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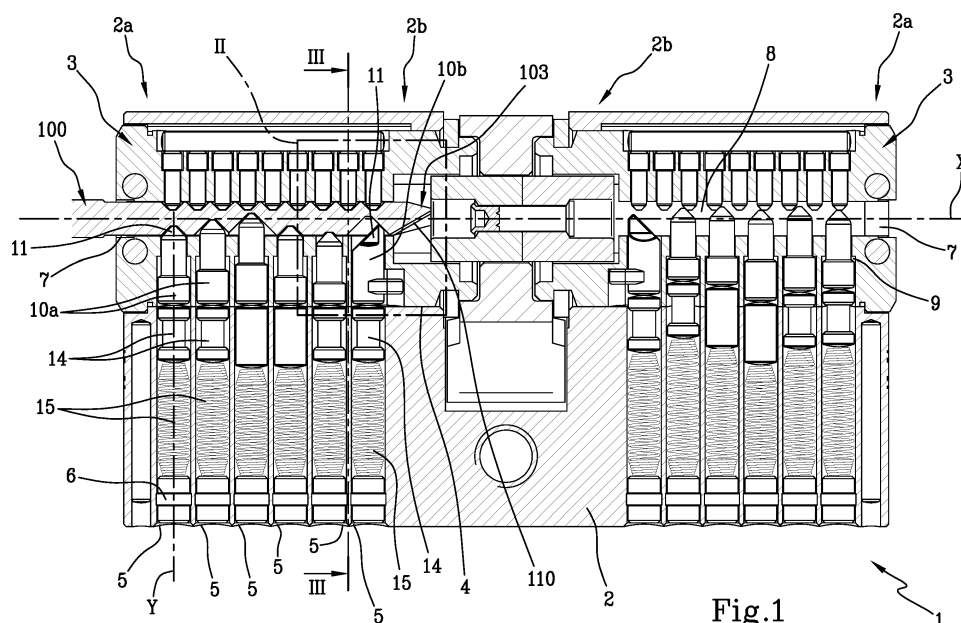
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(54) **CYLINDER LOCK OPERATING WITH A PUNCHED CONTROL KEY, A BLANK FOR MAKING A DUPLICATE OF SAID PUNCHED CONTROL KEY, AND A LOCKING SYSTEM THEREOF**

(57) A locking system comprising a cylinder lock (1) having an active anti-burglary piston (10b) housed in a respective radial hole (9) of a rotor (3), slidable along a central axis (Y) of said radial hole (9) and comprising a control head (11) configured to abut in said punched control key (100) at an active anti-burglary punching (100b). A locking system further comprising a blank for making a duplicate of a punched control key (100) for said cylinder lock (1). The blank comprises an active anti-burglary punching (100b) formed in a proximal position with respect to a free end (103) and a chute (110) that extends between said active anti-burglary punching (100b) and

said free end (103). The active anti-burglary punching (100b) and/or control head (11) of the anti-burglary piston (10b) are shaped and/or arranged in such a way that, in a coupling condition between the punched control key (100) obtained from said blank and said cylinder lock, said control head (11) abuts in said active anti-burglary punching (100b) and is arranged in the rear portion of the internal volume of the active anti-burglary punching (100b), leaving a gap (19) between the control head (11) of the anti-burglary piston (10b) and a front portion of the active anti-burglary punching (100b).



Description

[0001] The present invention relates to a cylinder lock of the type operating with a punched control key, a blank for making a duplicate of the punched control key, and a locking system thereof.

[0002] The present invention also relates to a method for making a blank for duplicating a punched control key and a method for duplicating a punched control key.

[0003] The term cylinder lock is intended as a type of lock in which a cylindrical drive rotor of the latch is rotatably housed in a stator and has a slit for receiving a punched control key. This key has flared punchings, which, following an elastic thrusting action, abut against control heads of pistons housed in the lock.

[0004] The depth and position of the punchings constitute the cuts of the key that corresponds to the position of the pistons adapted to allow the rotation of the rotor. In fact, when the control key corresponding to the lock is inserted into the slit and the pistons abut in their respective punching, the opposite ends of the pistons align on the sliding surface between the rotor and stator, allowing the rotation of the rotor itself.

[0005] One known method of opening this type of lock is called "key bumping", which consists in preparing a "bumping key" provided with punchings having the maximum depth obtainable in the thickness of the key itself. The bumping key can be inserted in the slit of the lock at a length greater than the control key. In general, the bumping key is made starting from a blank or untreated key, adapted to create a duplicate of the control key of the lock, providing thereon maximum-depth punchings and filing the typical stop abutments of the control key.

[0006] By inserting the bumping key in the slit, all the pistons arrange at their maximum height. By hitting the key to push it further into the slit, the pistons are subjected to an impact in a radial direction, making the rotation of the rotor possible.

[0007] In this context, the technical task underlying the present invention is to propose a locking system, in particular a cylinder lock and/or a blank for making a duplicate of a punched control key, able to resist such an opening method.

[0008] The stated technical task and the aims specified are substantially achieved by a cylinder lock of the type operating with a punched control key, by a blank for making a duplicate of the punched control key, by a locking system and by a method for making a blank or for duplicating a punched control key, each comprising the technical features described in one or more of the accompanying claims.

[0009] In particular, in accordance with a first aspect, the present invention relates to a cylinder lock adapted to operate with a punched control key. Among the pistons that characterise the cylinder lock, i.e. adapted to cooperate with corresponding active punchings of the punched control key, an anti-burglary piston is provided whose control head has an asymmetrical shape with re-

spect to a central sliding axis of the piston itself. An apex of the control head of the anti-burglary piston is arranged behind this central axis, i.e. at a rear portion of the anti-burglary piston itself.

[0010] In accordance with a second aspect, the present invention relates to a blank for making a duplicate of a punched control key. A first longitudinal track of the blank has an active anti-burglary punching formed in a proximal position with respect to a free end of the blank itself. A chute extends between the active anti-burglary punching and the free end. The active anti-burglary punching is uniquely associated to a given cylinder lock and defines an internal volume greater than the volume occupied by a control head of an anti-burglary piston of the cylinder lock. The shape and/or form of the active anti-burglary punching is such that the corresponding anti-burglary piston abuts in it to be arranged in a rear portion of the internal volume, leaving before it a gap suited to preventing burglary attempts using bumping keys.

[0011] In accordance with a third aspect, the present invention relates to a locking system comprising a cylinder lock and/or a blank for making a duplicate of a punched control key for the cylinder lock.

[0012] In accordance with further aspects, the present invention relates to a method for making a blank and a method for duplicating a punched control key such that the active anti-burglary punching is performed directly on the blank and the other active punchings of the control key are made during the step of making a duplicate of the punched control key.

[0013] In one or more of the aspects indicated, the present invention may comprise one or more of the characteristics set forth in the dependent claims, incorporated here for reference, each corresponding to a possible embodiment.

[0014] Additional features and advantages of the present invention will become more apparent from the indicative, and thus non-limiting description that follows. This description is provided herein below with reference to the attached drawings, which are provided solely for purpose of providing approximate and thus non-limiting examples, of which:

- figure 1 is a schematic, longitudinal section view of a first embodiment of a cylinder lock associated with a respective punched control key;
- figure 2 is an enlarged view of detail II in figure 1;
- figure 3 is a sectional view according to track III-III in figure 1;
- figure 4 is a schematic, longitudinal section view of the cylinder lock of figure 1 associated with a bumping key;
- figure 5 is an enlarged view of detail V in figure 4;
- figure 6 is an enlarged view of detail VI in figure 3;
- figure 7 is a schematic, longitudinal section view of a second embodiment of a cylinder lock associated with a respective punched control key;
- figure 8 is an enlarged view of detail VIII in figure 7;

- figure 9 is a sectional view according to track IX-IX in figure 7;
- figure 10 is a schematic, longitudinal section view of the cylinder lock of figure 7 associated with a bumping key;
- figure 11 is an enlarged view of detail XI in figure 10;
- figure 12 is a schematic perspective view of a blank for making a duplicate of a punched control key adapted to be used in a cylinder lock;
- figure 13 is a schematic plan view of a punched control key adapted to be used in a cylinder lock.

[0015] With reference to the accompanying figures, the number 1 comprehensively denotes a cylinder lock, the number 100 denotes a punched control key adapted to control the unlocking and locking of the cylinder lock 1 and the number 200 denotes a blank or untreated key for making a copy of the punched control key 100.

[0016] Referring for example to figures 1, 7 and 13, the punched control key 100 comprises a grip 101 and a plate-like body 102 that mainly extends along a longitudinal direction "A" from the grip 101 toward a free end 103. In other words the punched control key 100, in particular the plate-like body 102, has a longitudinal dimension greater than the transverse dimensions, with reference to the longitudinal direction "A". In turn, a transverse direction of the plate-like body 102 is greater than the other one so as to define two major side surfaces 102a and two minor side surfaces 102b.

[0017] At least one major side surface 102a of the plate-like body 102 has a longitudinal trail 104, a first longitudinal track 105 on which active punchings 100a, 100b are made and a second longitudinal track 106 on which passive punchings 100c can be made. Preferably, the punched control key 100 is reversible, i.e. the two major side surfaces 102a of the plate-like body 102 are identical as a result of a 180° rotation of the punched control key around the longitudinal direction "A".

