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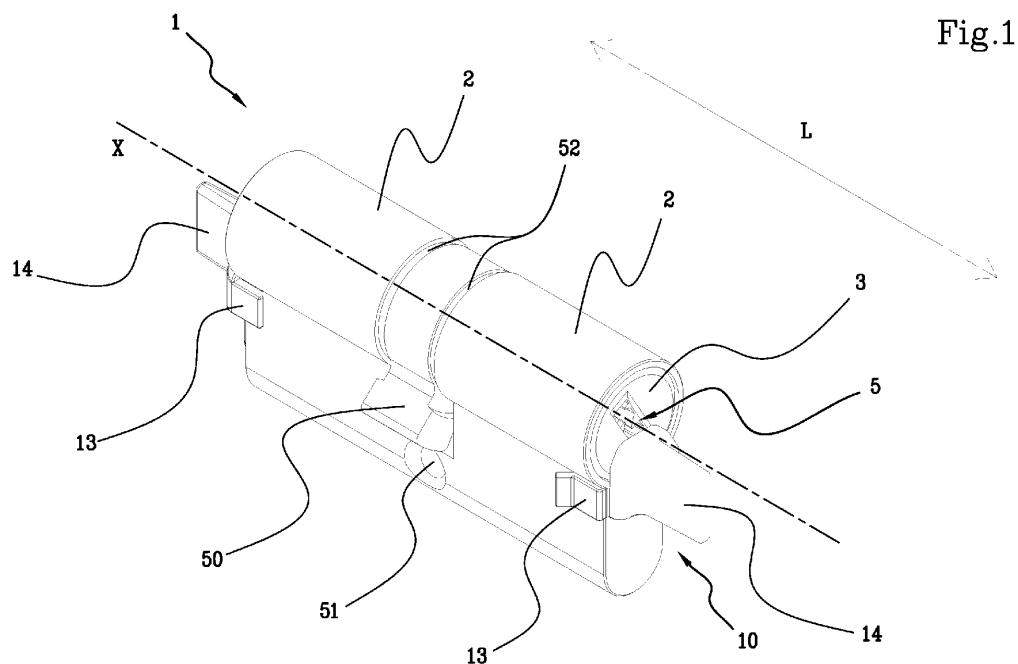
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KH MA MD TN(71) Applicant: **Alban Giacomo S.p.A.****36060 Romano d'Ezzelino (VI) (IT)**(72) Inventor: **ALBAN, Giacomo Mario****36060 Romano d'Ezzelino (VI) (IT)**(74) Representative: **Lissandrini, Marco****Bugnion S.p.A.****Via Pancaldo 68****37138 Verona (IT)**(30) Priority: **28.12.2022 IT 202200027033**(54) **REKEYABLE CYLINDER FOR A LOCK, METHOD FOR PRODUCING A REKEYABLE CYLINDER AND PROCESSES FOR PREPARING FOR USE A REKEYABLE CYLINDER**

(57) A cylinder (1) for a lock having a main body comprising a plug (3) inserted in a housing (4) of the main body (2) and configured to rotate about a rotation axis (X) thereof, a plurality of active pins (6) housed in respective seats (7) obtained on the plug (3), a plurality of counter-pins (8) housed in respective seats (9) obtained in the main body (2) so as to jointly define, with the active pins (6), a keying of the lock. In particular, the plug (3) has a slot (5) for inserting a key and, moreover, is in a rotated position so that the slot (5) is inclined relative to

an operative configuration of the cylinder (1). The cylinder (1) also comprises a blocking device (10) configured to maintain the plug (3) in the rotated position in such a way as to maintain the counter-pins (8) abutted against an outer lateral wall of the plug (3) and so that the counter-pins (8) are maintained completely inside their respective seats (9). The subject matter of the present invention also relates to a method for producing a rekeyable cylinder (1) and processes for preparing for use a rekeyable cylinder (1).

**Fig.1****EP 4 394 149 A1**

Description

TECHNICAL FIELD

[0001] The present invention relates to a rekeyable cylinder for a lock.

[0002] The invention also relates to a method for producing a rekeyable cylinder.

[0003] In addition, the invention also refers to processes for preparing for use a rekeyable cylinder.

[0004] In particular, the rekeyable cylinder, the method, and the processes fit into the sector of rekeyable locks for creating different opening systems such as, for example, keyed alike ("KA") systems, master key ("MK") systems, grand master key ("GMK") systems, central cylinder ("CC") systems, and central cylinder and master key ("CCMK") systems.

PRIOR ART

[0005] At present there exist substantially two different methods for rekeying a flat key cylinder for a lock.

[0006] A first method provides for the key of the lock to be cut in half along the longitudinal direction thereof so as to maintain only the part of the keying that acts on the active pistons in order to create a sufficient space for the insertion of a spring pressing accessory specifically shaped and configured to maintain the counter-pins and springs in a position of noninterference with the plug.

[0007] After machining the key, one can then proceed to remove the retaining ring of the plug and insert, in sequence, the half key to align the active pins (without rotating the plug) and the spring pressing accessory to the side of the half key.

[0008] Subsequently, it is possible to carry out a partial rotation of the plug (about 90°) until aligning the spring pressing accessory with the counter-pins so as to be able to take out the plug without the springs (compressed) and the respective counter-pins being pushed out of their seats.

[0009] At this point, before resetting the cylinder with a process that substantially mirrors the one just described, it is possible to replace the active pins (extracted with the plug in which they are contained) and possibly also a series of passive pins, if present, in order to modify the keying of the lock according to the customer's requirements.

[0010] A second method, by contrast, provides for the plug to be completely extracted after the retaining ring has been removed and the key (whole, not machined) inserted into the slot. In this case, unlike with the previous method, the counter-pins come out of their seats due to the compression to which the respective springs are subjected. Therefore, these components must be reloaded into the body of the lock using a special tool and a specific procedure. Subsequently, after the springs and counter-pins have been repositioned inside their respective seats (and secured in place with a special spring pressing de-

vice which prevents them from coming out), it is possible to proceed to replace the active pins inside the plug and, finally, reset the lock itself, with the modified keying as requested by the customer.

[0011] Optionally, the repositioning of the springs and counter-pins can also be carried out after reinserting the plug (in which the active pins have been replaced). In the latter case, the springs and counter-pins are inserted into their respective seats through openings (closed off by closures) in the latter facing towards the outside of the body of the cylinder. However, this entails the use of a further specific apparatus capable of repositioning the closures in the openings.

[0012] The choice between the first and second methods is mainly determined by habit, the tools necessary and the ability of the operator who must carry them out.

[0013] The main drawback of the first method regards the process of longitudinal cutting of the key, which requires the use of dedicated equipment (for example, clamp, saw or rotary blade ...) and, moreover, is time-consuming.

[0014] In reference to the second method, on the other hand, the main drawback regards the step of repositioning the components (namely the counter-pins and springs) that have come out of place following the extraction of the plug. In fact, this step requires the use of dedicated equipment and a high level of precision on the part of the operator, who, consequently, must invest a great deal of time for correct repositioning.

[0015] Document WO 2009/001330 A2 is known in the prior art. That document, according to the abstract thereof, relates to an instrument for loading the elements of the stack of pins in a pin tumbler lock.

SUMMARY

[0016] In this context, the technical task at the basis of the present invention is to propose a cylinder for a lock, a method for producing a rekeyable cylinder and processes for preparing for use a rekeyable cylinder which overcome the aforesaid drawbacks of the prior art.

[0017] In particular, one object of the present invention is to provide a cylinder for a lock configured to ensure the rekeying of the lock in a short time, with few steps and with the use of a limited number of tools. At the same time, one object of the present invention is also to provide a cylinder for a lock that can be immediately rendered "operative" and thus considered (for example, for selling purposes) as a cylinder with random keying (i.e. of the "KD" type). Therefore, more specifically, the invention has the object of providing a cylinder for a lock that enables the standardisation of hardware stock. In this manner, it is possible to order a single type of cylinder that can be resold as a cylinder with random keying ("KD") or, thanks to the rekeying, as a system cylinder ("KA", "MK", ...), based on the customer's requirements.

