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REKEYABLE CYLINDER FOR A LOCK, METHOD FOR PRODUCING A REKEYABLE CYLINDER AND PROCESS FOR PREPARING FOR USE A REKEYABLE CYLINDER

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A rekeyable cylinder (1) for a lock comprises a main body, 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 and comprising an insert (11) adapted to be inserted into the slot (5) and press on the counter-pins (8) to maintain them 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).

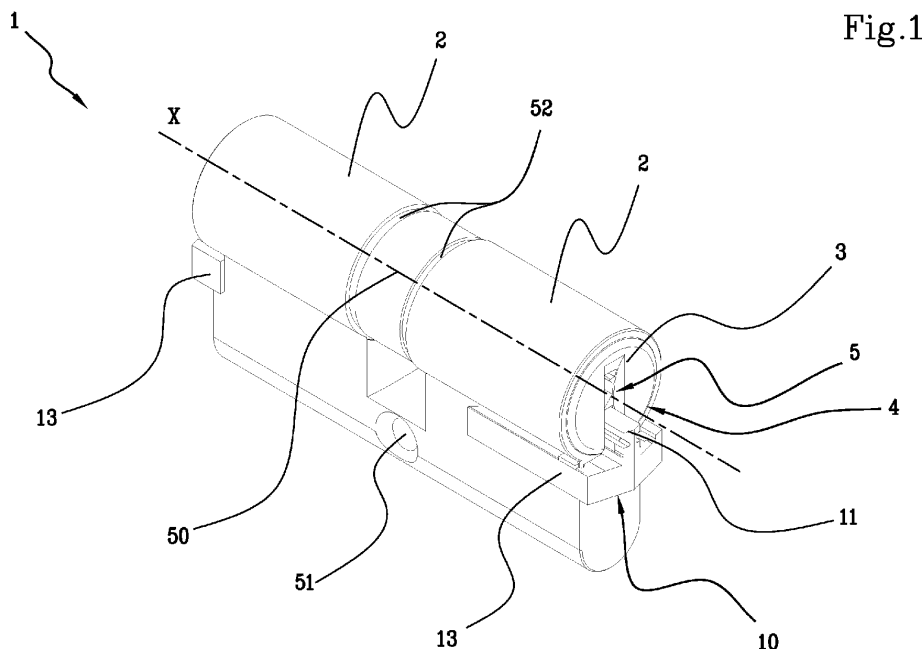


Fig.1

## 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. In addition, the invention also refers to a process for preparing for use a rekeyable cylinder.

**[0003]** In particular, the rekeyable cylinder, the method, and the process 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, or central cylinder and master key ("CCMK") systems.

### PRIOR ART

**[0004]** At present there exist substantially two different methods for rekeying a flat key cylinder for a lock.

**[0005]** 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 non-interference with the plug.

**[0006]** 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.

**[0007]** 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.

**[0008]** 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.

**[0009]** 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. Optionally, the repositioning of the springs and counter-pins can also be carried out after reinserting the plug (in which the active pins, and the passive pins if present, have been replaced). In the latter case, the springs and counter-pins are inserted into their respective seats through the 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 aforesaid openings. 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.

**[0010]** 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. 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.

**[0011]** 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

**[0012]** 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 a process for preparing for use a rekeyable cylinder which overcome the aforesaid drawbacks of the prior art.

**[0013]** 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.

**[0014]** 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 ca-

pable of providing both cylinders with random keying ("KD"), and system cylinders ("KA", "MK", ...).

**[0015]** 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 a process 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.

**[0016]** 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.

**[0017]** The invention relates to a rekeyable cylinder for a lock.

**[0018]** In particular, the rekeyable cylinder comprises a main body, a plug inserted in a housing of the main body and, moreover, 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. In addition, the plug has a slot for inserting a key.

**[0019]** A plurality of active pins are housed in respective seats obtained on the plug, whilst a plurality of counter-pins are housed in respective seats obtained in the main body according to a direction that is transverse, preferably perpendicular, to the rotation axis. In this manner, the active pins and the counter-pins jointly define a keying of the lock when the aforesaid plug is in an operative configuration, i.e. the configuration in which each active pin is aligned with a respective counter-pin.