[0018] Further passive punchings 100d can possibly be provided on a minor side surface 102b of the plate-like body 102.

[0019] The active punchings have a flared shape, for example conical, with varying depths in relation to the cuts of the punched control key 100. Among the active punchings, the punched control key 100 comprises an active anti-burglary punching 100b formed in a proximal position with respect to the free end 103.

[0020] Preferably, the active anti-burglary punching 100b has a basic footprint 107 having an elongated shape in a direction perpendicular to the longitudinal direction "A" of the plate-like body 102. Even more preferably, the active anti-burglary punching 100b has two planar surfaces 108 that extend from the basic footprint 107 connected by substantially truncated-conical side surfaces 109. The overall active anti-burglary punching 100b has a flared shape, both at the planar surfaces 108 and at the side surfaces 109. A planar surface 108 extends toward the free end 103, forming a rear planar surface 108.

The other planar surface 108 extends toward the grip 101, forming a front planar surface 108.

[0021] The active anti-burglary punching 100b has a width at the base equal to 0.5 mm, length equal to 1.7 mm and depth equal to 1.5 mm.

[0022] In general, the term "front" is used to indicate a portion and/or an element arranged and/or facing toward the grip 101, with reference to the punched control key 100, or toward an insertion area of the punched control key 100 in the cylinder lock 1, with reference to the lock itself. Similarly, the term "rear" is used to indicate a portion and/or an element arranged and/or facing toward the free end 103, with reference to the punched control key 100 or toward the part opposite the insertion area of the punched control key 100 in the cylinder lock 1, with reference to the lock itself.

[0023] The major side surface of the plate-like body 102 also has a chute 110 that extends between the active anti-burglary punching 100b and the free end 103.

[0024] Along the longitudinal direction "A" of the punched control key 100, an abutment portion 111 is provided, preferably two abutment portions 111, which in the use of the punched control key 100 abuts against a corresponding abutment portion of the cylinder lock 1 such that the punched control key 100 has a predefined longitudinal dimension of insertion "H" and the active punchings are arranged in respective predefined longitudinal positions within the cylinder lock. By way of example the basic footprint of the active anti-burglary punching 100b is arranged at a position longitudinally placed at a distance H1 equal to 18.5 mm from the abutment portion in the case that will be described in reference to figure 1 and equal to 17.9 mm in the case that will be described in reference to figure 7.

[0025] To make a duplicate of the punched control key 100, use of the blank 200 or an untreated key is envisaged, for which figure 12 constitutes a possible non-limiting exemplary embodiment. The blank 200 has certain features in common with the punched control key 100 that have been indicated in figure 12 with the same reference number. In fact, the blank 200 comprises the grip 101 and the plate-like body 102 with at least one major side surface 102a provided with the longitudinal trail 104. The first longitudinal track 105 is adapted to receive the active punchings 100a of the control key 100 and the second longitudinal track 106 is adapted to receive the passive punchings 100c of the control key 100.

[0026] The first longitudinal track 105 already has the active anti-burglary punching 100b formed in a proximal position with respect to the free end 103, and the chute 110 that extends between the active anti-burglary punching 100b and the free end 103.

[0027] In other words, the creation of the active anti-burglary punching 100b is envisaged directly on the same blank, as well as duplicating a punched control key 100 starting from this blank, by completing the active punchings 100a on the first longitudinal track 105.

[0028] Figures 1-6 illustrate a first embodiment of the

cylinder lock 1.

[0029] The cylinder lock 1 comprises a stator 2 and at least one cylindrical rotor 3. In the illustrated examples, two rotors 3 are provided, arranged symmetrically so as to terminate at the respective inner and outer surfaces of a door or a window.

[0030] The stator 2 has a cylindrical seat 4 which extends longitudinally between a front portion 2a and a rear portion 2b. "X" is used to indicate a longitudinal axis of the cylindrical seat 4.

[0031] The stator 2 further has a plurality of radial holes 5 terminating in the cylindrical seat 4. The radial holes 5 have respective central axes arranged radially with respect to the longitudinal axis "X" and lying in the same plane containing the longitudinal axis "X". Preferably the radial holes 5 pass through the entire thickness of the stator 2 and, on the opposite side of the cylindrical seat 4, are closed by respective closure elements 6. The rotor 3 is housed in the cylindrical seat 4 such to be able to rotate around the longitudinal axis "X" in multiple angular positions. The surface that delimits the cylindrical seat 4 defines a sliding surface between the rotor 3 and the stator 2.

[0032] The rotor 3 has a front opening 7 which provides access to a slit 8 that extends between the front opening 7 and a rear portion of the rotor and which therefore has a longitudinal extension which coincides with the longitudinal axis "X". The front opening 7 and the slit 8 are adapted to the insertion of the punched control key 100 i.e., with respect to the longitudinal axis "X", they have a transverse counter-shaped profile with respect to the transverse section of the punched control key 100.

[0033] The rotor 3 has a plurality of radial holes 9 that terminate in the slit 8 and radially pass through the entire thickness of the rotor itself. The radial holes 9 of the rotor 3 have respective central axes arranged radially with respect to the longitudinal axis "X" and lying in the same plane containing the longitudinal axis "X".

[0034] In the angular position of the rotor 3 shown in figure 1, corresponding to an angular alignment position, the radial holes 5 of the stator 2 and the radial holes 9 of the rotor 3 are aligned to form a plurality of radial recesses that extend along the respective central axes comprehensively indicated with the letter "Y".

[0035] The cylinder lock 1 comprises a plurality of pistons, among which a plurality of locking pistons 10a are provided, each adapted to abut in an active punching 100a of the punched control key 100, and at least one anti-burglary piston 10b suited to abut in the active anti-burglary punching 100b of the punched control key 100. Preferably, the anti-burglary piston 10b is the piston farthest from the front opening 7, therefore arranged in the rear portion of the rotor 3.

[0036] Each piston 10a, 10b is housed in a radial hole 9 of the rotor 3 and is slidable along the central axis "Y".

[0037] Each piston 10a, 10b comprises a control head 11 having an apex 12 protruding inside the slit 8 and a control surface 13a configured to come into contact with

the punched control key 100 at an active punching 100a, 100b of the control key itself.

[0038] Each piston is associated with a respective counter-piston 14, arranged in line with the piston itself along the central axis "Y" and in contact with it at the respective abutment ends, and an elastic element 15, arranged in line with the piston and the counter-piston along the central axis "Y" and in contact with the latter. Each counter-piston 14 is therefore interposed between an elastic element 15 and a piston 10a, 10b.

[0039] Each elastic element 15 is housed in a radial hole 5 of the stator 2 and is thrustingly active on the respective counter-piston 14 to push the set constituted by the counter-piston and piston toward the slit 8. In the remainder of the present description, this movement will also be defined as lifting, independent of the fact that the pistons and counter-pistons are oriented vertically or in different angles.

[0040] In addition, the set constituted by the piston and counter-piston is movable in opposition to the respective elastic element 15 as a result of the interaction between the control head 11 of the piston 10a, 10b and the punched control key 100. In the remainder of the present description, this movement will also be defined as lowering, independent of the fact that the pistons and counter-pistons are oriented vertically or in different angles.

[0041] In use, when the rotor 3 is in the angular alignment position and the punched control key 100 is outside the slit 8, the counter-pistons 14 are free to rise in their respective radial seats, pushed by the elastic elements 15, and to straddle between the rotor 3 and the stator 2, preventing the rotation of the rotor around the longitudinal axis "X".

[0042] To free the rotation of the rotor 3, the punched control key 100 having the correct cuts is inserted into the slit 8, when the rotor 3 is in the angular alignment position. Finding abutment in the respective active punchings 100a, 100b, the pistons 10a, 10b and consequently the counter-pistons 14 are lowered and compress the elastic elements 15. The abutment ends of the pistons and counter-pistons are aligned along the sliding surface between the rotor 3 and the stator 2. Using the punched control key 100, the rotor 3 is placed in rotation around the longitudinal axis "X", dragging the pistons with itself while the counter-pistons and the elastic elements remain housed in the stator 2.

[0043] In the case of locking pistons 10a, the relative control head 11 has a substantially conical or slightly truncated-conical shape, with the apex 12 lying on the central axis "Y". To free the rotation of the rotor 3, the control head 11 abuts against and comes into contact with a respective active punching 100a having a substantially conical or slightly truncated-conical shape, complementary shaped to the control head itself. The control surface 13a of the control head 11 is for example constituted by a top surface of the locking piston 10a, i.e. the apex 12.

[0044] In the case of an anti-burglary piston 10b, the

relative control head 11 is shaped asymmetrically with respect to the central axis "Y", having the apex 12 lying on the opposite side of the front opening 7 with respect to the central axis "Y", i.e. at a rear portion of the anti-burglary piston 10b. Preferably the control head 11 of the anti-burglary piston 10b comprises a front surface 13b arranged toward the front opening 7, terminating at the apex 12 and intersecting the central axis "Y" of the radial hole 9 of the rotor 3 in which the anti-burglary piston 10b is housed. The front surface 13b is preferably inclined toward the apex 12 with respect to the central axis "Y".

