinder lock and key combination, and also the safety against an unauthorized opening of the disc tumbler cylinder lock.

In order to open cylinder lock 3, the right key 2 is fully inserted into the lock cylinder. Then the transversal groove/s 19 are in line with the projections 31 of the plate/s 14, and the key can be turned. When turning the key 2, the transversal groove/s allows the projections 31 to move along the transversal groove/s, which means that the plate/s move when turning the key. If the key is a wrong key, for example having the guiding grooves 21 but no transversal groove/s, the sides 21C of the guiding grooves 21 hinder the movement of the plate/s 14.

Fig. 9 shows the plates 14 of a rotation limiting means turned by the right key 2 from the locking position, viewed from the key opening 18 side. Fig. 10 shows positions of the taps of the plates turned from the locking position, viewed from a guiding element side. As can be seen the plates 19 have moved along the transversal grooves 19 towards the outer edge of the casing 11. The taps 32 have been moved away from the dead-end point (middle point) of the sectors 27. When the turning of the key is continued, the taps move away from the sectors 27 into the outer parts of the circle groove 24. Fig. 12 shows positions of the taps of the plates 14 when the key 2 (and the body 13 and the plates) has been turned 90 degrees from the locking position, viewed from a guiding element side. Figures 8, 10 and 12 show the yoke part of the guiding element 12. Fig. 11 shows the plates 14 of the rotation limiting means turned 90 degrees from the locking position, viewed from the key opening side. In the position of fig. 11 and 12, the key code is cleared and when turning of the key continues, the disc tumbler cylinder lock is unlocked/opened.

Further, it can be seen in the figures that the side edges 29A of the side parts 29 are arranged to be against the guiding projections 37, and the projections 31 are at internal corners 29B of the side parts 29.

In figure 13, it can be seen that the transversal groove 19 has a bottom 19A, which can be at the same level than the highest section 21A of a bottom of the guiding groove 21 as the case is in fig. 13. Although the transversal groove 19 could be deeper, this kind of groove embodiment has some benefits. The middle part of the key shank remains more rigid because this kind of transversal groove is a two-part part groove having no extra transversal cut at the bottom of the longitudinal guiding groove 21. Further,

this kind of transversal groove 19 on the sides of the key shank can be situated at a place of a combination cut 20 without preventing the function of the combination cut. By doing so the same key 2 can be used with the disc tumbler cylinder lock described above and illustrated in fig. 1, and also with another disc tumbler cylinder lock having one or more additional disc tumblers 6 than described above. In other words, the other cylinder lock can be longer, than the embodiment of fig. 1.

The bottom of the guiding groove 21 can be used to provide a profile of a lock-matching key for a corresponding rail shapes of the guiding element 12. Figure 13 only one possible example. The bottom may, for example, be flat, in which case the whole bottom provides the highest section 21A of a bottom of the guiding groove. There can also be more than one highest sections 21A in the bottom as the case is in figure 13. So the bottom may have one or more profile grooves 21B.

One or two plates 14 can be used when providing an embodiment according to the invention. Any case, the embodiment of two plates is more reliable and safe, since force distribution is more even inside the rotation limiting means 10, i.e. the rotation limiter. Further, it is possible that the projection 25 comprises a minor recess 28 in the middle of the projection, and the cavity 26 comprises a minor protrusion 28A in the middle of the cavity. These minor recess and protrusion promote to keep the taps 32 in the basic position.

Figures 14 and 15 show another embodiment of the invention. It also comprises a disc tumbler cylinder lock 3A and key 2B combination. Figure 14 does not show an outer cylinder 4, but it is noted that the cylinder lock comprises it, like correspondingly illustrated in figure 1. An inner cylinder 60 comprises disc tumblers 6A and intermediate discs 7A. The intermediate discs 7 are fixed to the inner cylinder in a nonrotatable manner, so the turning movement of a single disc tumbler 6 is not transmitted to an adjacent disc tumbler. Figure 14 shows also a locking bar 61. The functioning of the locking bar and the disc tumblers has described above.