**[0020]** Preferably, the seats obtained in the main body (for the counter-pins) are arranged in sequence along a direction parallel to the rotation axis and, moreover, they are arranged in communication with the aforesaid housing. 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, and they are disposed in communication with the slot. In addition, the seats for the active pins are in communication with the slot.

**[0021]** Preferably, the plug is disposed in a rotated position relative to the operative configuration so that the slot is aligned with the transverse direction.

**[0022]** In addition, the cylinder also comprises a blocking device configured to maintain the plug in the aforesaid rotated position relative to the operative configuration so that the counter-pins are maintained completely inside their respective seats. Preferably, the blocking device comprises an insert that extends along the direction of longitudinal extension of the plug in order to be inserted into the slot so as to press on the counter-pins to maintain them completely inside their respective seats.

**[0023]** 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.

5 **[0024]** The cylinder in accordance with the invention can be rekeyed in a shorter time, as the counter-pins are maintained inside their loro seats with the plug inserted and, moreover, can be thus maintained by means of the insert of the blocking device itself, also at the time of  
10 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.

**[0025]** In addition, the aforesaid cylinder can alternatively be immediately rendered operative (as better described below with the 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.

20 **[0026]** 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.

**[0027]** The invention also relates to a method for producing a rekeyable cylinder. 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;
- 30 - inserting the plug into the housing of the main body of the cylinder;
- housing a plurality of active pins in their 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;
- 40 - rotating the plug about the rotation axis thereof, so that the slot takes on an orientation parallel to the transverse direction according to which the seats of the counter-pins (8) are obtained;
- 45 - blocking the plug by means of a blocking device that has an insert having a direction of longitudinal extension and adapted to be inserted into the slot in such a way as to maintain it oriented according to the parallel orientation;
- 50 - housing a plurality of counter-pins in the seats obtained in the main body in such a way that the insert presses on the counter-pins so as to maintain them completely inside the respective seats.

55 **[0028]** 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.

**[0029]** The invention also relates to a process for preparing for use a rekeyable cylinder.

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

- providing a cylinder of the type described previously;
- releasing the rotation of the plug;
- rotating the plug into the operative configuration until obtaining an alignment between the active pins and the counter-pins;
- removing the insert.

**[0031]** If it is necessary to carry out a rekeying of the cylinder, the aforesaid process also comprises a preliminary rekeying step to be carried out before the step of releasing the rotation of the plug.

**[0032]** In particular, the rekeying step comprises:

- 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. If present, the passive pins can also be replaced;
- repositioning the plug in the housing.

**[0033]** At this point, it is thus possible to proceed to release the rotation of the plug, rotate it into the operative configuration and remove the insert.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0034]** 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 for a lock;
- figure 2 illustrates a front view of the rekeyable cylinder illustrated in figure 1;
- figures 3 and 4 illustrate side views of a possible sequence of actions to be carried out in order to rekey the cylinder illustrated in figures 1 and 2.

**[0035]** With reference to the drawings, they 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

**[0036]** With reference to the figures, the present invention relates to a rekeyable cylinder generically denoted by the number 1.

**[0037]** 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.

**[0038]** Figure 1 shows a rekeyable cylinder 1 for a lock having a main body 2. More precisely, figure 1 illustrates a rekeyable double cylinder 1, whose main body 2 is divided into two substantially symmetrical parts.

**[0039]** 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.

**[0040]** The cylinder 1 comprises a cam 50 (also called bit, which may be better seen in figure 2) 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 2), so as to prevent the extraction of the cylinder 1 from its housing in the lock (so-called "anti-pull"). In addition, as may be better seen in figure 1, 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 extraction of the cylinder 1 from the lock also in the event that the cam 50 is not projecting from the main body 2.

**[0041]** With particular reference to figure 1, the cylinder 1 comprises fixing means to maintain the plugs 3 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.

**[0042]** 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.

**[0043]** 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 aligned with the aforesaid

transverse direction T.

**[0044]** The cylinder 1 also comprises a blocking device 10 configured to maintain the plug 3 in the rotated position relative to the operative configuration.