[0018] A further object of the present invention is to provide a method for producing a rekeyable cylinder and

processes for preparing for use a rekeyable cylinder capable of providing both cylinders with random keying ("KD"), and system cylinders ("KA", "MK", ...).

[0019] The stated technical task and specified objects are substantially achieved by a rekeyable cylinder for a lock, a method for preparing a rekeyable cylinder and processes for preparing for use a rekeyable cylinder, which comprise the technical features disclosed in the respective independent claims. The dependent claims correspond to further advantageous aspects of the invention.

[0020] It should be appreciated that this summary introduces a selection of concepts in simplified form, which will be further elaborated on in the detailed description provided below.

[0021] The invention relates to a rekeyable cylinder for a lock.

[0022] The cylinder has a main body and, moreover, comprises a plug inserted in a housing of the main body and configured to rotate about a rotation axis thereof. Preferably, the main body extends along a longitudinal direction of extension coinciding with the rotation axis of the plug. Consequently, the housing obtained in the main body also extends along the rotation axis.

[0023] In addition, the plug has a slot for inserting a key. The cylinder further comprises a plurality of active pins housed in respective seats obtained on the plug and a plurality of counter-pins housed in respective seats obtained in the main body according to a direction that is transverse, preferably perpendicular, to the rotation axis in order to define a keying of the lock when the aforesaid plug is in an operative configuration, in which each active pin is aligned with a respective counter-pin. Preferably, the seats obtained in the main body (for the counter-pins) are arranged in sequence along a direction parallel to the rotation axis. Furthermore, the seats obtained on the plug (for the active pins) are arranged in sequence along a direction parallel to the rotation axis, when the plug is inserted in the housing. In addition, the seats for the active pins are in communication with the slot.

[0024] In particular, the plug is in a rotated position relative to the operative configuration so that the slot is inclined relative to the aforesaid transverse direction. Furthermore, a blocking device is removably engageable to the main body and, moreover, is configured to maintain the plug in the rotated position relative to the operative configuration, in such a way as to maintain the counter-pins abutted against an outer lateral wall of the plug. Therefore, the counter-pins are maintained completely inside their respective seats.

[0025] Advantageously, the production of a rekeyable cylinder for a lock with the provision of a blocking device configured to maintain the plug in a rotated position relative to the normal operative configuration of the lock ("normal" in that locks are normally set and sold in that configuration) extremely simplifies the operations of rekeying by a specialised technician, or a locksmith, or even the end user.

[0026] In fact, the cylinder in accordance with the invention can be rekeyed in a shorter time, as the counter-pins are maintained inside their seats with the plug inserted and can be thus maintained using a spring pressing device at the time of extracting the plug for a possible rekeying. Advantageously, therefore, there is no need for cutting tools or particular machining operations on the opening key, unlike in the prior art.

[0027] In addition, the aforesaid cylinder can alternatively be immediately rendered operative (as better described below with the first preparation process) simply by removing the blocking device and rotating the plug. In this manner, the cylinder can be sold as a "KD" cylinder with random keying.

[0028] Therefore, the reseller or locksmith is advantageously able to manage different customer needs with a single product, thus also simplifying the management of their stock.

[0029] The invention also relates to a method for producing a rekeyable cylinder.

[0030] In particular, the method comprises the following operating steps:

- providing a plug having a slot for inserting a key;
- providing a cylinder having a main body provided with seats for receiving a plurality of counter-pins. The seats are obtained according to a direction that is transverse to a rotation axis of the plug when the latter is inserted in a housing of the main body;
- inserting the plug into the housing of the main body of the cylinder;
- housing a plurality of active pins in respective seats obtained on the plug, the seats of the counter-pins having been previously aligned in the main body with the seats of the pins present on the plug;
- rotating the plug about the rotation axis thereof, so that the slot takes on an inclined orientation relative to said transverse direction according to which the seats of the counter-pins (8) are obtained;
- blocking the plug by means of a blocking device in such a way as to maintain the slot oriented according to the inclined orientation;
- housing a plurality of counter-pins in the seats obtained in the main body;
- maintaining the counter-pins abutted against an outer lateral wall of the plug, so that the counter-pins are completely maintained inside the respective seats.

[0031] In accordance with an alternative aspect of the invention, the method comprises housing a plurality of active pins in respective seats obtained on the plug and only afterwards inserting the plug into the housing of the main body of the cylinder.

[0032] The invention also relates to a process for preparing for use a rekeyable cylinder.

[0033] In particular, the process has two variant em-

bodiments, according to whether the rekeyable cylinder is rendered operative with or without rekeying of the lock.

[0034] If the cylinder does not need to be rekeyed, the process of preparing for use comprises the following steps:

- providing a cylinder having one or more of the previously described features;
- removing the blocking device;
- rotating the plug from the rotated position to the operative configuration so as to align the active pins and the counter-pins.

[0035] If the cylinder needs to be rekeyed, the process of preparing for use comprises the following steps:

- providing a cylinder having one or more of the previously described features;
- providing a spring pressing device having a rod-shaped portion configured to be insertable into the slot to maintain the counter-pins completely inside their respective seats when the plug takes on a further rotated position in which the slot is aligned with the transverse direction and, moreover, has an entry turned towards the seats of housing of the counter-pins.
- removing the blocking device;
- maintaining the plug in the rotated position;
- inserting the rod-shaped portion of the spring pressing device into the slot;
- rotating the plug with the spring pressing device inserted until the rod-shaped portion is abutted against the counter-pins so as to maintain them completely inside their respective seats;
- extracting the plug from the housing of the main body of the cylinder;
- replacing the plurality of active pins with a plurality of different active pins so as to form, jointly with the plurality of counter-pins, a new keying of the cylinder. In addition, or alternatively, it is also possible to replace the passive pins usually present in the plug with a new series of passive pins;
- repositioning the plug in the housing;
- rotating the plug with the spring pressing device inserted to bring the plug in the operative configuration, so as to align the active pins with the counter-pins;
- extracting the rod-shaped portion of the spring pressing device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] Additional features and advantages of the present invention will emerge more clearly from the approximate, and thus non-limiting, description of a preferred but not exclusive embodiment of a rekeyable cylinder for a lock as illustrated in the appended drawings, in which:

- figure 1 illustrates a perspective view of a possible embodiment of a rekeyable cylinder of a lock;
- figure 2 illustrates a front view of the cylinder shown in figure 1;
- figure 3 illustrates a side sectional view of the cylinder shown in the figure 1 and 2;
- figures 4a-4b and 5a-5b illustrate front and side views of the cylinder shown in figures 1-3, during an operation of rekeying the lock.

[0037] The drawings serve solely to illustrate embodiments of the invention with the aim of better clarifying, in combination with the description, the inventive principles underlying the invention.

DETAILED DESCRIPTION

[0038] With reference to the figures, the present invention relates to a rekeyable cylinder generically denoted by the number 1.

[0039] In greater detail, the appended figures illustrate a so-called "double cylinder", that is to say, a cylinder in which the key can be inserted on both sides of the cylinder itself. In this manner, when installed on a door, the cylinder will allow the insertion of the key from both the outside and inside. It should be noted that the present description is also applicable to other types of cylinders that are not illustrated, such as the so-called "half cylinder" or "thumb turn cylinder", wherein the key can be inserted from one side only, as is typically the case for garage or front door locks.

[0040] Figure 1 shows a rekeyable cylinder 1 for a lock having a main body 2.

[0041] More precisely, figure 1 illustrates a rekeyable double cylinder 1, whose main body 2 is divided into two substantially symmetrical parts.