The disc tumbler cylinder lock 3A comprises rotation limiting means 10A for the key. The rotation limiter has a body 131, which is a circle plate comprising a key hole 341. The guiding element 12A has two rods having narrow ends 12B. The circle plate body

further comprises two holes 132 where to the narrow ends 12B are connected. The plate 14A comprises a center hole 42 for the key 2B and two second holes 43. The narrow ends 12B are through the second holes. The center hole and the second holes are arranged to allow the movement of the plate 14A along the transversal groove 191 when turning the key 2B. It is worth to note that in this embodiment the guiding element 12A can be considered to be a part of the rotation limiting means 10A, because it is connected to the body, and it provides guidance to the plate 14A.

The plate 14A comprises said limiting surface 40 and can have a return surface 44. The inner cylinder 60 of the disc tumbler cylinder lock comprises the counter surface 41 and can have a counter return surface 45. The return surface and counter return surface are arranged to guide the movement of the plate 14A back to the locking position when turning the key in the opposite direction. The counter return surface 45 and the counter surface 41 are ends of a cutting sector 46 of an inner cylinder of the disc tumbler cylinder lock.

Fig. 16 shows the plate 14A of the rotation limiting means in the locking position, viewed from the key opening side. Since the projections 133 of the plate is in the guiding grooves 211 (See also Fig. 15) the insertion of the key into the cylinder lock 3 has been allowed. The ends 12B and the shapes of the plate edge against the inner cylinder 60 keep the plate in the basic position. The plate is not allowed to move freely in the basic position. In order to open the cylinder lock 3A, the right key 2B is fully inserted into the lock cylinder. Then the transversal grooves 191 are in line with the projections 133 of the plate 14A, and the key can be turned. When turning the key 2A, the transversal grooves allow the projections 133 to move along the transversal grooves, which means that the plate moves when turning the key. If the key is a wrong key, for example having the guiding grooves 211 but no transversal grooves, the sides of the guiding grooves hinder the movement of the plates 14A.

Fig. 17 shows the plate 14A turned by the right key 2B from the locking position, viewed from the key opening side. As can be seen the plate have moved along the transversal grooves. The center hole 42 and two holes 43 for the ends 12B of the guiding element, have space to allow the movement of the plate 14A. When the turning of

the key is continued, it can be turned to the position illustrated in figure 18. Figure 18 shows a situation when the key 2B (and the body 131) has been turned 90 degrees from the locking position. In this position the rotation limiting means is turned 90 degrees from the locking position, and the key code is cleared and when turning of the
 5 key continues, the disc tumbler cylinder lock is unlocked/opened.

As can be seen in figures 16 - 18 the plate 14A can have a stopper 47, which is arranged to be against the limiting surface 40 when the plate 14A is in an 90 degrees turned position. The plate can further comprise a slope surface 48 being in connection with the return surface 44 at a deeper end 48A of the slope surface. The plate 14A may
 10 have a projection sector 49 between the stopper 47 and the return surface 44. The plate 14A has an indentation 411 for a locking bar as well.

The inner cylinder 60 may comprise a zero tumbler 50 having a central hole 51 and two second holes 52. A zero tumbler disc is a tumbler disc that turns always with the key. The narrow ends 12B of the rods 12A are through the two second holes 52, and
 15 the zero tumbler 50 is against the plate 14A. This kind of zero tumbler disc may provide further support for the plate 14A. Both the body plate 131 and the zero tumbler 50 may conveniently have profile projections 53 towards each other. The profile projections match with the guiding grooves 211.

The invention improves operational reliability and the security features of the disc
 20 tumbler cylinder lock and key combination. Reliability of the lock's function is better, and manipulation is more difficult since the plates 14 do not move freely in the basic position.

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
 25 within the scope of the independent claim.