**[0045]** In particular, the blocking device 10 comprises an insert 11 that extends along a direction of longitudinal extension "L" and, moreover, is configured to be inserted into the slot 5 and press on the counter-pins 8 to maintain them completely inside the respective seats 9.

**[0046]** In other words, the provision of the aforesaid blocking device 10 is advantageously capable of maintaining the counter-pins 8 inside their respective seats 9 so as not to oppose any free rotation of the plug 3 (as better described below).

**[0047]** In particular, the maintaining of the counter-pins 8 inside their respective seats 9 is ensured by the insert 11 which, as mentioned, is shaped so as to extend inside the slot 5 along the seats 9 of the counter-pins 8. In other words, the insert 11 acts as an abutment element, against which the counter-pins 8 abut. In fact, when the plug 3 is in the rotated position, the slot 5 is aligned with the transverse direction T and, therefore, the seats 9 of the counter-pins 8 are in direct communication with the slot 5 itself.

**[0048]** Advantageously, therefore, the cylinder 1 is in a configuration ready for a rekeying without the use of tools, unlike in the prior art, where cutting tools are necessary to divide a key in half.

**[0049]** 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, thus preventing the rotation of the plug 3.

**[0050]** In accordance with one aspect of the invention, 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.

**[0051]** 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.

**[0052]** In this regard, closures 8c are positioned in said openings to prevent the counter-pins 8 from coming out.

**[0053]** With particular reference to figures 3 and 4, a preferred embodiment of the blocking device 10 envisages that the insert 11, when inserted into the slot 5, extends parallel to the rotation axis X for at least part of the length of the plug 3. In particular, the insert 11 is disposed along a line of separation between the plug 3 and the housing 4 in such a way as to maintain the counter-pins 8 completely inside their respective seats 9.

**[0054]** In other words, the insert 11 preferably extends at the interruption (caused by the cutting of the slot 5) of the outer lateral wall 12 of the plug 3 (which may be seen in figure 4) so as to maintain the counter-pins 8 abutted against it and, therefore, completely inside their respective seats 9.

**[0055]** Preferably, the insert 11 is partially inserted inside the slot 5 relative to the direction of longitudinal extension "L" (i.e. the length or depth of the plug 3) and/or relative to the transverse direction T (i.e. the width or diameter of the plug 3).

**[0056]** In other words, like a key of a lock which, when inserted, occupies the volume defined by the slot 5, the insert 11 is thus preferably shaped so as to occupy a portion of volume close to the outer circumference of the plug 3. In this manner, when it is inserted in the slot 5, the insert 11 lies in a plane tangent to the outer circumference of the plug 3.

**[0057]** In accordance with one aspect of the invention, the insert 11 extends along the direction of longitudinal extension L for a length that can also be less than the length of the plug 3, but which must be sufficient to intercept and lie over all the seats 9 of the counter-pins 8.

**[0058]** In accordance with another aspect of the invention which may be seen in figure 2, the insert 11 has a cross section transverse to the longitudinal direction L with a shape that is substantially complementary to that of a portion of the slot 5.

**[0059]** In this manner, when the insert 11 is positioned in the slot 5, the blocking device 10 is able to remain in a stable position with respect to the cylinder 1.

**[0060]** In accordance with a further aspect of the invention, the blocking device 10 can comprise 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 itself is inserted in the slot 5, in order to prevent the rotation of the plug 3 in at least one direction of rotation about the rotation axis X.

**[0061]** 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.

**[0062]** 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).

**[0063]** In accordance with another aspect of the invention, the tab 13 extends laterally to the insert 11, preferably parallel to the longitudinal direction of extension L.

**[0064]** In other words, the tab 13 is advantageously shaped so as to abut against a lateral outer portion of the main body 2 in order to define a mechanical interference, as previously explained.

**[0065]** In accordance with a further aspect of the in-

vention, the insert 11 acts as a sliding guide for the sliding of the plug 3 during the steps of extraction and insertion thereof. In fact, when inserted into the slot 5, the insert 11 acts as a sliding track. In addition, if present, the tab 13 (or the pair of tabs 13 as better explained below) acts as a lateral sliding guide.

**[0066]** In accordance with a preferred aspect of the invention, the tab 13 is breakable so as to be removable from the blocking device 10, leaving the insert 11 inside the slot 5. In this manner, the user can advantageously rotate the plug 3 into the operative configuration for a ready use of the cylinder 1 in the event that no rekeying is necessary.