[0042] In particular, the cylinder 1 comprises a pair of plugs 3 (figure 3), each of which is inserted into a respective housing 4 of the main body 2. Each plug 3 is configured to rotate about a rotation axis X thereof. Each plug 3 further has a slot 5 (figure 1) for inserting a key.

[0043] The cylinder 1 comprises a cam 50 (also called bit) preferably disposed asymmetrically relative to the middle of the main body 2 and connected to each plug 3. In particular, the cam 50 acts directly on the closing mechanism of the lock (for example, a bolt) so as to regulate the opening and closing thereof as a function of the rotation of the plug by the key. For security reasons, when the plug 3 is positioned in the operative configuration inside the main body 2 of the cylinder 1, the cam 50 is disposed in a projecting position relative to the main body 2 (figure 1), so as to prevent the extraction of the cylinder 1 from its housing in the lock. In addition, the main body 2 has a fixing opening 51 disposed below the cam 50 and adapted to receive a corresponding fixing screw configured to maintain the cylinder 1 in a position solidly joined to and inside the lock. In other words, the fixing screw is a further security element for preventing the ex-

traction of the cylinder 1 from the lock also in the event that the cam 50 is not projecting from the main body 2.

[0044] With particular reference to figures 1 and 3, there are fixing means present to maintain the plugs inserted inside the housings 4 of the main body 2. In particular, the fixing means are obtained by means of circlips 52 positioned at the sides of the cam 50.

[0045] With reference to figure 3, a plurality of active pins 6 are housed in respective seats 7 obtained on the plug 3. Furthermore, a plurality of counter-pins 8 are housed in respective seats 9 obtained in the main body 2 according to a direction T that is transverse to the rotation axis X of the plug, in order to define a keying of the lock when the plug 3 is in an operative configuration, in which each active pin 6 is aligned with a respective counter-pin 8.

[0046] With particular reference to figures 1 and 2, the plug 3 is in a rotated position relative to the operative configuration, so the slot 5 is inclined relative to the aforesaid transverse direction T.

[0047] A blocking device 10 is removably engageable to the main body 2 and is further configured to maintain the plug 3 in the rotated position relative to the operative configuration, in such a way as to maintain the counter-pins 8 abutted against an outer lateral wall of the plug 3. Therefore, the counter-pins 8 are maintained completely inside the seats 9.

[0048] In other words, the provision of a blocking device 10 between the plug 3 and main body 2 of the cylinder 1 is advantageously capable of maintaining the aforesaid plug 3 in a rotated position, so that the counter-pins 8 are maintained completely inside their respective seats 9 and the active pins 6 are maintained completely inside their respective seats 7 without opposing the possible free rotation of the plug 3 (once the blocking device 10 is not present).

[0049] Even more advantageously, therefore, the cylinder 1 is in a configuration ready for rekeying without the use of tools, unlike in the prior art, where cutting tools are necessary to divide a key in half.

[0050] With reference to figure 3, each counter-pin 8 comprises a pre-loaded elastic element 8a, for example a spring, and a spacer 8b, for example a cylindrical element. In greater detail, when the plug 3 is in the operative configuration and the key is not (completely) inserted into the slot 5, one or more of the spacers 8b are disposed at least partially outside their respective seat 9, beyond the line of separation between the main body 2 and the plug 3, due to the normal extension of the elastic element 8a, in such a way as to prevent the rotation of the plug 3.

[0051] In accordance with one aspect, the seats 9 for arranging the counter-pins 8 are obtained as through openings on the main body 2 in order to allow the insertion of the counter-pins 8 from outside the cylinder 1 along the transverse direction T.

[0052] In other words, making reference to figure 3, the counter-pins 8 can be inserted into their respective seats 9 through specific openings obtained on the main

body 2, also when the plug 3 is positioned in the housing 4.

[0053] In this regard, closures 8c are positioned in said openings to prevent the counter-pins 8 from coming out.

[0054] A possible embodiment (not illustrated) of the blocking device 10 envisages the use of a plate or covering or tape configured to be placed over at least part of the front face of the plug 3 (i.e. the key insertion face) and, at the same time, at least part of the front face of the main body 2 (i.e. the section that defines the outline of the housing 4 and surrounds the plug 3 when inserted). The plate or covering or tape is advantageously configured to maintain the plug 3 blocked inside the housing 4 in the rotated position and thus solidly joined to the main body 2 of the cylinder. In particular, the plate or covering or tape can have an adhesive or highfriction surface, such as, for example, a layer of rubber, so as to exert a force of adhesion both on the plug 3 and on the front face of the main body 2 and thus prevent an involuntary rotation of the plug relative to the main body.

[0055] In other words, therefore, the plate or covering or tape acts as a bridge element between the plug 3 and the main body 2 in order to maintain them solidly joined and fixed to each other.

[0056] Additionally, the plate or covering or tape could be configured in such a way as to secure the entire cylinder 1 and simultaneously block both plugs present 3.

[0057] With particular reference to figure 4a, a preferred embodiment for the blocking device 10 comprises an insert 12 which extends along a longitudinal direction of extension L of the plug 3 so as to be inserted at least partially into the slot 5. Advantageously, the use of an insert 12 allows the blocking device 10 to be stably constrained to the plug 3 and the main body 2, in such a way as to maintain the plug 3 in the aforesaid rotated position in which the slot 5 is inclined relative to the transverse direction T.

[0058] Even more preferably, the insert 12 is at least partially complementarily shaped relative to a portion of the slot 5. In this manner, when the insert 12 itself is positioned in the slot 5, the blocking device 10 is able to remain in a stable position with respect to the cylinder 1 so as to prevent the rotation of the plug 3 about the rotation axis X.

[0059] In accordance with one aspect of the invention, the blocking device 10 comprises at least one tab 13 configured to extend over an outer portion of the main body 2 of the cylinder 1, when the blocking device 10 is inserted in the slot 5, in such a way as to prevent the rotation of the plug 3 itself in at least one direction of rotation about the rotation axis X.

[0060] In other words, the tab 13 is advantageously shaped so as to define an interference (for example mechanical, as may be seen in the appended figures, or kinematic through the generation of a high friction force capable of opposing the possible rotation of the plug 3) with an outer portion of the main body 2 in order to prevent the rotation of the plug 3 at least according to a possible

direction of rotation about the rotation axis X.

[0061] With reference to figure 1, the tab 13 is able to prevent the rotation of the plug 3 at least in an anticlockwise direction of rotation (looking at the cylinder 1 as illustrated in figure 2).

[0062] In accordance with another aspect of the invention, the tab 13 extends laterally to the insert 12, preferably parallel to the longitudinal direction of extension L.

[0063] In other words, the tab 13 is advantageously shaped so as to lie over a lateral outer portion of the main body 2 in order to define an interference as previously explained.

[0064] In accordance with one aspect of the invention that may be better seen in figure 4a, the insert 12 and the tab 13 extend projecting and opposite relative to a graspable portion 14 to which they are connected. Preferably, the insert 12, the tab 13 and the graspable portion 14 are made in a single body.

[0065] In accordance with one aspect of the invention, the blocking device 10 can be integrally coupled and decoupled to/from the plug, that is to say, it can be inserted/disengaged without breaking any component thereof.

[0066] In accordance with an advantageous aspect of the invention, the tab 13 can be breakable so as to be removable from the blocking device 10, leaving the insert 12 inside the slot 5. Advantageously, in this manner the user can easily exploit the graspable portion 14 to rotate the plug, in the event that it is not necessary to do any rekeying, but it is desired to bring the plug 3 directly into the operative configuration for ready use. Subsequently, again by means of the graspable portion 14, the user will proceed to extract what remains of the blocking device, in particular the insert 12.

[0067] In accordance with another aspect of the invention, the blocking device 10 can comprise a pair of tabs 13. In particular, each tab 13 is configured to prevent the rotation of the plug in a respective direction of rotation about the rotation axis X.