Claims

1. A disc tumbler cylinder lock (3, 3A) and key (2, 2B) combination, wherein the disc tumbler cylinder lock (3, 3A) comprises rotation limiting means (10, 10A) for the key, which rotation limiting means comprise a body (13, 131) having a key profile opening (34, 341), a guiding element (12, 12A) connected to the body, and the key (2, 2A) comprises guiding grooves (21, 211) at both sides of the key in a longitudinal direction of a key shank (2A, 2A1), and a transversal groove (19, 191), which is transverse in relation to a longitudinal axis of the shank (2A, 2A1) of the key (2, 2B), **characterized** in that the rotation limiting means (10, 10A) comprises a plate (14, 14A), which is in moveable connection with the body, the plate comprising projections (31, 133) towards each other, the projections (31, 133) being in the guiding grooves (21, 211) when the key (2, 2B) being inserted into the cylinder lock, the plate also having a limiting surface (40, 32A), and the disc tumbler cylinder lock comprises a counter surface (41, 25A),

the rotation limiting means (10, 10A) being arranged to be in its locking position wherein the limiting surface (40, 32A) is against the counter surface (41, 25A), and the rotation limiting means being arranged to rotate in case the key (2, 2B) being inserted into the cylinder lock and turned, and when the transversal groove (19, 191) is in line with the projections (31, 133) allowing the plate (14, 14A) to move along the transversal groove (19, 191), and the turning the key moving the limiting surface (40, 32A) away from the counter surface (41, 25A).

2. A combination according to claim 1, **characterized** in that the transversal groove (19) has a bottom (19A), which is at the same level than the highest section (21A) of a bottom of the guiding groove (21).

3. A combination according to claim 1, **characterized** in that the transversal groove (191) has a concave bottom.

4. A combination according to claim 1, 2 or 3, **characterized** in that it comprises a casing (11), which at least partially surrounds the body, and the rotation limiting means (10) comprises one or two plates (14) having an U-form comprising two side parts (29) and a connecting part (33) connecting the side parts, the connecting part having a tap (32), and the side parts (29) having the projections (31) towards each other, the tap (32) having the limiting surface (32A),

the body (13) comprising one or two slots (35) on an outer edge (13A) of the body, and guiding projections (37) on a side of the body, said plate/s (14) being between the guiding projections (37), and the tap/s (32) being through the slots (35),

10 the casing (11) comprising a central hole (22) , and a circle groove (24) around the central hole, the circle groove having one or two sectors (27) being nearer the central hole (22) than the rest of the circle groove, at said sector/s (27) an outer edge of the circle groove having a projection (25) towards the central hole (22), and an inner edge of the circle groove (24) having a cavity (26), the projection (25) having the counter surface (25A),

the rotation limiting means (10) being arranged to be in its locking position wherein the tap/s (32) is/are in said sector/s (27) against the projection/s (25) and the cavity/s (26), and the rotation limiting means being arranged to rotate in case the key (2) being inserted into the cylinder lock and turned, and when the transversal groove (19) is in line with the projections (31) allowing the plates (14) to move along the transversal groove (19), and the turning the key moving the tap/s in the circle groove (24) away from said sector/s (27).

5. A combination according to claim 4, **characterized** in that the connecting part (33) of the plate has an internal side (33A), which provides a bottom of a slot (30), which slot is between said two side parts (29), the internal side (33A) being arranged to be at the same level with an edge (34A) of the key profile opening (34), or near enough.

6. A combination according to claim 4 or 5, **characterized** in that side edges (29A) of the side parts (29) are arranged to be against the guiding projections (37), and the projections (31) being at internal corners (29B) of the side parts (29).

7. A combination according to any of claims 4 - 6, **characterized** in that the transversal grooves (19) on the sides of the key shank are at a place of a combination cut (20).