[0045] Preferably, the control surface 13a of the control head 11 of the anti-burglary piston 10b is inclined toward the apex 12 with respect to the central axis "Y" and is arranged on the part opposite the front opening 7 with respect to the central axis "Y" at the rear portion of the anti-burglary piston 10b. To free the rotation of the rotor 3, the control surface 13a abuts against and preferably only comes into contact with a rear portion of the active anti-burglary punching 100b.

[0046] In one possible embodiment for which the accompanying drawings constitute a non-limiting example, the control head 11 of the anti-burglary piston 10b has a chisel shape with the front surface 13b and the control surface 13a having a planar shape and converging in the apex 12. The apex 12 thus has a linear shape and is preferably arranged in a direction perpendicular to the central axis "Y" and to the longitudinal extension of the slit 8, i.e. the longitudinal axis "X".

[0047] In one possible embodiment for which the accompanying drawings constitute a non-limiting example, the apex 12 having a linear shape has a length L1 which is smaller than the diameter "D" of the radial seat and of the body of the anti-burglary piston 10b and is preferably offset with respect to the central axis "Y" along a direction perpendicular to the longitudinal extension of the slit 8 (figure 3 and figure 6).

[0048] In one possible embodiment for which the accompanying drawings constitute a non-limiting example, the anti-burglary piston 10b comprises an anti-rotation device 16 configured to keep the angular position of the anti-burglary piston 10b fixed around the central axis "Y". Preferably, the anti-rotation device 16 comprises a tab 17 of the anti-burglary piston 10b that extends transversely with respect to the central axis "Y" to be inserted in a guide 18 of the rotor 3 parallel to the central axis "Y". The guide 18 is configured to allow the translation of the tab 17 along the central axis "Y" and to prevent rotation about the central axis "Y".

[0049] In use, to free the rotation of the rotor 3, the locking pistons 10a abut in the respective active punchings 100a of the punched control key 100 while the anti-burglary piston 10b abuts in the active anti-burglary punching 100b in mutual contact only at the respective rear portions. Figure 1 illustrates the angular alignment position of the rotor 3 with the punched control key 100 inserted into the slit 8 and correctly interacting with the pistons 10a, 10b such to allow the rotation of the rotor 3

around the longitudinal axis "X". It can be noted that the active punchings 100a of the punched control key 100 are arranged along the longitudinal direction "A" such to be arranged symmetrically on the respective central axis "Y" of the cylinder lock and to circumferentially wind around the control head 11 at least to the depth that characterises them.

[0050] Preferably, the active anti-burglary punching 100b is also arranged along the longitudinal direction "A" such to be arranged symmetrically on the respective central axis "Y". The active anti-burglary punching 100b defines in its interior a volume greater than the volume occupied by the control head 11 of the anti-burglary piston 10b that is arranged in the rear portion of this volume. In other words, in the interaction between the control head 11 of the anti-burglary piston 10b and active anti-burglary punching 100b, the control surface 13a comes into contact with the rear planar surface 108 of the active anti-burglary punching 100b and generates a gap 19 between the front surface 13b of the anti-burglary piston 10b and the front portion of the active anti-burglary punching 100b. The gap 19 is adapted to prevent burglary attempts using bumping keys, as will be described later. In other words, the active anti-burglary punching 100b already formed on the blank 200, and therefore also present on the punched control key 100, is configured and/or arranged to receive an anti-burglary piston 10b of the cylinder lock 1 resting on the rear planar surface 108, i.e. that which extends toward the free end 103, in a coupling condition between the punched control key 100 obtained from the blank 200 and the cylinder lock itself.

[0051] The blocking of the rotation of the rotor 3 is performed in a manner similar to the locking pistons 10a and the anti-burglary piston 10b by extracting the punched control key 100.

[0052] Figures 4 and 5 illustrate a burglary attempt that exploits the method known as "key bumping", wherein a "bumping key" 300 is inserted into the slit 8 and hit from the outside to force the lowering of the pistons.

[0053] The bumping key 300 is obtained starting from the blank 200, comprising the active anti-burglary punching 100b, wherein further punchings 300a are made having an identical depth equal to the maximum obtainable depth on the blank 200. When the bumping key 300 is inserted into the slit 8 all the locking pistons 10a abut against their maximum height at the further punching 300a. In the interaction between the control head 11 of the anti-burglary piston 10b and the active anti-burglary punching 100b of the bumping key 300, a gap 19 is however created between the front surface 13b of the anti-burglary piston 10b and the front portion of the active anti-burglary punching 100b. The percussion exerted on the bumping key 300 from the outside is not able to cancel the gap 19 and therefore cause the lowering of the anti-burglary piston 10b. Any further action on the active anti-burglary punching 100b would lead to an increase in the gap 19, thereby increasing the security of the cylinder lock.

[0054] Figures 7-11 illustrate a second embodiment of the cylinder lock 1. The elements which are shared with the first embodiment have been indicated with the same reference number. In this case, a particular shape of the anti-burglary piston 10b is not provided, as it has a control head 11, which is structurally and functionally similar to those of the locking pistons 10a. Its anti-burglary function is determined by its position, which leads it to abut in the active anti-burglary punching 100b of the punched control key 100.

[0055] The blank 200 and the punched control key 100 comprise the active anti-burglary punching 100b, whose shape is preferably similar to that described previously.

[0056] The active anti-burglary punching 100b is formed in a proximal position with respect to the free end 103 and the chute 110 that extends between the active anti-burglary punching 100b and the free end 103. The active anti-burglary punching 100b is arranged along the longitudinal direction "A" such to be positioned offset along the longitudinal axis "X", toward the front opening 7 of the cylinder lock 1, with respect to the apex 12 of the anti-burglary piston 10b and the central axis "Y", in a coupling condition between the control key 100 obtained from the blank 200 and the cylinder lock 1. In figure 8 the letter "S" is used to indicate the distance between the basic footprint 107 of the active anti-burglary punching 100b and the apex 12 of the anti-burglary piston 10b. This staggered arrangement can also be envisaged in the first embodiment.

[0057] In use, to free the rotation of the rotor 3, the locking pistons 10a abut in the respective active punchings 100a of the punched control key while the anti-burglary piston 10b abuts in the active anti-burglary punching 100b in mutual contact at the respective rear portions. Figure 7 illustrates the angular alignment position of the rotor 3 with the punched control key 100 inserted into the slit 8 and correctly interacting with the pistons 10a, 10b such to allow the rotation of the rotor 3 around the longitudinal axis "X". It can be noted that the active punchings 100a of the punched control key 100 are arranged along the longitudinal direction "A" such to be arranged symmetrically on the respective central axis "Y" and to circumferentially wind around the control head 11 at least to the depth that characterises them. The active anti-burglary punching 100b is arranged along the longitudinal direction "A" such to be arranged offset along the longitudinal axis "X" toward the front portion of the rotor 3, with respect to the central axis "Y".

[0058] Also in this case, the active anti-burglary punching 100b defines in its interior a volume greater than the volume occupied by the control head 11 of the anti-burglary piston 10b that abuts in the rear portion of this volume. In other words, in the interaction between the control head 11 of the anti-burglary piston 10b and active anti-burglary punching 100b, the control head 11 comes into contact with the rear planar surface 108 of the active anti-burglary punching 100b and generates a gap 19 between the control head 11 of the anti-burglary piston 10b

and the front portion of the active anti-burglary punching 100b.

[0059] In other words, the active anti-burglary punching 100b of the blank 200 is configured and/or arranged to receive an anti-burglary piston 10b of the cylinder lock 1 resting on the rear planar surface 108, i.e. that which extends toward the free end 103, in a coupling condition between the punched control key 100 obtained from the blank 200 and the cylinder lock itself.

[0060] The rotation of the rotor 3 is blocked in a similar manner to the locking pistons 10a and the anti-burglary piston 10b by extracting the anti-burglary control key.

[0061] Figures 10 and 11 illustrate a burglary attempt that exploits the method known as "key bumping", wherein a "bumping key" 300 is inserted into the slit 8 and hit from the outside to force the lowering of the pistons. As previously described, the percussion exerted on the bumping key 300 from the outside is not able to cancel the gap 19 and therefore cause the lowering of the anti-burglary piston 10b. Any further action on the active anti-burglary punching 100b would lead to an increase in the gap 19, thereby increasing the security of the cylinder lock.

[0062] In general terms, the cylinder lock 1 and/or the blank 200 for making a copy of the punched control key 100 define a locking system.

[0063] The cylinder lock 1 comprises an anti-burglary piston 10b housed in a respective radial hole 9 of the rotor 3 and comprising a control head 11 configured to abut at the active anti-burglary punching 100b of the punched control key 100.

[0064] The blank 200 already has the active anti-burglary punching 100b and the chute 110 that extends between the active anti-burglary punching 100b and the free end 103.

[0065] The active anti-burglary punching 100b and/or the anti-burglary piston 10b are shaped and/or arranged in such a way that, in a coupling condition between the punched control key obtained from the blank 200 and the cylinder lock 1, the anti-burglary piston 10b abuts in the active anti-burglary punching 100b at a respective rear portion and that a front portion of the active anti-burglary punching 100b is arranged at a longitudinal distance "Z" from a front portion of the anti-burglary piston 10b in order to generate the gap 19.

[0066] The longitudinal distance "Z" is greater than 1.7 mm, i.e. has a possible further longitudinal excursion obtainable on a bumping key 300, filing the abutment portion 111.