**[0067]** In accordance with one 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 3 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 11 is substantially interposed between the pair of tabs 13.

**[0070]** Even more preferably, the blocking device 10 has a substantially symmetrical configuration, wherein the insert 11 is disposed centred relative to the pair of tabs 13.

**[0071]** In other words, therefore, the blocking device 10 has a configuration that is substantially similar to that of a trident, wherein the insert 11 is configured to be positioned inside the slot 5, whilst the tabs 13 are configured to laterally embrace the main body 2. In this manner, the insert 11 and the pair of tabs 13 define a sliding guide parallel to the rotation axis X. Advantageously, in the event that it is necessary to proceed with rekeying of the cylinder 1 (as described below), it is thus easily possible to extract/insert the plug 3 from/into the housing 4.

**[0072]** Furthermore, the aforesaid particular configuration of the blocking device 10 assures that the insert and the tab do not interfere with the direction of extraction/insertion of the plug 3.

**[0073]** Preferably, in the case where a pair of tabs 13 is present, only one of them can be breakable.

**[0074]** The invention also relates to a method for producing a rekeyable cylinder 1 for a lock.

**[0075]** In particular, the aforesaid 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 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 orientation parallel to the transverse direction T according to which the seats 9 of the counter-pins 8 are obtained;
- inserting an insert 11 of a blocking device 10 into the slot 5 in such a way as to maintain it oriented according to the parallel orientation;
- housing a plurality of counter-pins 8 in the seats 9 obtained in the main body 2 so that the insert 11 presses on the counter-pins 8 to maintain them completely inside their respective seats 9.

**[0076]** 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.

**[0077]** In fact, the insert 11 closes off the seats 9 of the counter-pins 8 turned inwardly in the main body 2 and communicating with the slot 5.

**[0078]** Advantageously, the insert 11 thus allows the counter-pins 8 to be inserted into their respective seats 9 without them projecting into the slot 5. In other words, the insert prevents the counter-pins from going beyond the line of separation between the main body 2 and the plug 3.

**[0079]** Preferably, the method comprises a step of fixing the plug 3. Preferably, the fixing step is carried out 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.

**[0080]** Even more preferably, the step of inserting the plug 3 in the housing 4 also comprises a sub-step of checking that the cam 50 is maintained in a projecting position relative to the main body 2, as may be clearly seen in figure 2.

**[0081]** In accordance with one aspect of the invention, the step of inserting an insert 11 of a blocking device 10 is carried out before the step of housing a plurality of counter-pins 8.

**[0082]** Optionally, the method also 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.

**[0083]** The present invention also refers to a process for preparing for use a rekeyable cylinder 1 of a lock.

**[0084]** First of all, if the cylinder 1 does not need to be rekeyed, the process for preparing for use comprises the following steps:

- providing a cylinder 1 having one or more of the features described previously;
- releasing the rotation of the plug 3;
- rotating the plug 3 until obtaining an alignment between the active pins 6 and the counter-pins 8;
- removing the insert 12.

**[0085]** In this case, in fact, the keying of the cylinder already prepared in the manufacturing stage proves to be acceptable and thus does not need to be modified.

**[0086]** Removing the breakable tab 13, if present, 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.

**[0087]** 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).

**[0088]** 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.

**[0089]** In addition, it is noted that the aforesaid process does not require the use of specific tools.

**[0090]** In accordance with another aspect of the invention, if it is instead necessary to proceed with rekeying of the cylinder 1, before the step of releasing the rotation of the plug 3, the aforesaid process envisages performing the following steps:

- extracting the plug 3 from the housing 4 of the main body 2 of the cylinder 1 (figure 4), removing the circlip 52 if present;
- 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, if present, the passive pins are also replaced;
- repositioning the plug 3 in the housing 4.

**[0091]** In this way, it is possible to carry out the rekeying of the cylinder 1 in a simple, fast manner without using specific tools and/or carrying out any particular operations (such as cutting the key).