[0068] In this manner, the blocking device 10 is advantageously configured to prevent any movement of the plug 3 with the aim of maintaining it in the rotated position in which the cylinder 1 is easily rekeyable.

[0069] Preferably, the insert 12 is substantially interposed between the pair of tabs 13.

[0070] Even more preferably, the insert 12 is disposed off-centre and/or offset relative to the pair of tabs 13.

[0071] In this manner, due to the off-centre/offset configuration of the insert 12 relative to the tabs 13, the slot 5 is forced to take on and maintain a rotated position. More precisely, the insert 12 is inserted into one of the ends of the slot 5 tangent to the outer circumference of the plug. In this manner, the slot 5 takes on an inclined position relative to the transverse direction T along which the seats 9 of the counter-pins are obtained.

[0072] Preferably, in the case where a pair of tabs is present, only one of them is breakable.

[0073] In accordance with one aspect of the invention, the slot 5 has an inclined orientation comprised between

about 30° and 80°, preferably about 60°, relative to the transverse direction (T), when the plug (3) is disposed in the rotated position.

[0074] In general, it is sufficient that the plug 3 in the rotated position be placed in such a way that the slot 5 is not aligned with the transverse direction T; otherwise, the counter-pins 8 would interfere with the slot, blocking the plug and preventing both the resetting of the cylinder, and the rekeying thereof. At the same time, it is required that the slot 5 not be disposed rotated by 90° relative to the transverse T direction, in order to prevent the alignment between the active pins 6 and the counter-pins 8 and thus avoid the resetting of the cylinder; in fact, should an involuntary resetting of the cylinder occur, the action of simple rekeying in accordance with the invention would disadvantageously be precluded, unless one were to proceed to disassemble the entire cylinder, thus falling back into the previously mentioned drawbacks of the prior art.

[0075] In other words, the plug 3 in the rotated position must not dispose the seats 7, 9 of the active pins 6 and of the counter-pins 8 aligned with each other, nor the seats 9 of the counter-pins 8 with the lateral entry of the slot 5 (i.e. the missing portion of the lateral wall of the plug which defines a lateral end of the slot 5).

[0076] In accordance with another aspect of the invention that may be seen in figures 4a-5b, the cylinder 1 also comprises a spring pressing device 15 having a rod-shaped portion 16 configured to be insertable into the slot 5 to maintain the counter-pins 8 completely inside their respective seats 9 when the plug 3 takes on a further rotated position in which the slot 5 is aligned with the transverse direction T and has an entry turned towards the aforesaid seats 9 housing the counter-pins 8.

[0077] In particular, the advantages of the spring pressing device 15 will be better explained below in reference to the processes for preparing for use a rekeyable cylinder 1. In other words, the insert 12 of the blocking device 10 is introduced into the slot 5 during the construction of the cylinder 1 following the step of arranging the active pins 6 in the plug 3. In addition, advantageously, the insert 12 also makes it possible to insert from below (i.e. from a lower portion of the main body 2) the counter-pins 8 (i.e. the spacers 8b and the elastic elements 8a) as well and to install the closures 8c, in order to complete the assembly of the cylinder 1. In short, therefore, the completely assembled cylinder 1 has a blocking device 10 coupled to each plug 3 in order to maintain the latter oriented and constrained in the rotated position.

[0078] The present invention also relates to a method for producing a rekeyable cylinder for a lock.

[0079] In particular, the method comprises the following steps:

- providing a plug 3 having a slot 5 for inserting a key;
- providing a cylinder 1 having a main body 2 provided with seats 9 for receiving a plurality of counter-pins 8. The seats 9 are obtained according to a direction T that is transverse to a rotation axis X of the plug 3

when the latter is inserted in a housing 4 of the main body 2;

- housing a plurality of active pins 6 in respective seats 7 obtained on the plug 3;
- inserting the plug 3 in the housing 4 of the main body 2 of the cylinder 1;
- rotating the plug 3 about the rotation axis X thereof so that the slot 5 takes on an inclined orientation relative to the transverse direction T according to which the seats 9 of the counter-pins 8 are obtained and relative to the operative configuration;
- blocking the plug 3 by means of a blocking device 10 in such a way as to maintain the slot 5 oriented according to the aforesaid inclined orientation;
- housing a plurality of counter-pins 8 in the seats 9 obtained in the main body 2;
- maintaining the counter-pins 8 abutted against an outer lateral wall of the plug 3, so that the counter-pins 8 are completely maintained inside their respective seats 9.

[0080] In other words, compared to the prior art, the aforesaid method makes it possible to provide, for example already as output from the production line, a rekeyable cylinder by positioning the plug in a rotated position relative to the operative configuration and, furthermore, with the positioning of a blocking device 10 configured to ensure that the aforesaid plug 3 does not rotate accidentally, for example as a result of impacts or vibrations during transport, into the operative configuration or into another configuration that precludes the rekeying according to the invention.

[0081] Preferably, the method comprises a step of fixing the plug 3 which takes place before or after, preferably before, the step of rotating the plug 3 about the rotation axis X thereof. The step of fixing the plug 3 comprises positioning a circlip 52 in the specific groove present on the main body 2 of the cylinder in such a way as to prevent the plug 3 from coming out of the housing 4.

[0082] Even more preferably, the step of inserting the plug 3 in the housing 4 also comprises a control sub-step in which the cam 50 is maintained in a projecting position relative to the main body 2, as illustrated in figure 1 or 2.

[0083] In accordance with a preferred aspect of the invention, the step of inserting a blocking device 10 can be carried out alternatively before or after the step of housing a plurality of counter-pins 8.

[0084] Optionally, the method further comprises the steps of:

- housing the counter-pins 8 in their respective seats 9 through openings communicating with the outside of the main body 2; and
- positioning closures 8c in the openings in order to prevent the counter-pins 8 from coming out.

[0085] The positioning of the plug 3 in a rotated configuration inside the housing 4 allows the counter-pins 8

to be maintained inside the respective seats 9, by exploiting the fact that the outer lateral wall of the plug 3 closes off the aforesaid seats 9.

[0086] Advantageously, positioning the blocking device 10 before inserting the counter-pins 8 in their respective seats 9 ensures that the plug 3 is maintained in the rotated position, thereby facilitating the operations of assembling the cylinder during manufacturing.

[0087] In accordance with another aspect of the invention, the step of rotating the plug 3 comprises positioning the slot 5 according to an inclined orientation comprised between about 30° and 80°, preferably about 60°, relative to the transverse direction T.

[0088] The present invention also relates to processes for preparing for use a rekeyable cylinder for a lock.

[0089] In particular, the invention relates to two possible processes of preparing for use, according to the fact of whether the security keying of the cylinder 1 must be modified or maintained.

[0090] If the cylinder does not need to be rekeyed, the process of preparing for use has the following steps:

- providing a cylinder 1 having one or more of the previously described features;
- removing the blocking device 10;
- rotating the plug 3 from the rotated position to the operative configuration so as to align the active pins 6 and the counter-pins 8.

[0091] In this case, in fact, the keying of the cylinder already prepared in the manufacturing stage is acceptable and does not need to be modified. Removing the blocking device 10 allows the plug 3 to be moved in at least one direction of rotation so that a user can bring the plug 3 back into the operative configuration.

[0092] Preferably, the rotation of the plug 3 must take place according to the direction that requires the shortest path in order to reach the operative position (in an anti-clockwise direction based on the appended figures).

[0093] In this manner, by means of a few simple steps, the cylinder 1 is easily prepared for use, so as to be fitted and used in a lock.

[0094] In addition, it is noted that the aforesaid process does not require the use of specific tools and/or performance of particular operations (such as cutting the key).

[0095] If the cylinder 1 does not need to be rekeyed and in accordance with the embodiment that comprises at least one breakable tab 13, it will be sufficient to break the tab 13 to enable the user to draw the plug in rotation by means of the graspable portion 14 connected to the insert 12 which remains inserted inside the slot 5, acting like a key.