[0067] The configuration and/or shape of the active anti-burglary punching 100b is uniquely associated to a given cylinder lock such to define a volume inside the active anti-burglary punching 100b which is greater than a volume occupied by the control head of the anti-burglary piston 10b.

Claims

1. A cylinder lock (1) comprising:

- a stator (2) having a cylindrical seat (4), which extends along a longitudinal axis (X) between a front portion (2a) and a rear portion (2b), and a plurality of radial holes (5) terminating in said cylindrical seat (4),
- at least one rotating cylindrical rotor (3) housed in said cylindrical seat (4) and having a front opening (7) which grants access to a slit (8) having a longitudinal extension coinciding with the longitudinal axis (X) and adapted to receive a punched control key (100), wherein said rotor (3) has a plurality of radial holes (9) that terminate in said slit (8) and that, in an angular alignment position of said rotor (3), are aligned with the radial holes (5) of the stator (2) to form a plurality of radial seats that extend along respective central axes (Y),
- a plurality of pistons (10a, 10b), each piston being housed in a radial hole (9) of the rotor (3), slidable along said central axis (Y) and comprising a control head (11) having an apex (12) projecting inside the slit (8) and configured to abut at an active punching (100a, 100b) of the punched control key (100),
- a plurality of elastic elements (15), each elastic element being housed in a radial hole (5) of the stator (2),
- a plurality of counter-pistons (14), each counter-piston being interposed between an elastic element (15) and a piston (10a, 10b),

wherein each elastic element (15) is thrustingly active on the respective counter-piston (14) to push said counter-piston and said piston toward said slit (8) and wherein said piston and said counter-piston are movable in opposition to the respective elastic element (15) as a result of the interaction between the control head (11) and the punched control key (100),

characterised in that said plurality of pistons comprises an anti-burglary piston (10b) comprising said control head (11) shaped asymmetrically with respect to said central axis (Y), with said apex (12) arranged on the opposite side of the front opening (7) with respect to said central axis (Y), at a rear portion of said anti-burglary piston (10b).

2. The cylinder lock according to claim 1, wherein said control head (11) of said anti-burglary piston (10b) comprises a front surface (13b) arranged toward said front opening (7), terminating at said apex (12) and intersecting said central axis (Y).

3. The cylinder lock according to claim 2, wherein said

front surface (13b) is inclined toward said apex (12) with respect to said central axis (Y).

4. The cylinder lock according to one or more of the preceding claims, wherein said control head (11) of said anti-burglary piston (10b) comprises a control surface (13a) inclined toward said apex (12) with respect to said central axis (Y) and arranged on the opposite side of said front opening (7) with respect to said central axis (Y) at the rear portion of the anti-burglary piston (10b).

5. The cylinder lock according to one or more of the preceding claims, wherein said control head (11) of said anti-burglary piston (10b) has a chisel shape with a front surface (13b), and a control surface (13a) having a planar shape converging in said apex (12) having a linear shape.

6. The cylinder lock according to claim 5, wherein said apex (12) having a linear shape is arranged in a direction perpendicular to said central axis (Y) and to said longitudinal axis (X).

7. The cylinder lock according to claim 6, wherein said apex (12) having a linear shape has a length (L1) smaller than the diameter (D) of said radial hole (9) of the rotor (3) and is preferably offset with respect to said central axis (Y) along a direction perpendicular to said longitudinal axis (X).

8. The cylinder lock according to one or more of the preceding claims, wherein said anti-burglary piston (10b) is the piston which is most distant from the front opening (7), arranged in the rear portion of the rotor (3).

9. The cylinder lock according to one or more of the preceding claims, wherein said anti-burglary piston (10b) comprises an anti-rotation device (16) configured to maintain the angular position of the anti-burglary piston constant around the central axis (Y).

10. A blank (200) to make a duplicate of a punched control key (100) for a cylinder lock (1), in particular according to one or more of the preceding claims, said blank comprising a grip (101) and a plate-like body (102) which extends in a longitudinal direction (A) from said grip (101) toward a free end (103) of the blank, wherein said plate-like body (102) has a transverse section counter-shaped with respect to a front opening (7) and to a respective slit (8) of said cylinder lock (1), and wherein at least one major side surface (102a) of said plate-like body (102) has a longitudinal trail (104), a first longitudinal track (105) adapted to receive active punchings (100a, 100b) of said punched control key (100) and a second longitudinal track

- (106) adapted to receive passive punchings (100c) of said punched control key (100),
characterised in that said first longitudinal track (105) has an active anti-burglary punching (100b) formed in a proximal position with respect to the free end (103) and a chute (110) that extends between said active anti-burglary punching (100b) and said free end (103), the shape and/or the position of said active anti-burglary punching (100b) being uniquely associated with a given cylinder lock (1) and such as to define a volume inside the active anti-burglary punching (100b) that is greater than a volume occupied by a control head (11) of an anti-burglary piston (10b) adapted to abut in said active anti-burglary punching (100b) and arranged in the rear portion of such volume, leaving a gap (19) between the control head (11) of the anti-burglary piston (10b) and a front portion of the active anti-burglary punching (100b), said gap (19) being suitable for preventing burglary attempts using bumping keys.
11. The blank according to claim 10, wherein a basic footprint (107) of said active anti-burglary punching (100b) is elongated in a direction perpendicular to the longitudinal direction (A) of said plate-like body (102).
12. The blank according to claim 11, wherein said active anti-burglary punching (100b) has a front planar surface (108) and a rear planar surface (108) extending from said basic footprint (107) respectively toward said grip (101) and toward said free end (103), said two planar surfaces (108) being connected by substantially truncated-conical side surfaces (109).
13. The blank according to claim 12, wherein said active anti-burglary punching (100b) is configured and/or arranged to receive an anti-burglary piston (10b) of said cylinder lock (1) resting on the rear planar surface (108), in a coupling condition between a punched control key (100) obtained from said blank and said cylinder lock (1).
14. The blank according to one or more of claims 10-13, wherein said active anti-burglary punching (100b) is configured and/or arranged along the longitudinal direction (A) to be positioned offset along said longitudinal axis (X), toward said front opening (7) of said cylinder lock, with respect to an apex (12) of an anti-burglary piston (10b) of said cylinder lock, in a coupling condition between a punched control key (100) obtained from said blank and said cylinder lock.
15. A method for making a blank (200) according to one or more of claims 9 to 14, comprising creating said active anti-burglary punching (100b) directly on the blank.
16. A method for duplicating a punched control key (100) for a cylinder lock comprising:
- providing a blank (200) according to one or more of claims 9 to 14, or
 providing a blank (200) by applying a method according to claim 15,
 completing the active punchings (100a) on said first longitudinal track (105) of the blank (200) to obtain the duplicate of the punched control key (100).
17. A locking system comprising a cylinder lock (1) and/or a blank (200) for making a duplicate of a punched control key (100) for said cylinder lock (1), wherein said cylinder lock comprises an active anti-burglary piston (10b) housed in a respective radial hole (9) of a rotor (3), slidable along a central axis (Y) of said radial hole (9) and comprising a control head (11) configured to abut in said punched control key (100) at an active anti-burglary punching (100b), wherein said blank (200) comprises a longitudinal trail (104), a first longitudinal track (105) adapted to receive active punchings (100a, 100b) of said punched control key (100) and a second longitudinal track (106) adapted to receive passive punchings (100c) of said punched control key (100), said first longitudinal track (105) having an active anti-burglary punching (100b) formed in a proximal position with respect to a free end (103) of the blank and a chute (110) that extends between said active anti-burglary punching (100b) and said free end (103), wherein said active anti-burglary punching (100b) and/or said control head (11) of the anti-burglary piston (10b) are shaped and/or arranged in such a way that, in a coupling condition between the punched control key (100) obtained from said blank (200) and said cylinder lock, said control head (11) abuts in said active anti-burglary punching (100b) and is arranged in the rear portion of the internal volume of the active anti-burglary punching (100b), leaving a gap (19) between the control head (11) of the anti-burglary piston (10b) and a front portion of the active anti-burglary punching (100b), said gap (19) being adapted to prevent burglary attempts using bumping keys.