8. A combination according to any of claims 4 - 7, **characterized** in that the projection (25) comprises a minor recess (28) in the middle of the projection, and the cavity (26) comprises a minor protrusion (28A) in the middle of the cavity.

9. A combination according to any of claims 4 - 8, **characterized** in that the rotation limiting means (10) comprises a drilling cover (15) placed on another side of the plate/s (14) than the guiding element (12).

10. A combination according to any of claims 4 - 9, **characterized** in that the casing (11) is connected to an inner cylinder (5) of the disc tumbler cylinder lock in a nonrotatable manner.

11. A combination according to claim 1, 2 or 3, **characterized** in that the body (131) is a circle plate comprising a key hole (341), and the guiding element has two rods (12A) having narrow ends (12B), the circle plate further comprising two holes (132) where to the narrow ends (12B) are connected, the plate (14A) comprising a center hole (42) for the key (2B) and two second holes (43), the narrow ends (12B) being through the second holes, the center hole and the second holes being arranged to allow the movement of the plate (14A) along the transversal groove (191) when turning the key (2B).

12. A combination according to claim 11, **characterized** in that the plate (14A) comprises a return surface (44), and an inner cylinder (60) of the disc tumbler cylinder lock comprises the counter surface (41) and a counter return surface (45), which return surface and counter return surface are arranged to guide the movement of the plate back to the locking position when turning the key in the opposite direction, the counter return surface (45) and the counter surface (41) being end of a cutting sector (46) of an inner cylinder of the disc tumbler cylinder lock.