[0096] If the cylinder needs to be rekeyed, the process of preparing it for use is as schematically illustrated in figures 4a-4b and 5a-5b.

[0097] In particular, the method comprises the following steps:

- providing a cylinder 1 having one or more of the previously described features (figure 1);
- providing a spring pressing device 15 having a rod-shaped portion 16 configured to be insertable into the slot 5, in order to maintain the counter-pins 8 completely inside their respective seats 9 when the plug 3 takes on a further rotated position in which the slot 5 is aligned with the transverse direction T and, furthermore, has an entry turned towards the seats of housing 9 of the counter-pins 8;
- removing the blocking device 10 (figure 4a);
- maintaining the plug 3 in the rotated position (figure 4b);
- inserting the rod-shaped portion 16 of the spring pressing device 15 into the slot 5 (figures 4a-4b);
- rotating the plug 3 with the spring pressing device 15 inserted until the rod-shaped portion 16 is abutted against the counter-pins 8 so as to maintain them completely inside their respective seats 9 (figure 5a);
- extracting the plug 3 from the housing 4 of the main body 2 of the cylinder 1 (figure 5a);
- replacing the plurality of active pins 6 with a plurality of different active pins so as to form, jointly with said plurality of counter-pins 8, a new keying of the cylinder; preferably, if present, the passive pins are also replaced;
- repositioning the plug 3 in the housing 4 (figure 5b);
- rotating the plug 3 with the spring pressing device 15 inserted to bring the plug 3 into the operative configuration, so as to align the active pins 6 with the counter-pins 8;
- extracting the rod-shaped portion 16 of the spring pressing device 15.

[0098] In other words, as may be seen in figures 4a, 4b and 5b, providing the spring pressing device 15 allows the blocking device 10 to be removed and the plug 3 to be freely rotated from the rotated position to the further rotated position, in which the spring pressing device 15 acts on the counter-pins 8. In fact, the rod-shaped portion 16 of the spring pressing device 15 is advantageously shaped so as to extend along the slot 5 (i.e. along the longitudinal direction of extension L and/or along the rotation axis X) without preventing the movement of the plug 3 and, simultaneously, allows the seats 9 of the counter-pins 8 to be closed off when the plug is in the further rotated position, thereby maintaining the counter-pins 8 completely inside them.

[0099] At this point, as shown in figure 5a, following the removal of the circlip 52, the plug 3 can be extracted from the housing 4, whilst the spring pressing device 15 remains stably coupled to the main body 2 to prevent the counter-pins 8 from coming out of their respective seats 9.

[0100] After extracting the plug 3, it is easily possible to replace the active pins 6 disposed in their respective seats 7 (and also any passive pins) in order to modify the keying of the cylinder 1.

[0101] Finally, to reset the cylinder 1 in order to make it usable, the same steps are carried out in a substantially reverse order, that is to say: the plug 3 (equipped with the new active pins and any new passive pins) is inserted into the housing 4; the respective circlip 52 is repositioned; jointly with the spring pressing device 15, the plug 3 is rotated into the operative configuration; finally, the spring pressing device is removed to complete the resetting of the rekeyed cylinder 1.

Claims

1. A rekeyable cylinder (1) for a lock, said cylinder comprising:

- a main body (2);
- a plug (3) inserted in a housing (4) of the main body (2) and configured to rotate about a rotation axis (X) thereof, said plug (3) having a slot (5) for inserting a key;
- a plurality of active pins (6) housed in respective seats (7) obtained on the plug (3);
- a plurality of counter-pins (8) housed in respective seats (9) obtained in the main body (2) according to a direction (T) that is transverse to said rotation axis (X) in order to define a keying of the lock, when the plug (3) is in an operative configuration, in which each active pin (6) is aligned with a respective counter-pin (8) so as to jointly define said keying of the lock, wherein the plug (3) is in a rotated position relative to said operative configuration so that the slot (5) is inclined relative to said transverse direction (T);
- a blocking device (10) removably engageable to the main body (2) and configured to maintain the plug (3) in said rotated position relative to said operative configuration, in such a way as to maintain said counter-pins (8) abutted against an outer lateral wall of the plug (3), so that said counter-pins (8) are maintained completely inside the respective seats (9).

2. The cylinder (1) according to claim 1, wherein the blocking device (10) comprises an insert (12) having a longitudinal direction of extension (L) and adapted to be inserted into the slot (5) until passing through at least a part of the plug (3).

3. The cylinder (1) according to claim 2, wherein the blocking device (10) comprises at least one tab (13) configured to extend over an outer portion of the main body (2) of the cylinder (1), when said insert (12) is inserted in the slot (5), in such a way as to prevent the rotation of the plug (3) in at least one direction of rotation about said rotation axis (X).

4. The cylinder (1) according to claim 3, wherein the tab (13) extends laterally to said insert (12), preferably parallel to said longitudinal direction of extension (L) of the insert (12). 5
5. The cylinder (1) according to claim 3 or 4, wherein said insert (12) and said tab (13) extend projecting and opposite relative to a graspable portion (14) to which they are connected, preferably wherein the insert (12), the tab (13) and the graspable portion (14) are made in a single body. 10
6. The cylinder (1) according to any one of claims 3 to 5, wherein the tab (13) is breakable so as to be removable from said blocking device (10) and enable the rotation of the plug (3) to bring it into said operative configuration. 15
7. The cylinder (1) according to any one of claims 3 to 6, wherein the blocking device (10) comprises a pair of said tabs (13), each tab (13) being configured to prevent the rotation of said plug (3) in a respective direction of rotation about said rotation axis (X). 20
8. The cylinder (1) according to claim 7, wherein said insert (12) is substantially interposed between said pair of tabs (13). 25
9. The cylinder (1) according to claim 7 or 8, wherein said insert (12) is disposed off-centre and/or offset relative to said pair of tabs (13). 30
10. The cylinder (1) according to any preceding claim, wherein said slot (5) has an inclined orientation comprised between about 30° and 80°, preferably about 60°, relative to said transverse direction (T), when the plug (3) is disposed in said rotated position. 35
11. The cylinder (1) according to any preceding claim, comprising a spring pushing device (15) having a rod-shaped portion (16) configured to be insertable into the slot (5) to maintain the counter-pins (8) completely inside their respective seats (9) when the plug (3) takes on a further rotated position in which the slot (5) is aligned with said transverse direction (T) and has an entry turned towards the seats (9) of the housing (4) of the counter-pins (8). 40 45
12. The cylinder (1) according to claim 1, wherein the blocking device is selected from a plate, a covering or a strip, each configured to be placed over at least a portion of a front surface of the plug (3) and at least a portion of a front surface of the main body (2), so as to maintain the plug (3) blocked inside the housing (4) in the rotated position and solidly joined to the main body (2) of the cylinder. 50 55
13. A method for producing a rekeyable cylinder (1) for a lock, comprising the following steps:
 - providing a plug (3) having a slot (5) for inserting a key;
 - providing a cylinder (1) having a main body (2) provided with seats (9) for receiving a plurality of counter-pins (8), said seats (9) being obtained according to a direction (T) that is transverse to a rotation axis of the plug (3) when the latter is inserted in a housing (4) of the main body (2);
 - inserting the plug (3) into the housing (4) of the main body (2) of the cylinder (1);
 - housing a plurality of active pins (6) in respective seats (7) obtained on the plug (3);
 - rotating the plug (3) about the rotation axis (X) thereof so that the slot (5) takes on an inclined orientation relative to said transverse direction according to which the seats (9) of the counter-pins (8) are obtained and relative to the operative configuration;
 - blocking the plug (3) by means of a blocking device (10) in such a way as to maintain the slot (5) oriented according to said inclined orientation;
 - housing a plurality of counter-pins (8) in the seats (9) obtained in the main body (2);
 - maintaining said counter-pins (8) abutted against an outer lateral wall of the plug (3), so that said counter-pins (8) are completely maintained inside the respective seats (9).
14. The method according to claim 13, wherein said step of inserting a blocking device (10) can be carried out, alternatively, before or after the step of housing a plurality of counter-pins (8), optionally wherein said method further comprises the steps of:
 - housing the counter-pins (8) in the respective seats (9) through openings communicating with the outside of the main body (2); and
 - positioning closures in said openings to prevent said counter-pins (8) from coming out.
15. The method according to claim 13 or 14, wherein the step of rotating the plug (3) comprises a sub-step of positioning the slot (5) according to an inclined orientation comprised between about 30° and 80°, preferably about 60°, relative to said transverse direction (T).
16. A process for preparing for use a rekeyable cylinder (1) of a lock, comprising the following steps:
 - providing a cylinder (1) in accordance with any one of claims 1 to 12;
 - removing the blocking device (10);
 - rotating the plug (3) from the rotated position to the operative configuration so as to align said

active pins (6) and said counter-pins (8).