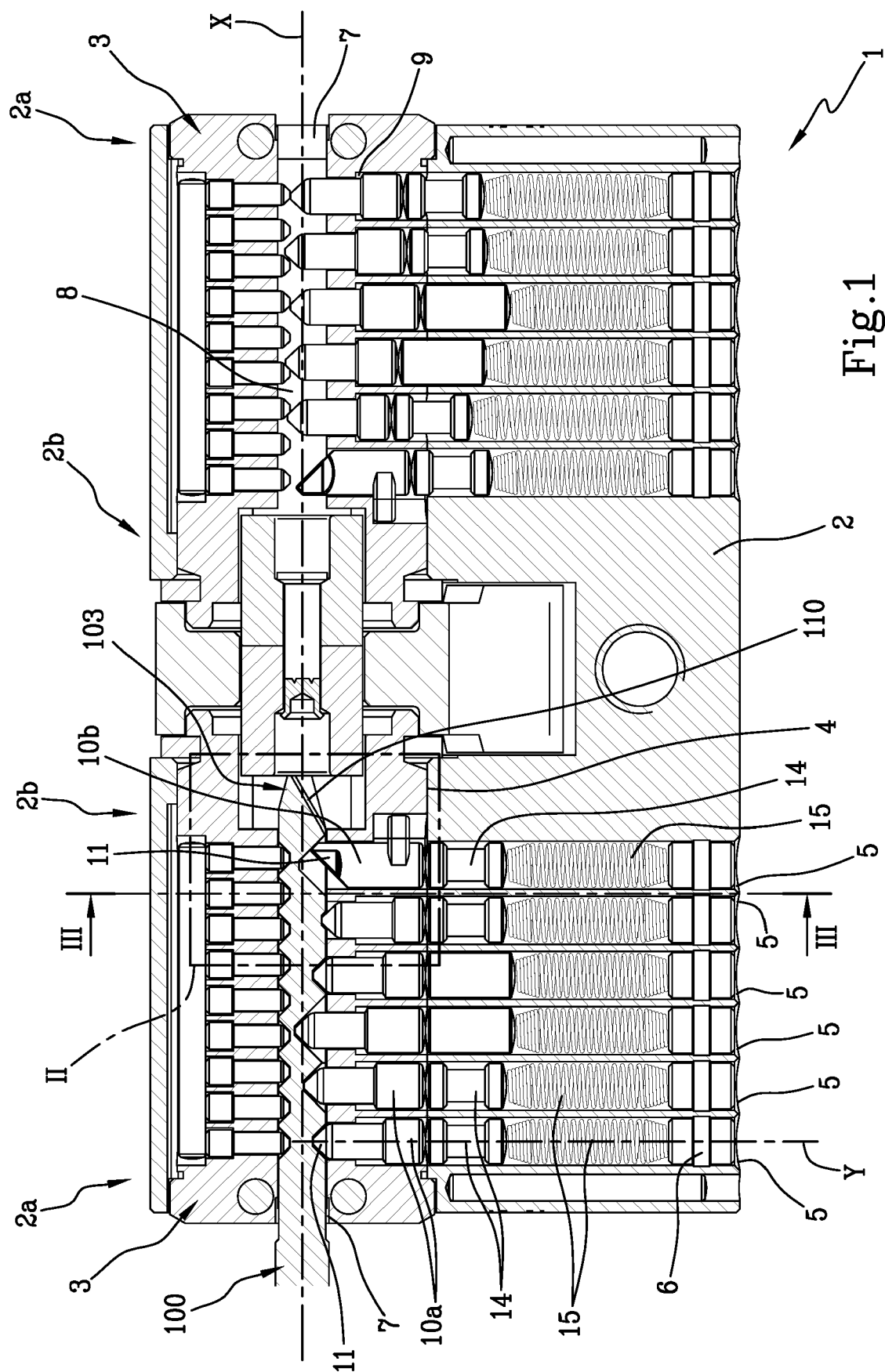


Fig.2

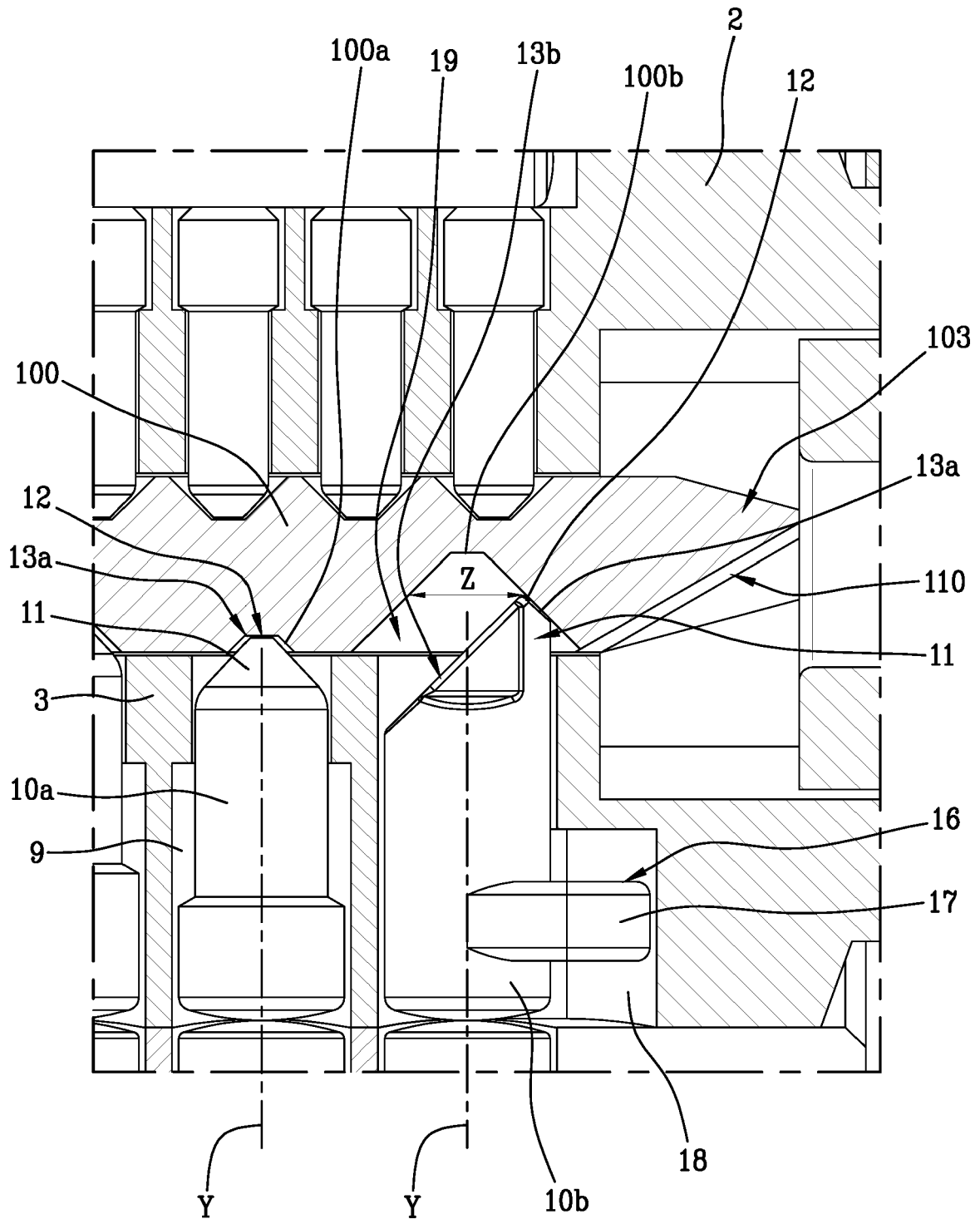
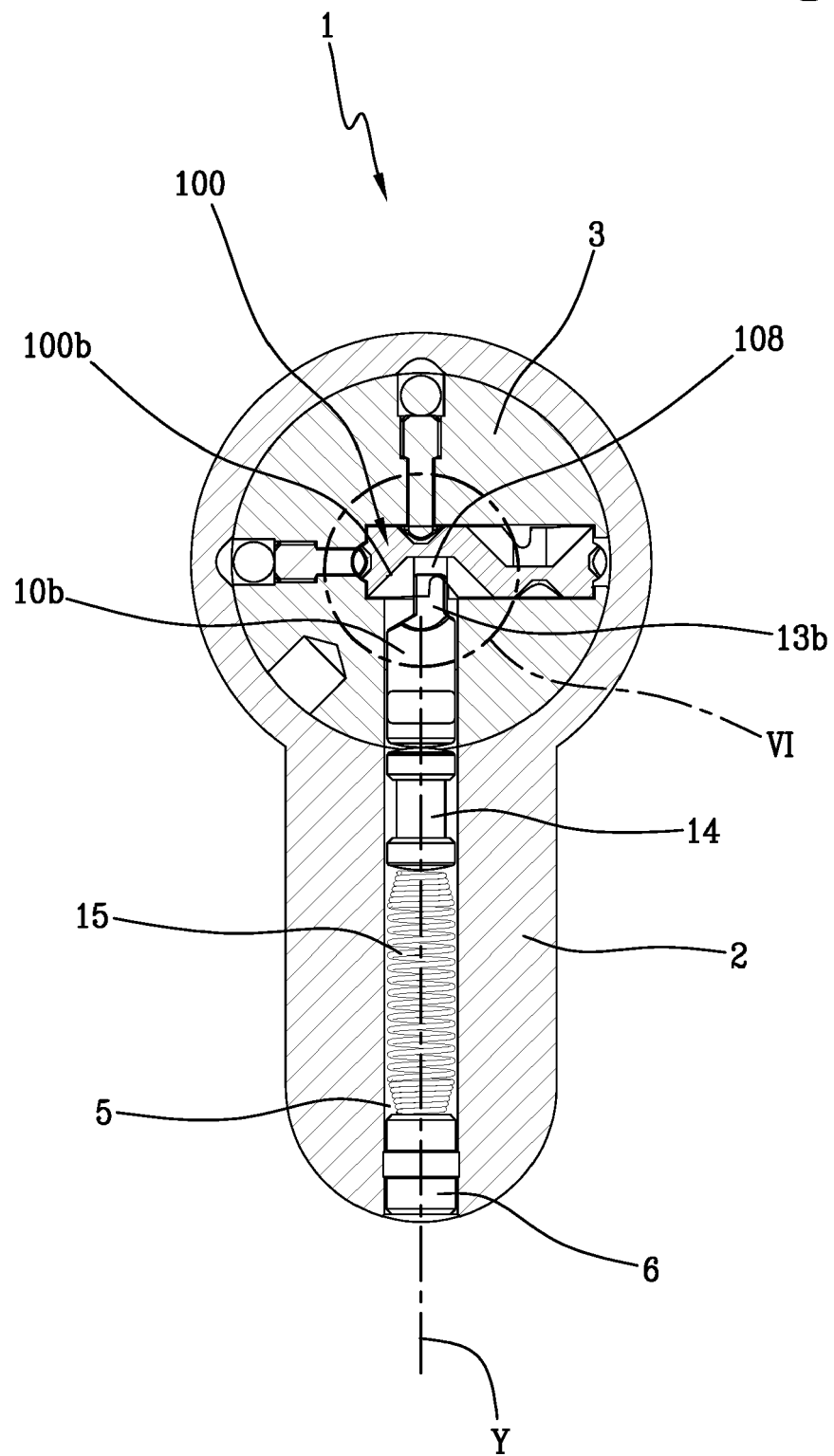