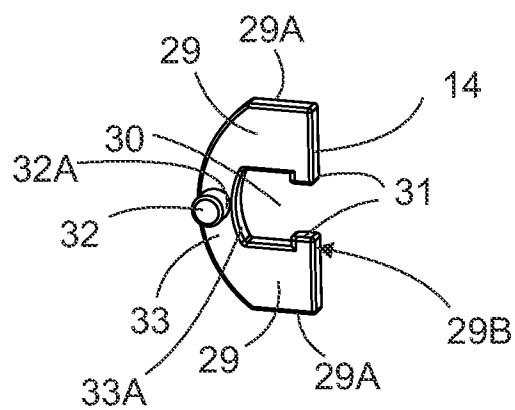
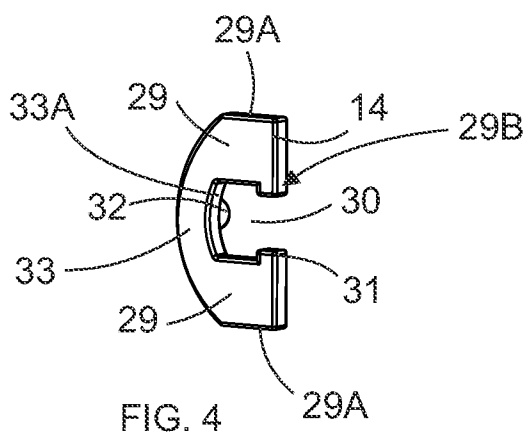
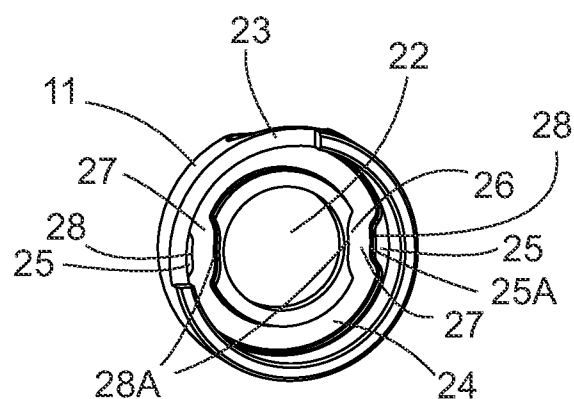
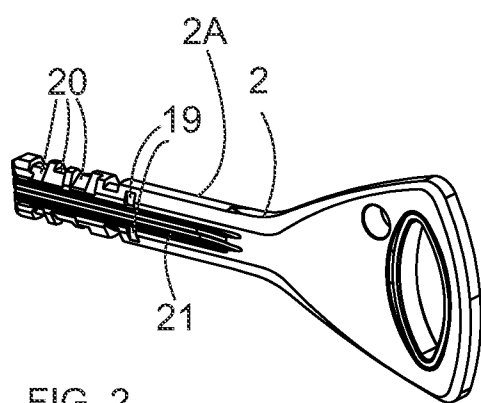
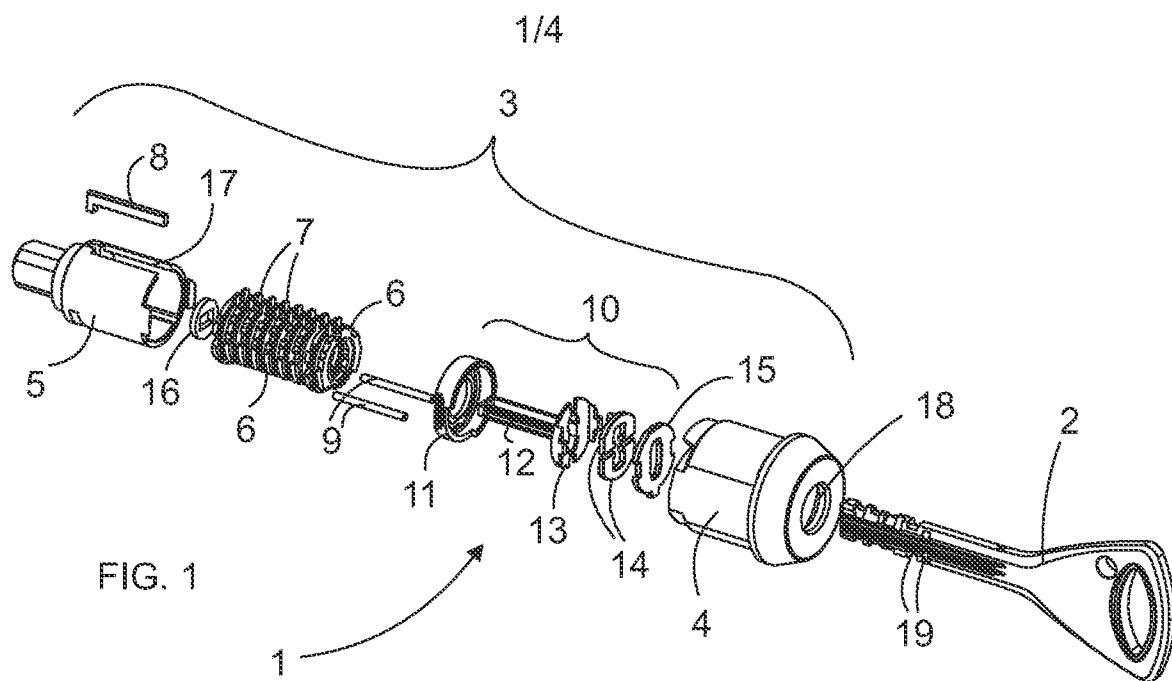
13. A combination according to claim 12, **characterized** in that the plate (14A) has a stopper (47), which is arranged to be against the limiting surface (40) when the plate (14A) is in an 90 degrees turned position, the plate further comprising a slope surface