17. A process for preparing for use a rekeyable cylinder (1) of a lock, comprising the following operating steps:

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- providing a cylinder (1) in accordance with any one of claims 1 to 12;
- providing a spring pressing device (15) having a rod-shaped portion (16) configured to be insertable into said slot (5) to maintain said counter-pins (8) completely inside their respective seats (9) when the plug (3) takes on a further rotated position in which the slot (5) is aligned with said transverse direction (T) and has an entry turned towards the seats (9) of the housing (4) of the counter-pins (8); 10
- removing the blocking device (10);
- maintaining the plug (3) in the rotated position;
- inserting the rod-shaped portion (16) of said spring pressing device (15) into the slot (5); 15
- rotating the plug (3) with the spring pressing device (15) inserted until said rod-shaped portion (16) is abutted against the counter-pins (8) so as to maintain them completely inside the respective seats (9); 20
- extracting the plug (3) from the housing (4) of the main body (2) of the cylinder (1);
- replacing the plurality of active pins (6) with a plurality of different active pins (6) so as to form, jointly with said plurality of counter-pins (8), a new keying of the cylinder (1), preferably wherein there is a further step of replacing any passive pins present in the cylinder (1); 25
- repositioning the plug (3) in the housing (4); 30
- rotating the plug (3) with the spring pressing device (15) inserted to bring the plug (3) into the operative configuration, so as to align said active pins (6) with said counter-pins (8); 35
- extracting the rod-shaped portion of said spring pressing device (15). 40