Fig.3



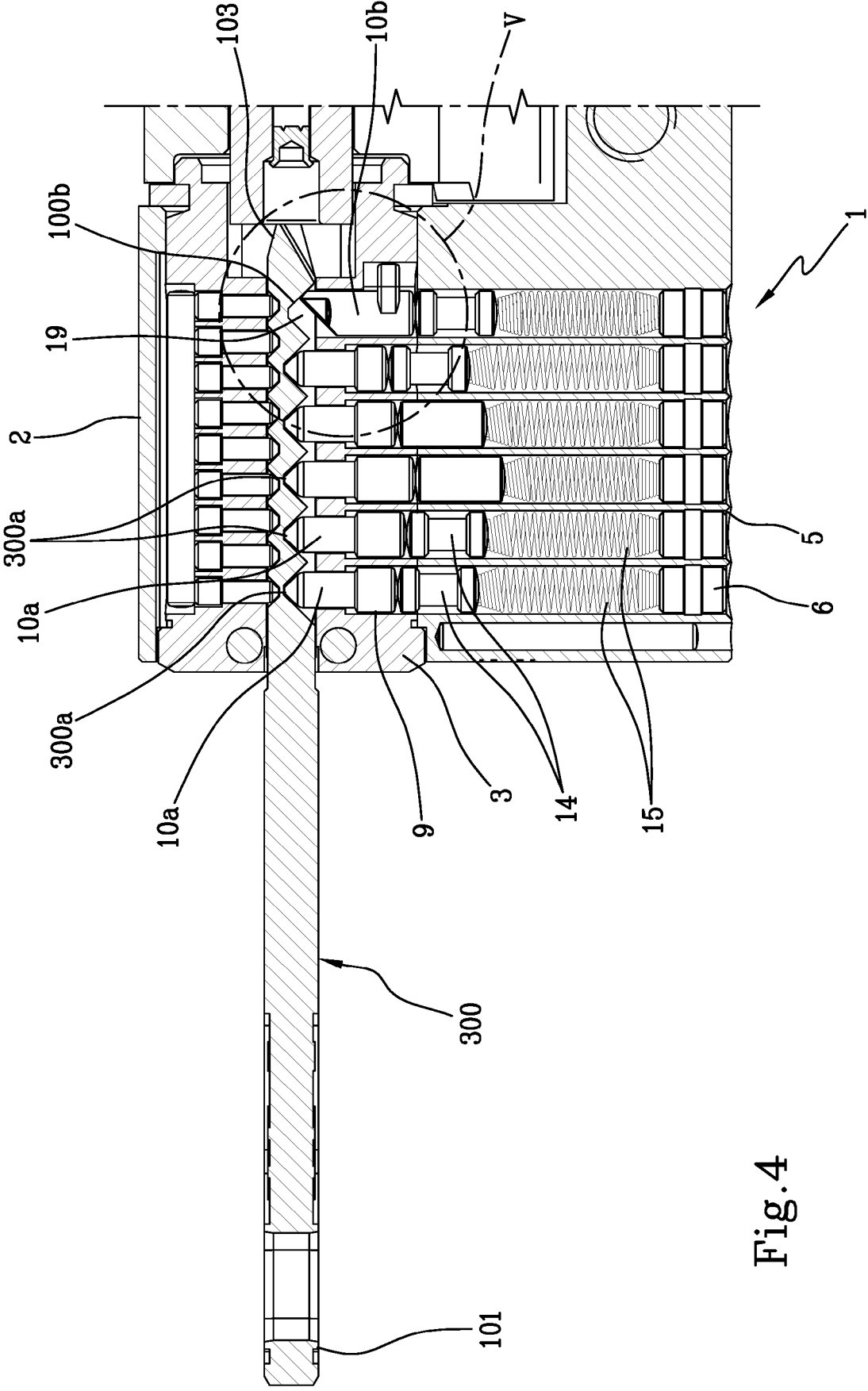


Fig. 4

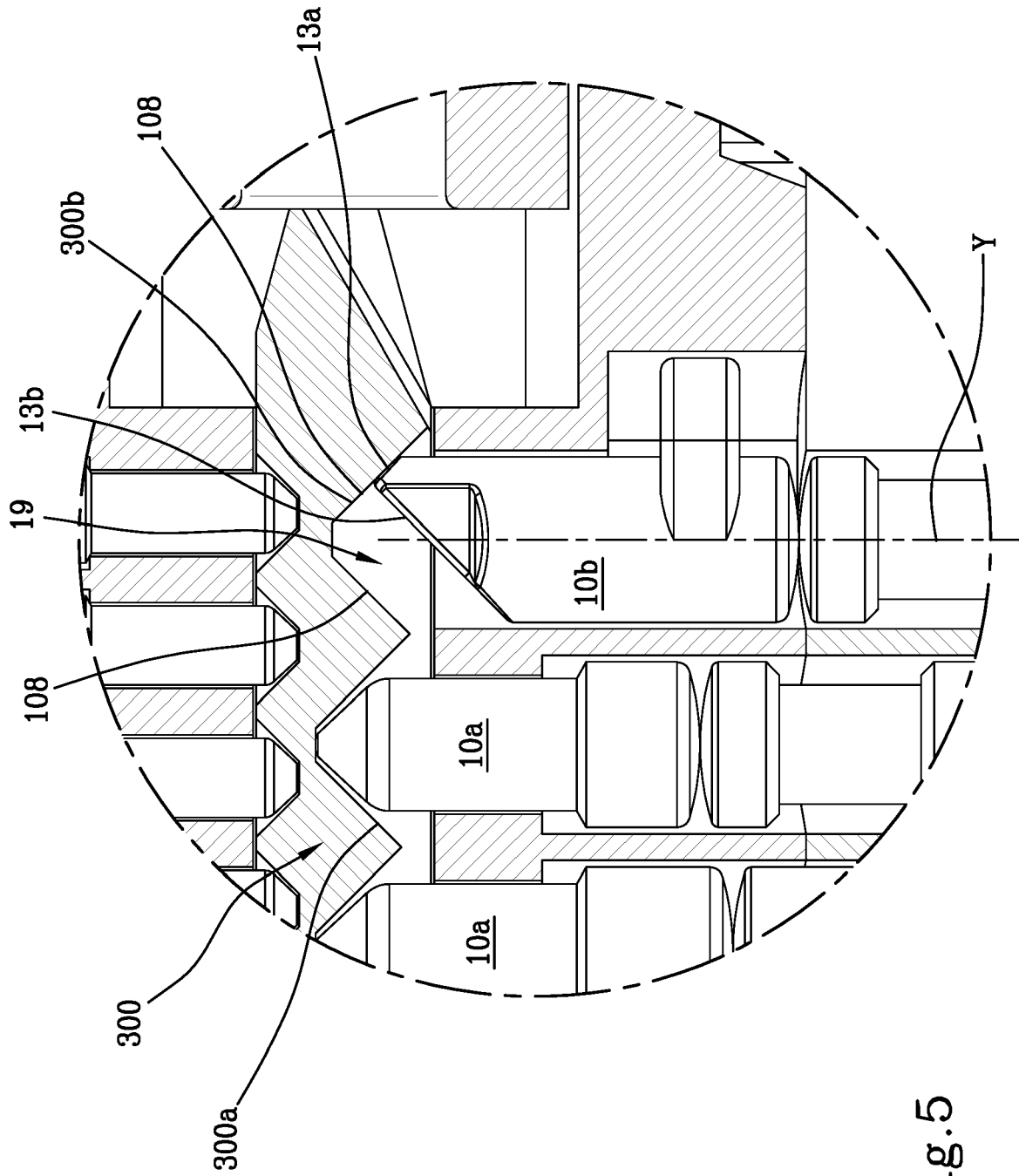


Fig.5

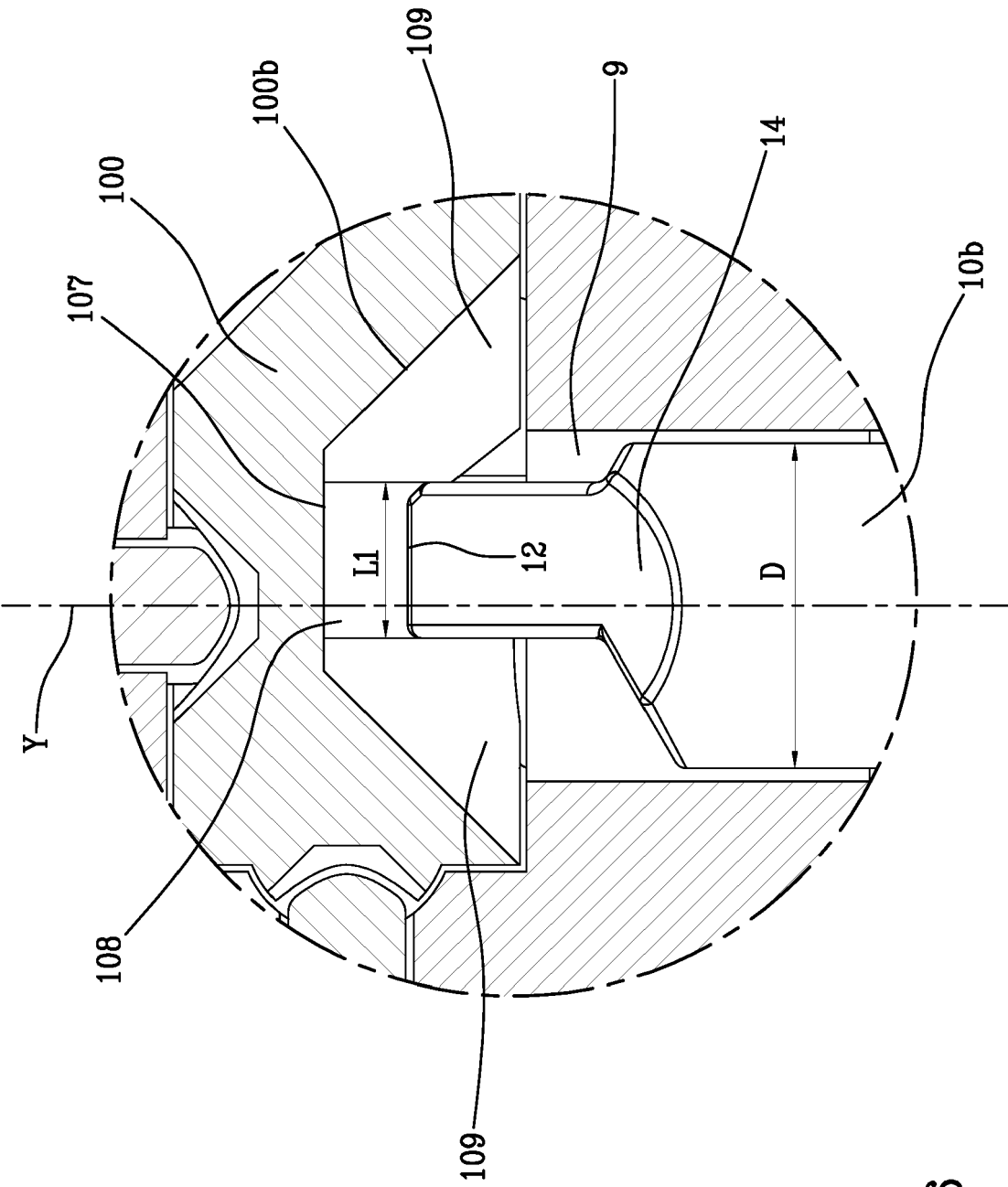