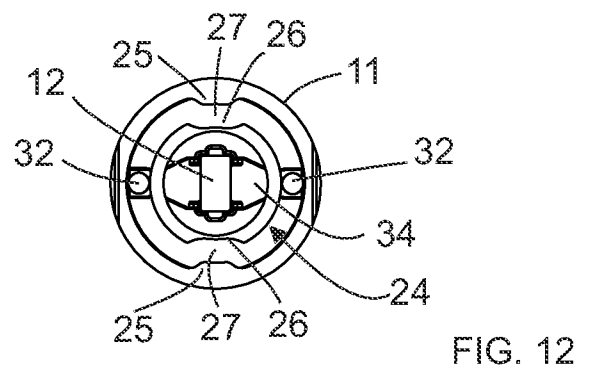
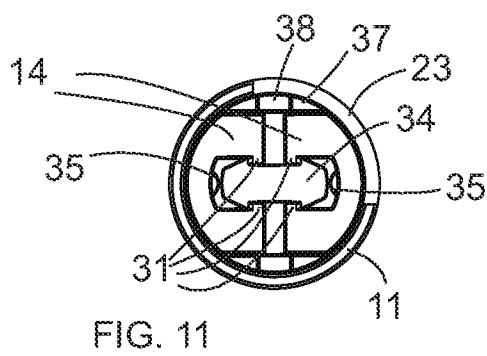
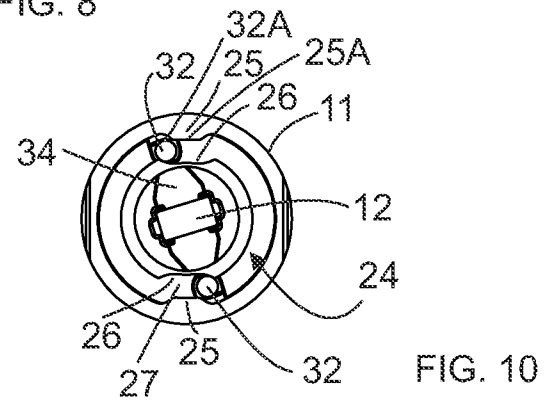
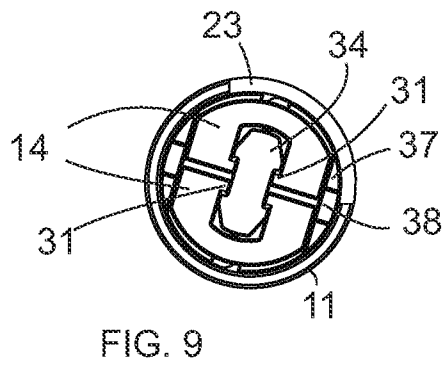
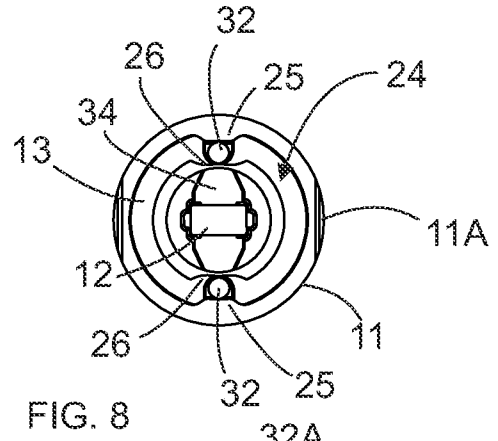
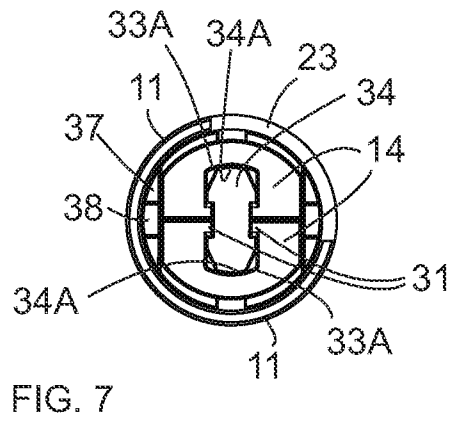
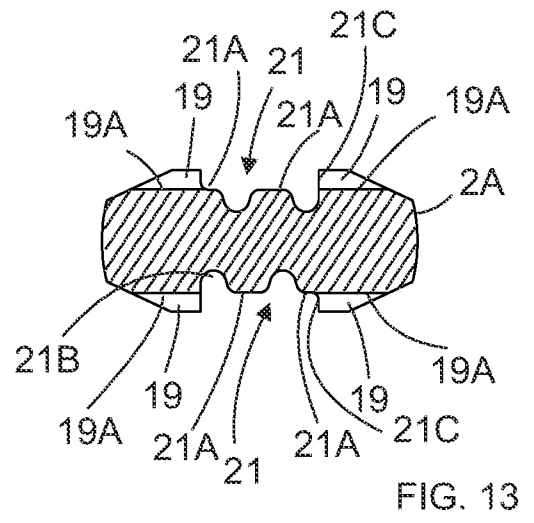
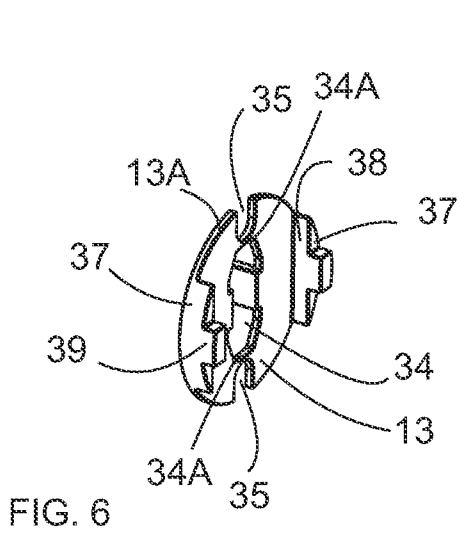
(48) being in connection with the return surface (44) at a deeper end of the slope surface.