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Fig.1

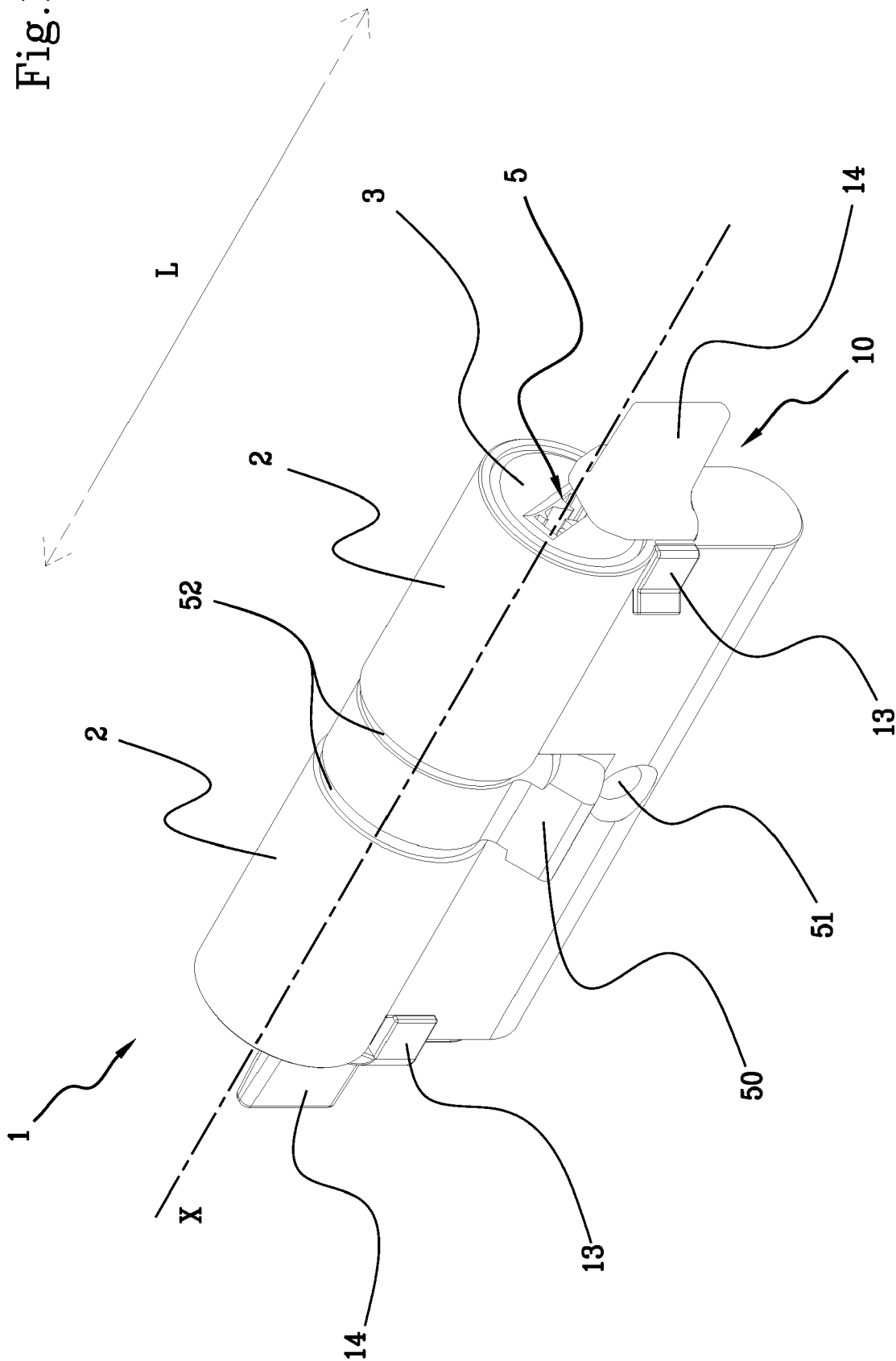


Fig.2

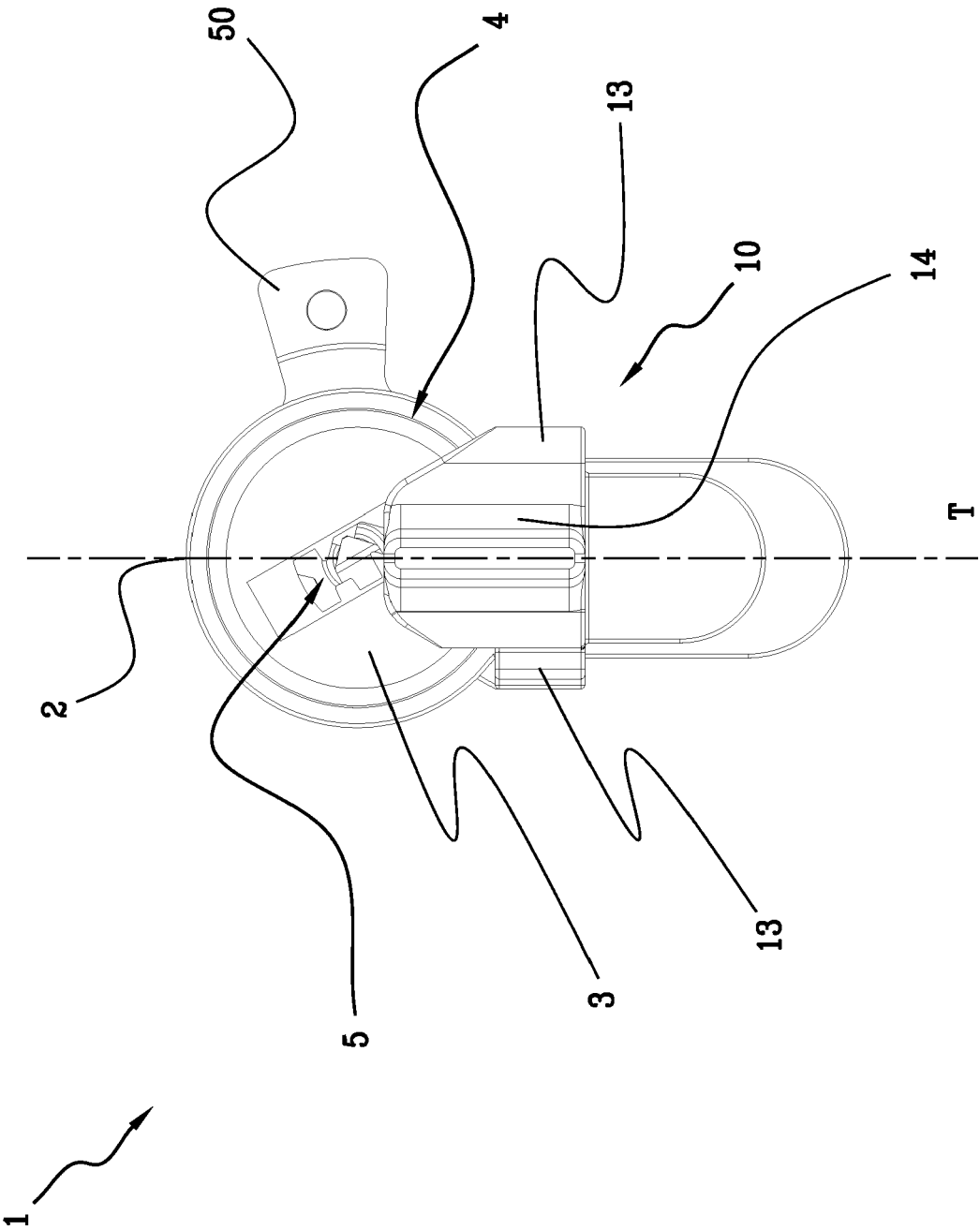


Fig.3

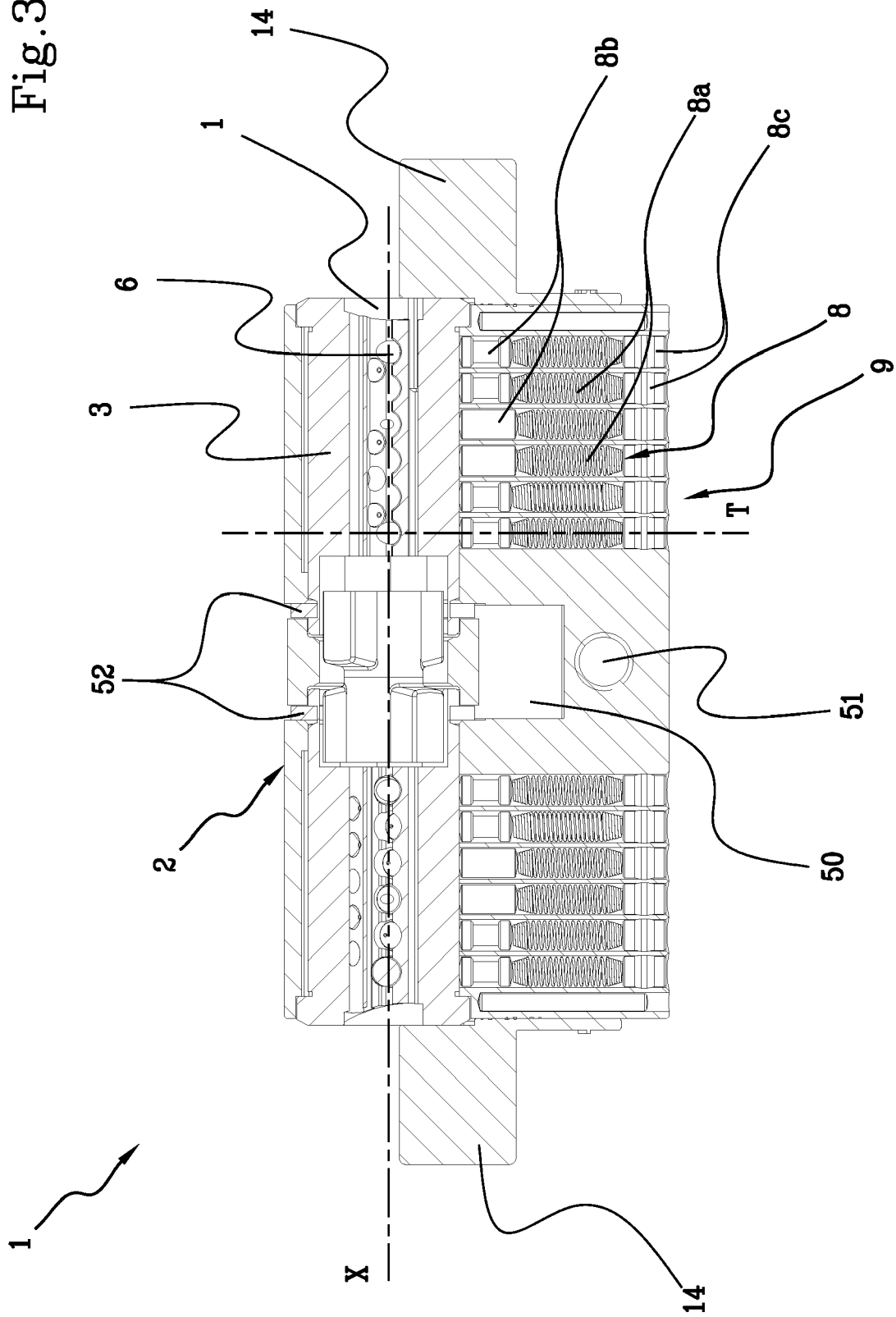


Fig.4b