Fig.6

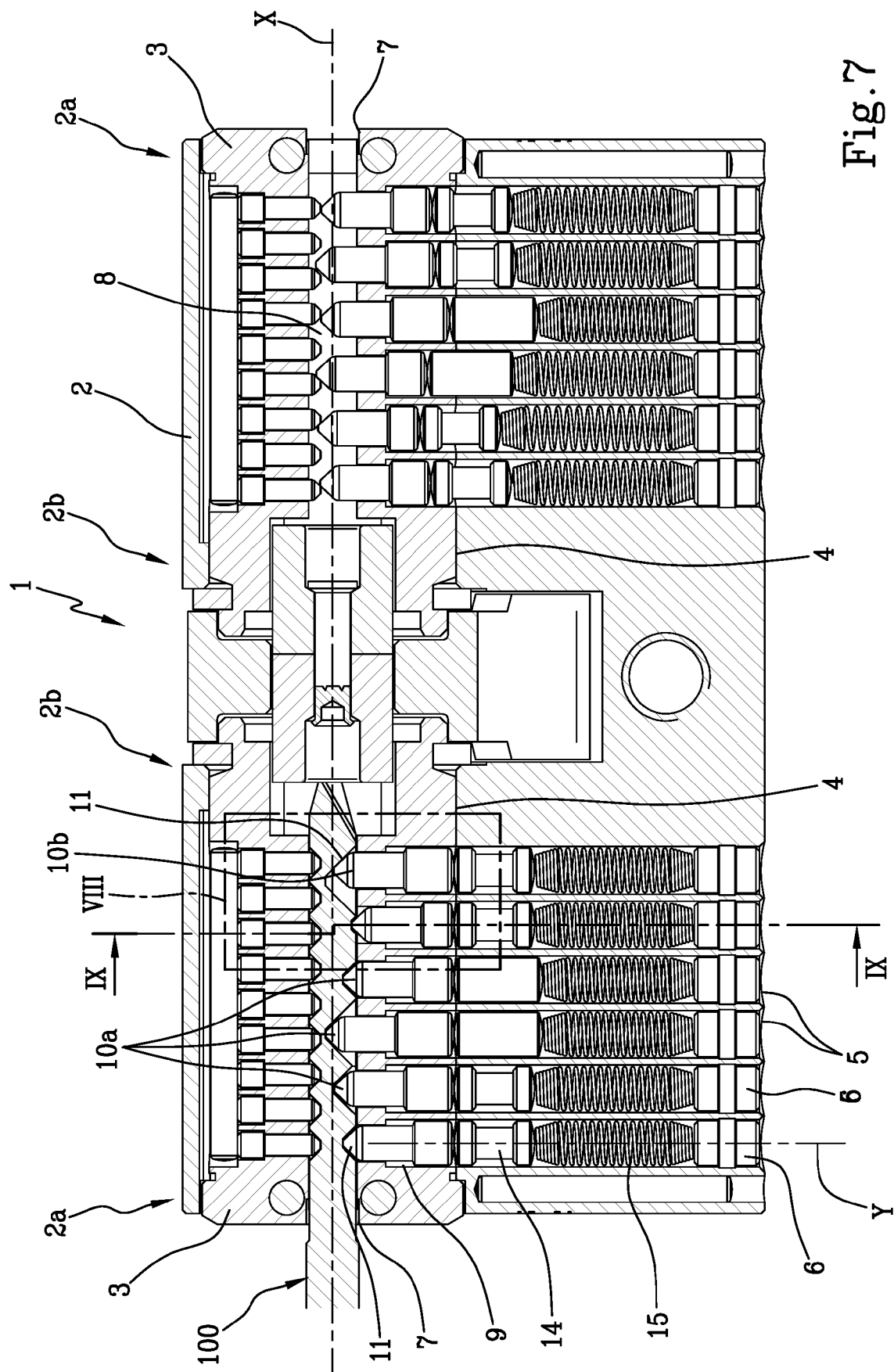
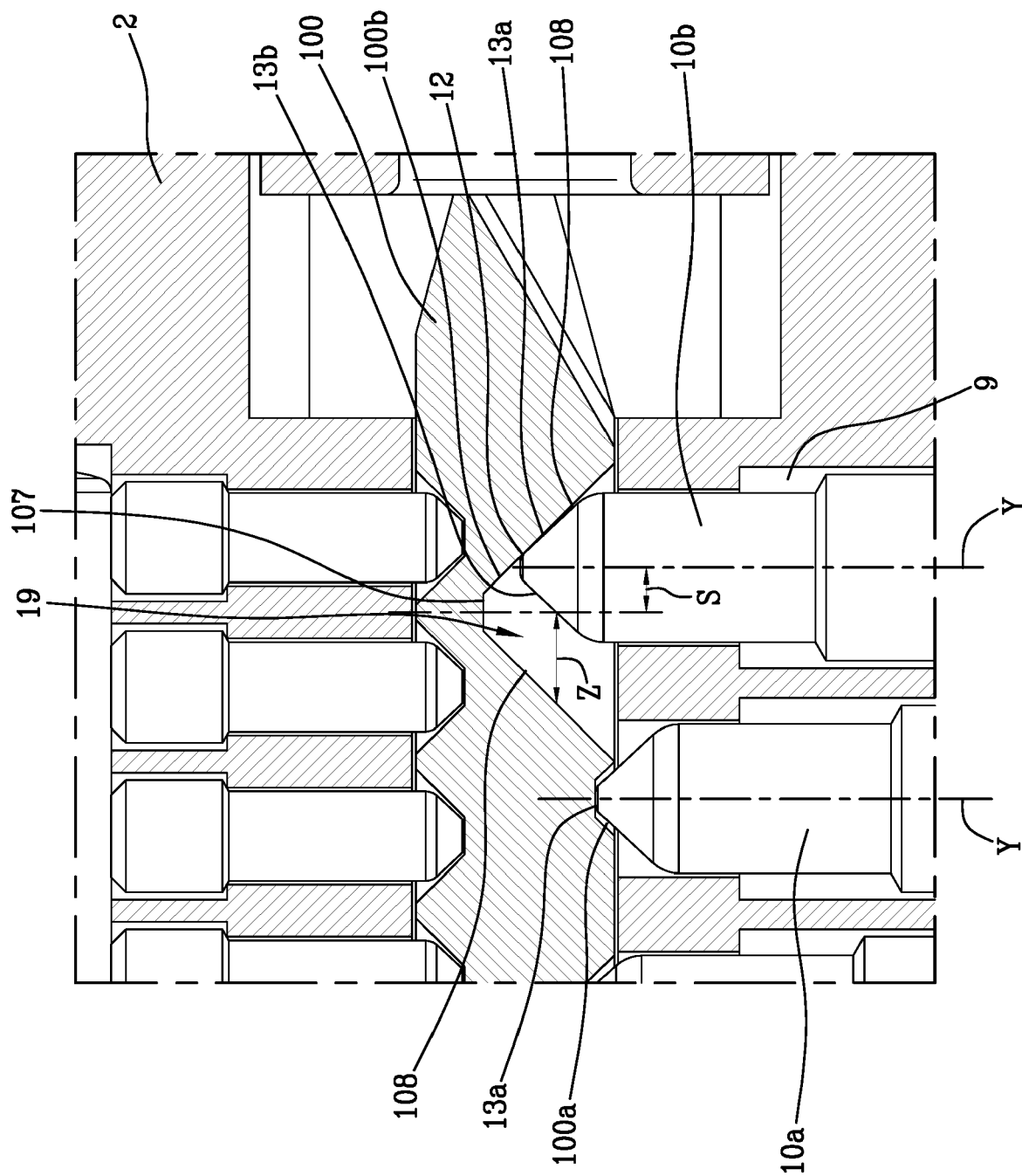
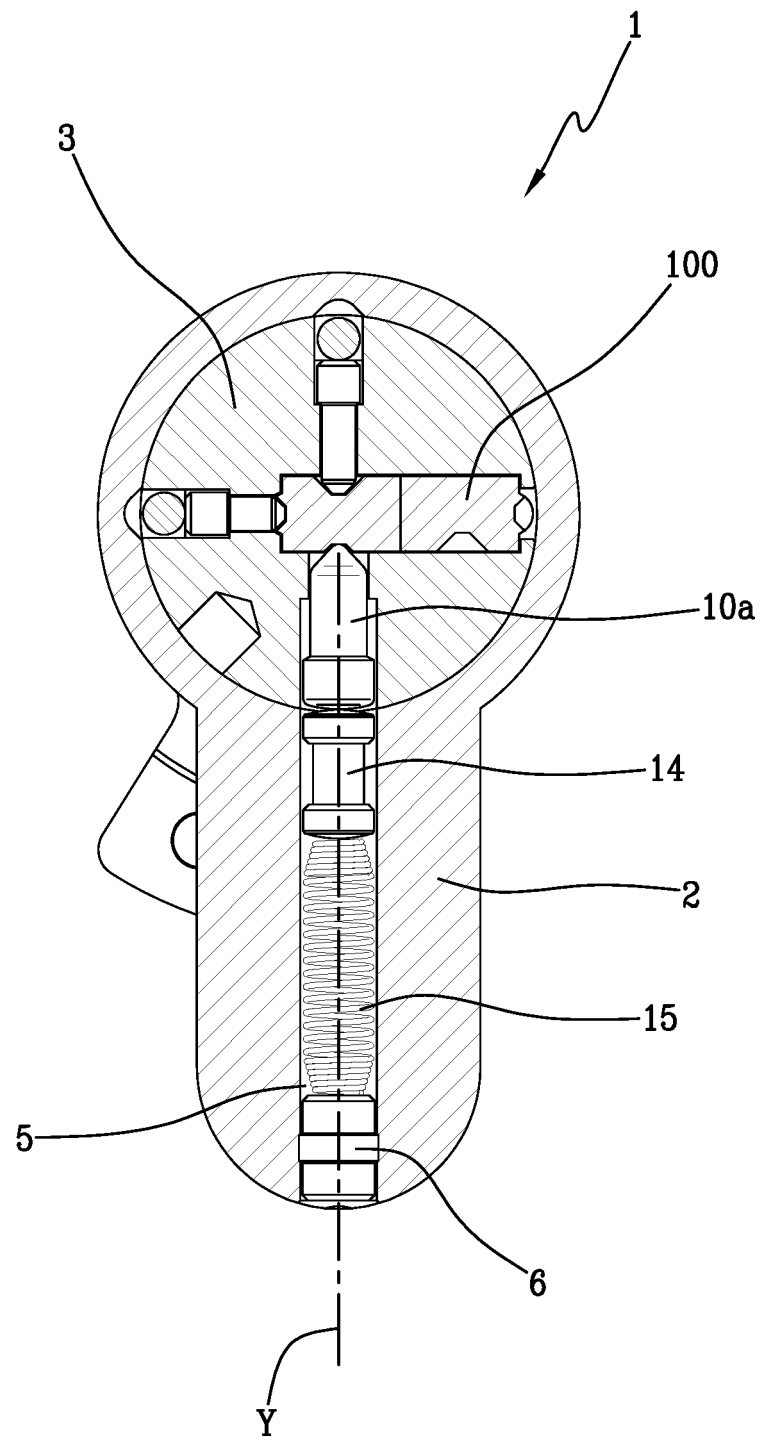