14. A combination according to claim 13, **characterized** in that the plate (14A) has a projection sector (49) between the stopper (47) and the return surface (44).

5 15. A combination according to claim 12, 13 or 14, **characterized** in that the plate (14A) has an indentation for a locking bar.

16. A combination according to claim 15, **characterized** in that it comprises a zero tumbler (50) having a central hole (51) and two second holes (52), the narrow ends (12B) of the rods (12A) being through the two second holes (52), the zero tumbler (50)
10 being against the plate (14A).





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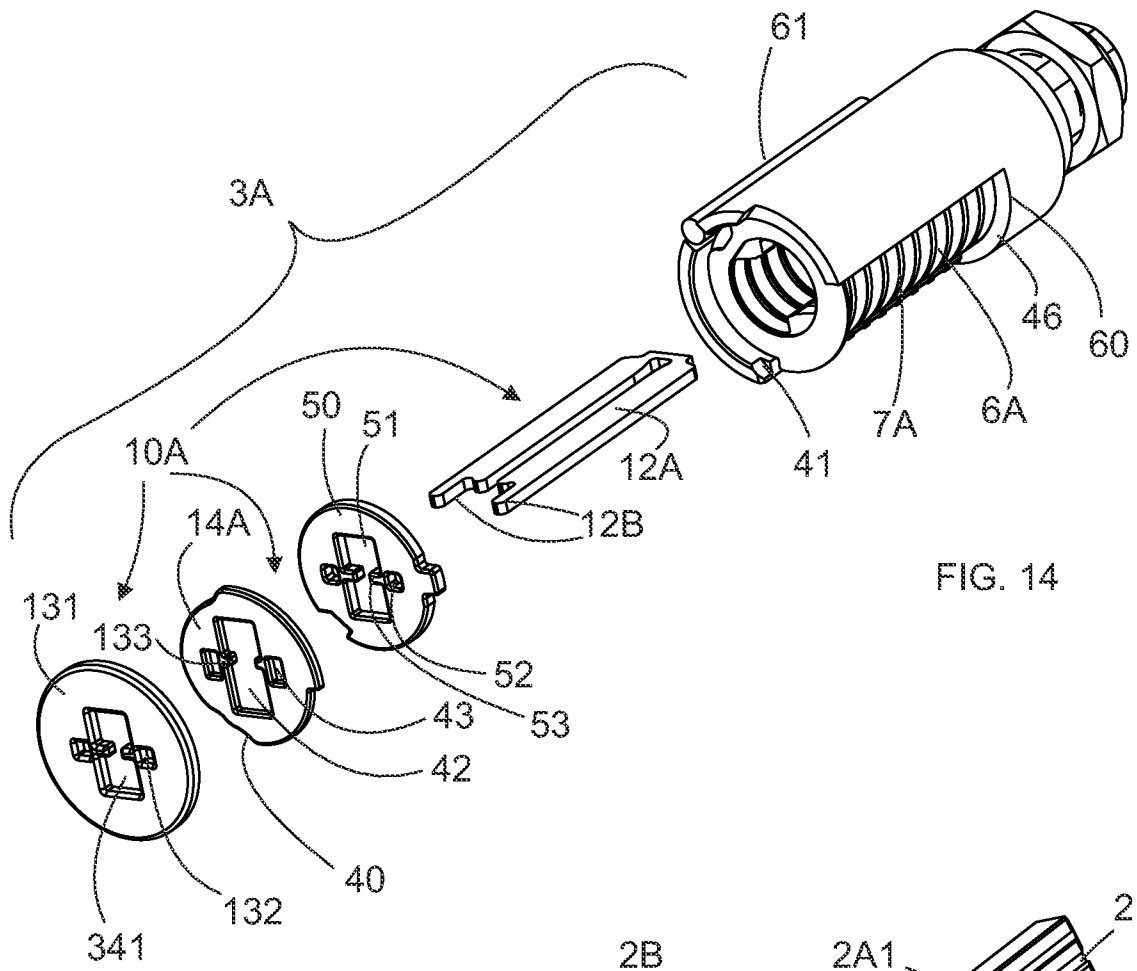


FIG. 14

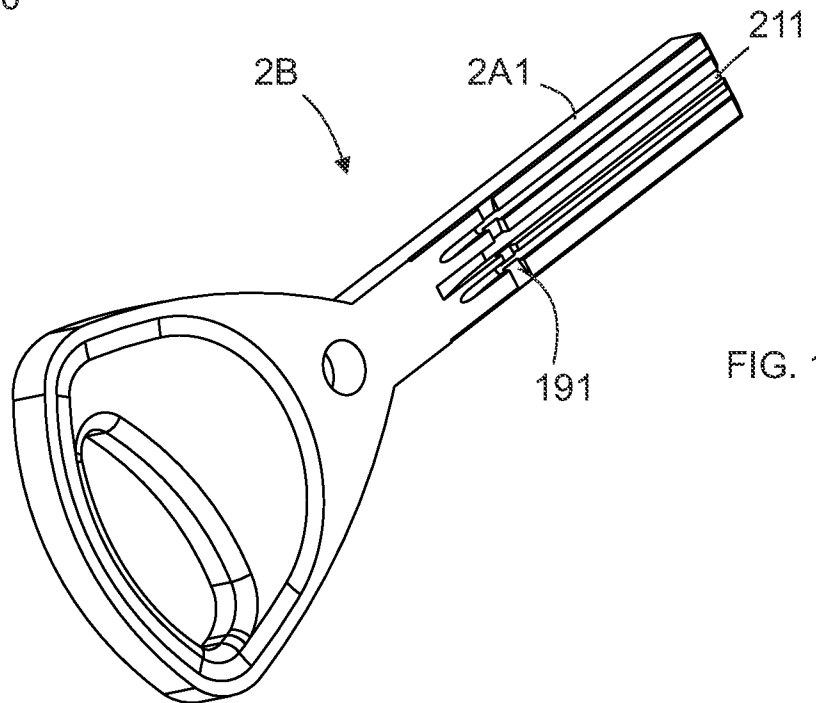


FIG. 15