**[0092]** In accordance with a further aspect of the invention illustrated in figure 4, the blocking device 10 is maintained in a fixed position relative to the main body 2 of the cylinder 1 both during the step of extracting the plug 3 from the housing 4, and during the step of repositioning the plug 3 in the same housing 4.

**[0093]** In other words, the blocking device 10 is advantageously configured to enable the removal of the plug 3 from the housing 4 without any prior operation of removing the insert 11 and/or the entire blocking device 10 being necessary.

**[0094]** Therefore, no component of the blocking device 10 interferes with the plug 3 during the sliding movement of extraction thereof from (or introduction into) the housing 4.

**[0095]** In addition, the blocking device 10 is able to maintain the counter-pins 8 in their respective seats 9 thanks to the correct positioning of the insert 11.

**[0096]** As shown in figure 4, following the removal of the circlip 52, the plug 3 can be extracted from the housing 4, whilst the blocking device 10 remains stably coupled to the main body 2 so that the insert 11 prevents the counter-pins 8 from coming out of their respective seats 9.

**[0097]** 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.

**[0098]** Finally, to reset the cylinder 1 in order to make it usable, the following steps are carried out: insertion of the plug 3 (equipped with the new active pins and, possibly, the new passive pins as well) into the housing 4; repositioning of the circlip 52; removal of the breakable tab 13, if present; rotation of the plug 3 into the operative configuration; and final removal of the insert 11, by moving the blocking device 10 away from the cylinder 1.

## Claims

1. A rekeyable cylinder (1) for a lock, 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 said 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 aligned with said transverse direction (T);
- a blocking device (10) configured to maintain the plug (3) in said rotated position relative to said operative configuration,

wherein said blocking device (10) comprises an insert (11) having a longitudinal direction of extension (L) and adapted to be inserted into the slot (5), said insert (11) pressing on the counter-pins (8) to maintain them completely inside the respective seats (9).

2. The cylinder (1) according to claim 1, wherein the insert (11) extends parallel to said rotation axis (X) for at least part of said plug (3) when inserted in said

- slot (5), said insert (11) being disposed at a line of separation between said plug (3) and said housing (4) in such a way as to maintain said counter-pins (8) completely inside the respective seats (9).
3. The cylinder (1) according to claim 1 or 2, wherein said insert (11) has a section that is transverse to said longitudinal direction (L) and substantially complementarily shaped relative to a portion of said slot (5) through which it is inserted.
  4. The cylinder (1) according to claim 2 or 3, 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 the insert (11) is inserted in the slot (5), in such a way as to prevent the rotation of said plug (3) in at least one direction of rotation about said rotation axis (X).
  5. The cylinder (1) according to claim 4, wherein the tab (13) extends laterally to said insert (11), preferably parallel to said longitudinal direction of extension (L).
  6. The cylinder (1) according to any one of claims 4 or 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.
  7. The cylinder (1) according to any one of claims 4 to 6, wherein said 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).
  8. The cylinder (1) according to claim 7, wherein said insert (11) is substantially interposed between said pair of tabs (13).
  9. The cylinder (1) according to claim 7 or 8, wherein the blocking device (10) has a substantially symmetrical configuration, said insert (11) being disposed centred relative to said pair of tabs (13).
  10. The cylinder (1) according any one of claims 4 to 9, wherein said insert (11) and said tab (13) are shaped so as to define a sliding guide parallel to said rotation axis (X) along which said plug (3) is configured to slide during insertion into and extraction from said housing (4).
  11. 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 orientation parallel to said transverse direction (T) according to which the seats (9) of the counter-pins (8) are obtained;
  - blocking the plug (3) by means of a blocking device (10) that has an insert (11) having a longitudinal direction of extension (L) and adapted to be inserted into the slot (5) in such a way as to maintain it oriented according to said parallel orientation;
  - housing a plurality of counter-pins (8) in the seats (9) obtained in the main body (2) so that said insert (11) presses on the counter-pins (8) to maintain them completely inside the respective seats (9).
12. The method according to claim 11, wherein said step of inserting an insert (11) of a blocking device (10) is carried out before said 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 (8c) in said openings to prevent said counter-pins (8) from coming out.
  13. 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 10;
    - releasing the rotation of the plug (3);
    - rotating the plug (3) until obtaining an alignment between the active pins (6) and the counter-pins (8);
    - removing said insert (12).
  14. The process according to claim 13, wherein before the step of releasing the rotation of the plug (3), the cylinder is rekeyed by means of the following steps:
    - 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);  
- repositioning the plug (3) in the housing (4).