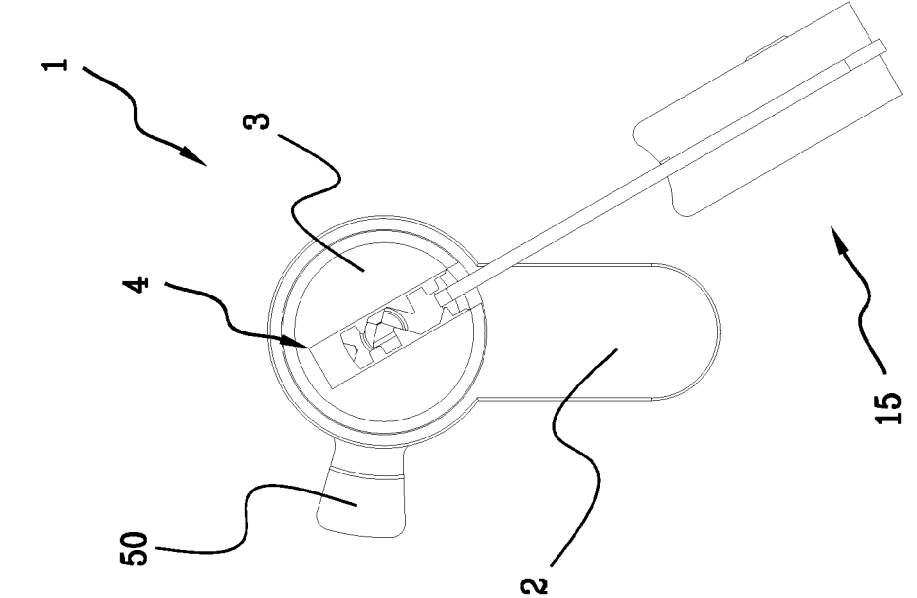


Fig.4a

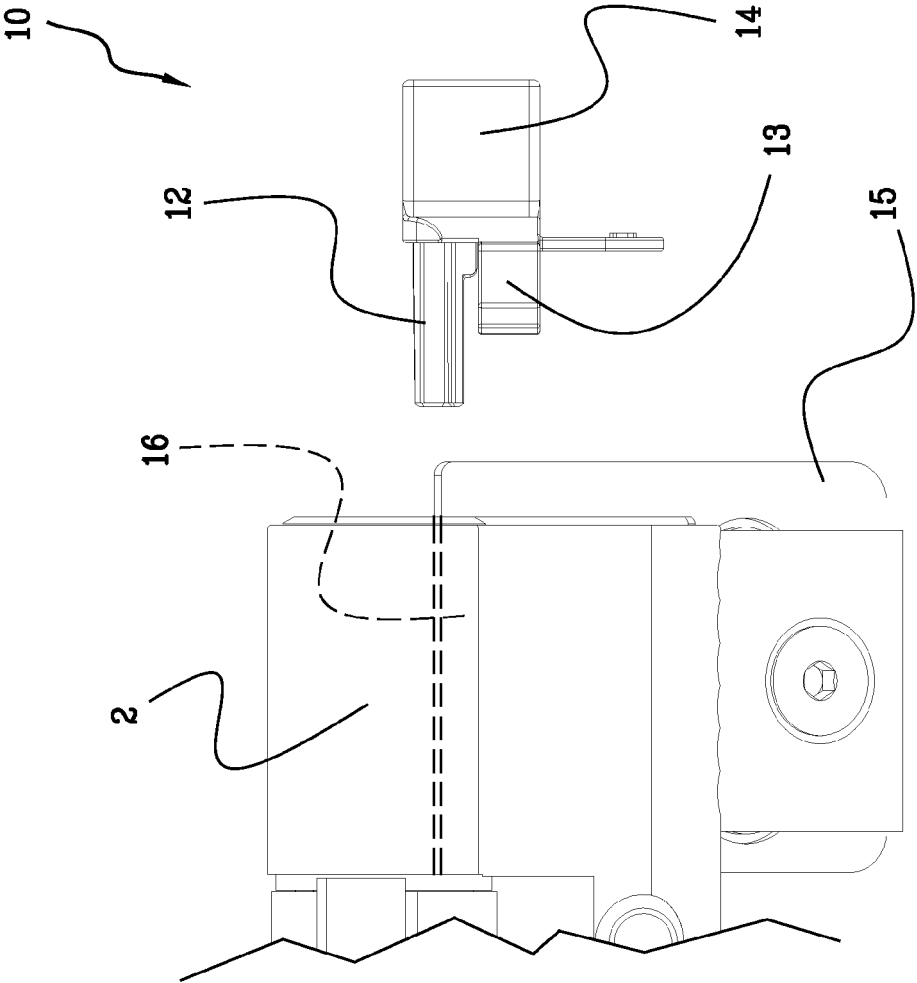


Fig.5a

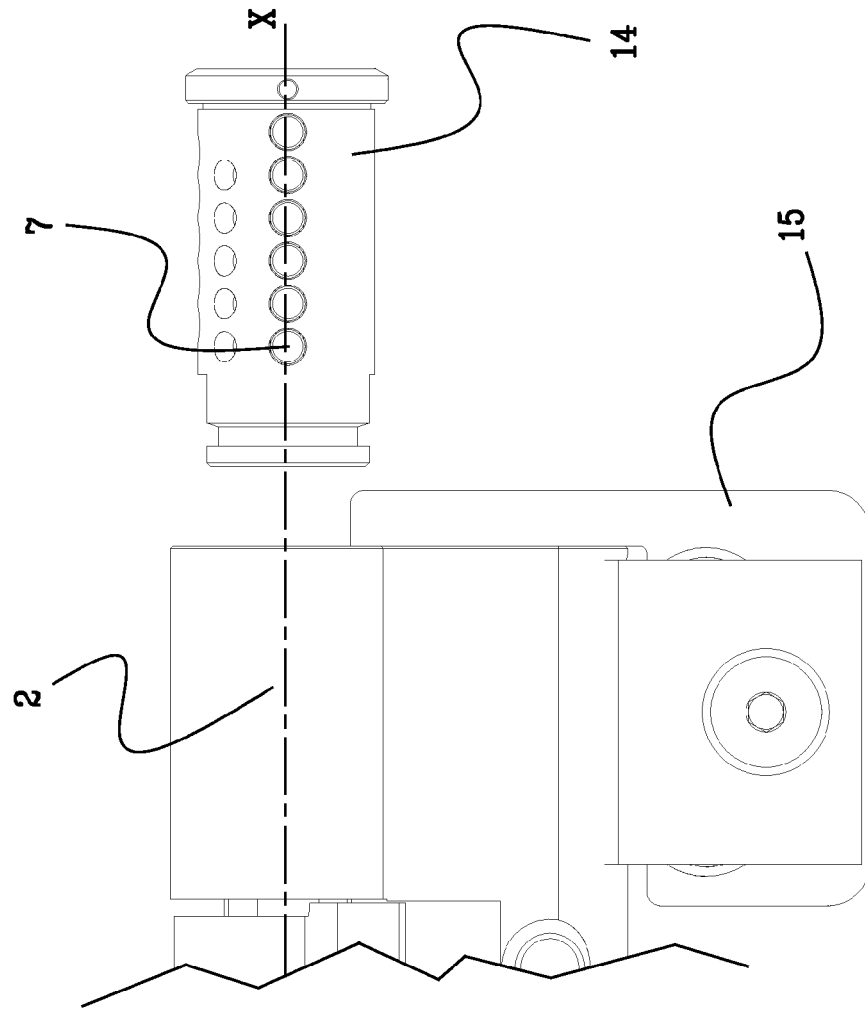
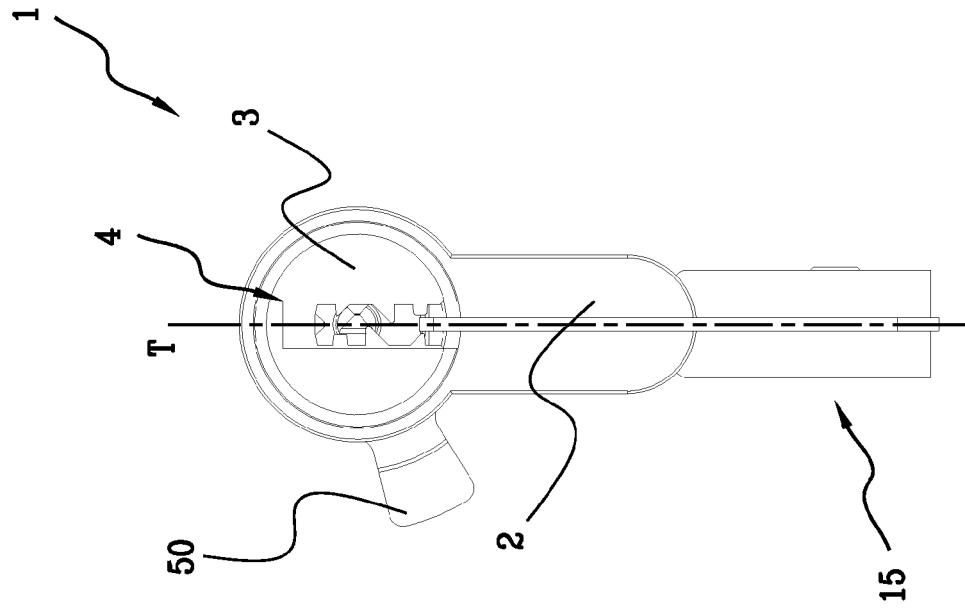


Fig.5b





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