15. The process according to claim 14, wherein said blocking device (10) is maintained in a fixed position relative to the main body (2) of the cylinder (1) both during the step of extracting the plug (3) from the housing (4), and during the step of repositioning the plug (3) in the housing (4), said plug (3) being made to slide along at least said insert (11), which acts as a sliding guide during said steps of extracting and inserting the plug (3) itself.

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Fig. 1

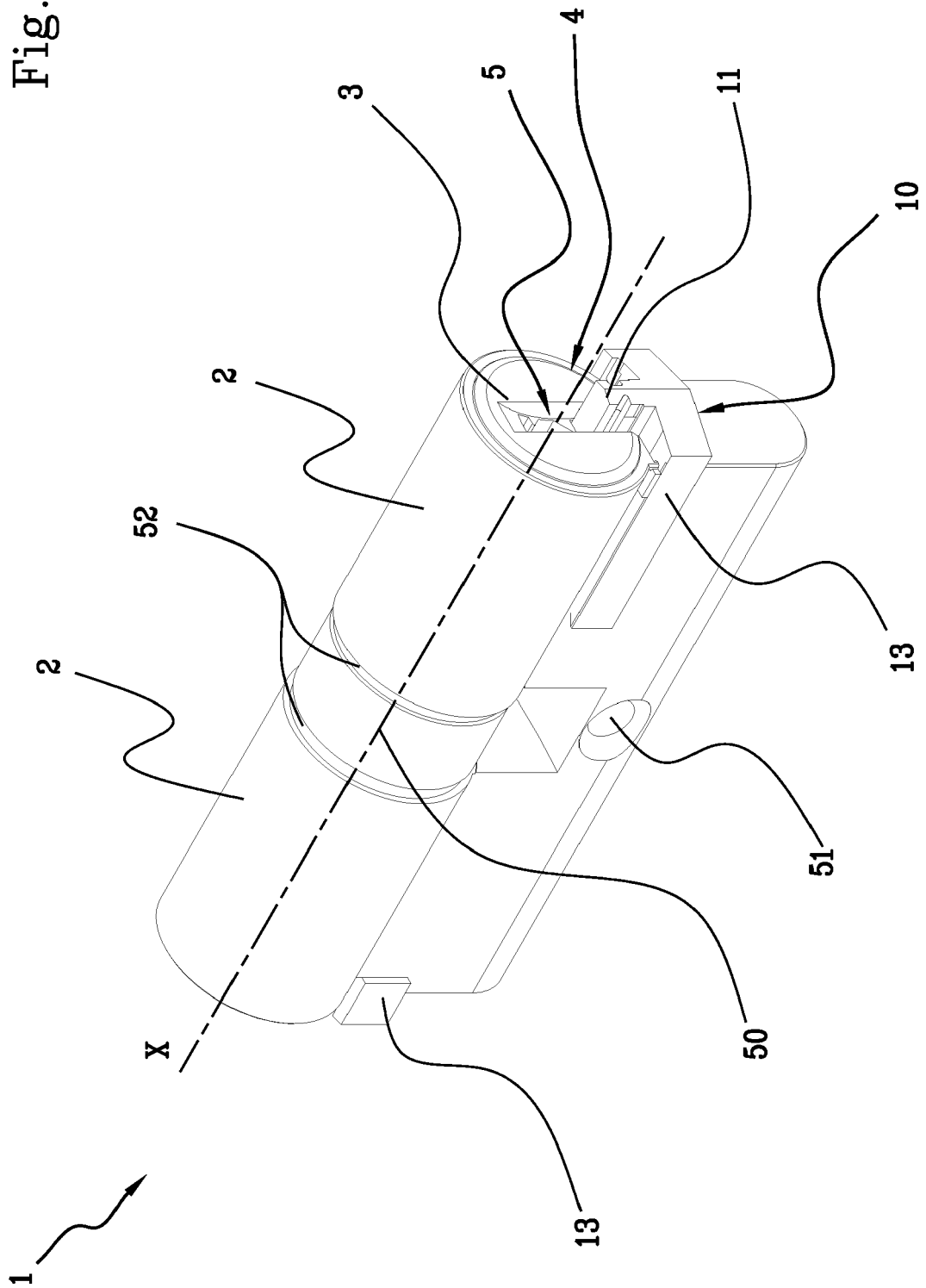


Fig.2

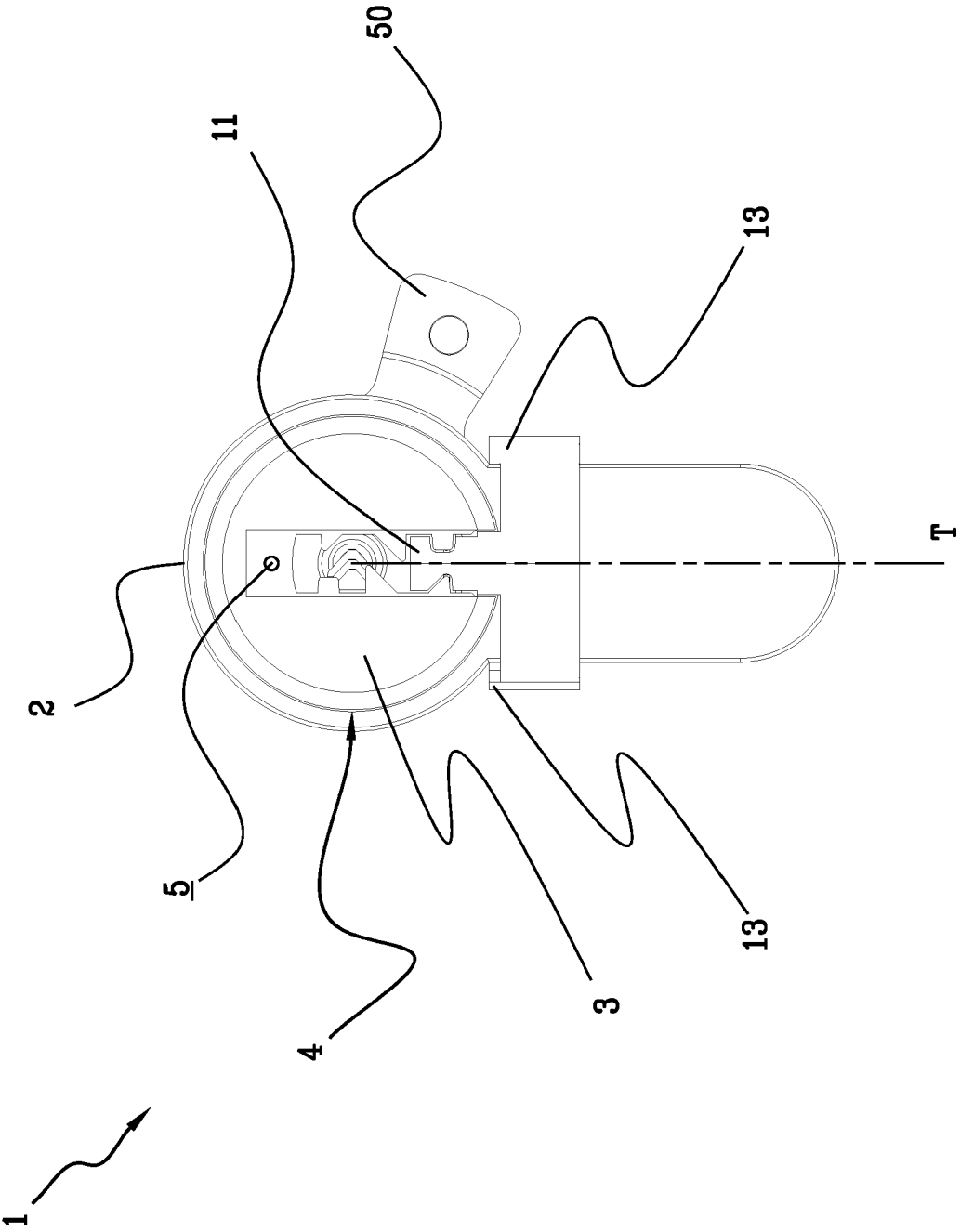
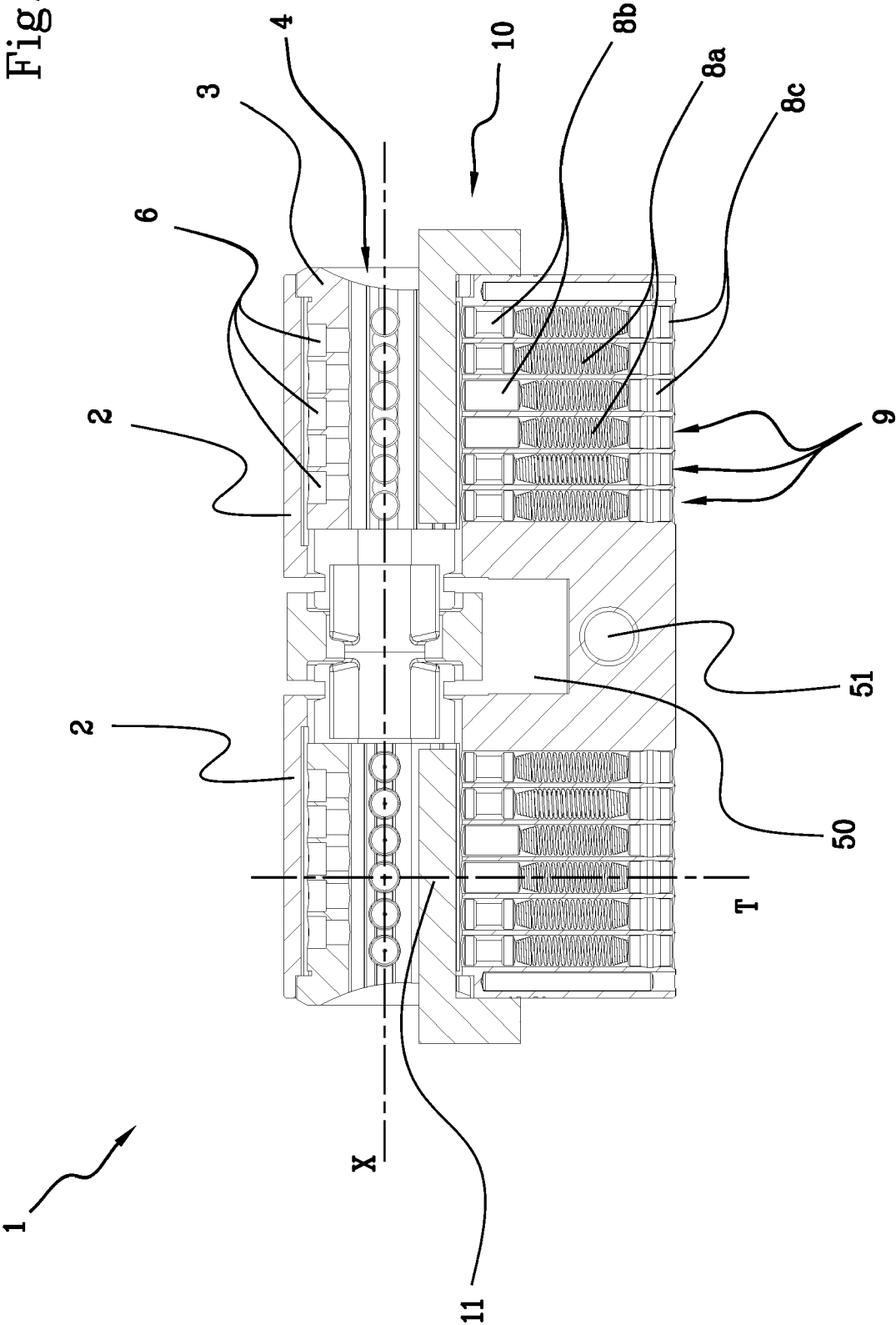


Fig.3







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Application Number

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EPO FORM 1503 03.82 (P04C01)

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The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>19 March 2024</b>	Examiner <b>Van Beurden, Jason</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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19-03-2024

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