Fig. 7



Fi. 8.

Fig.9



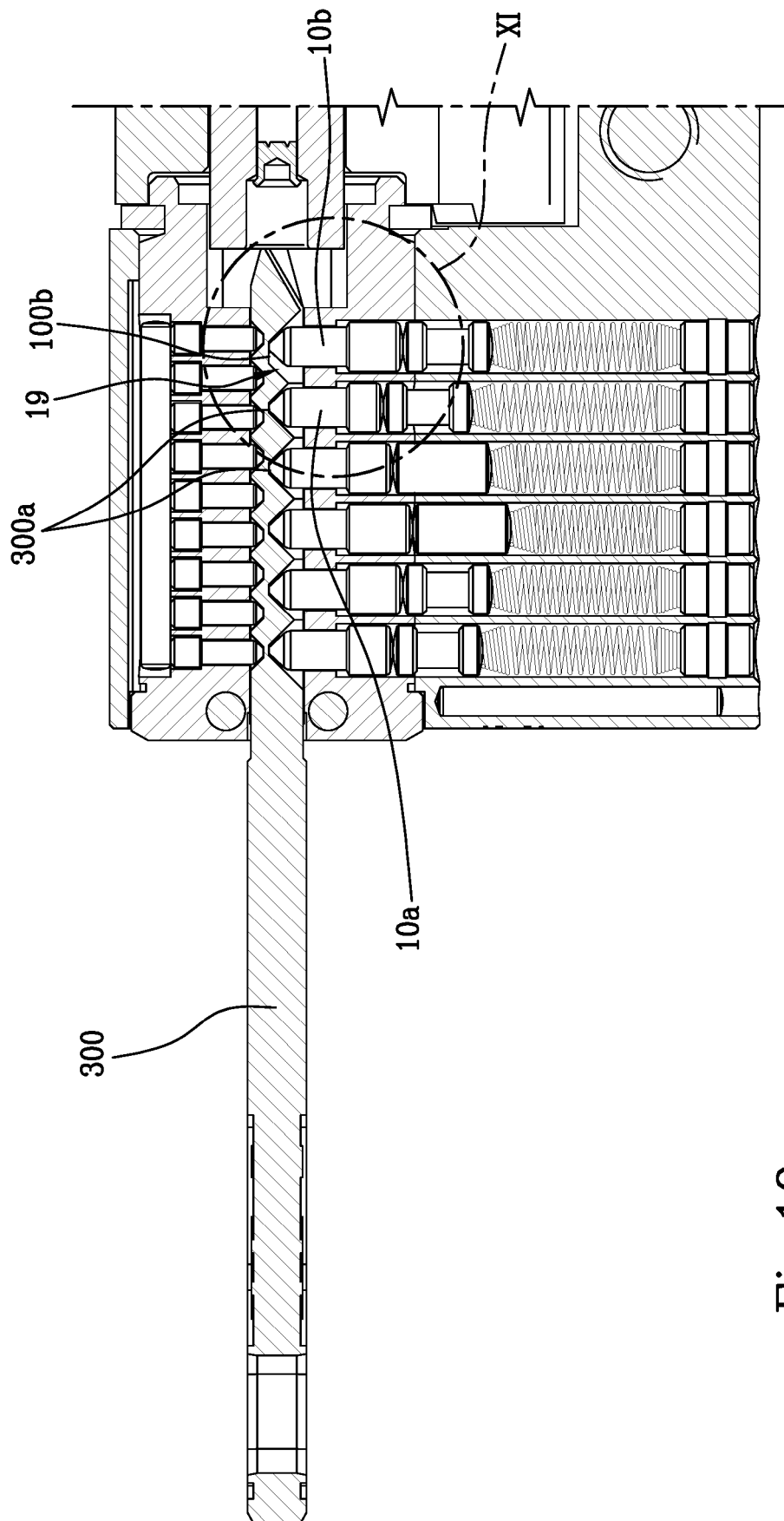


Fig.10

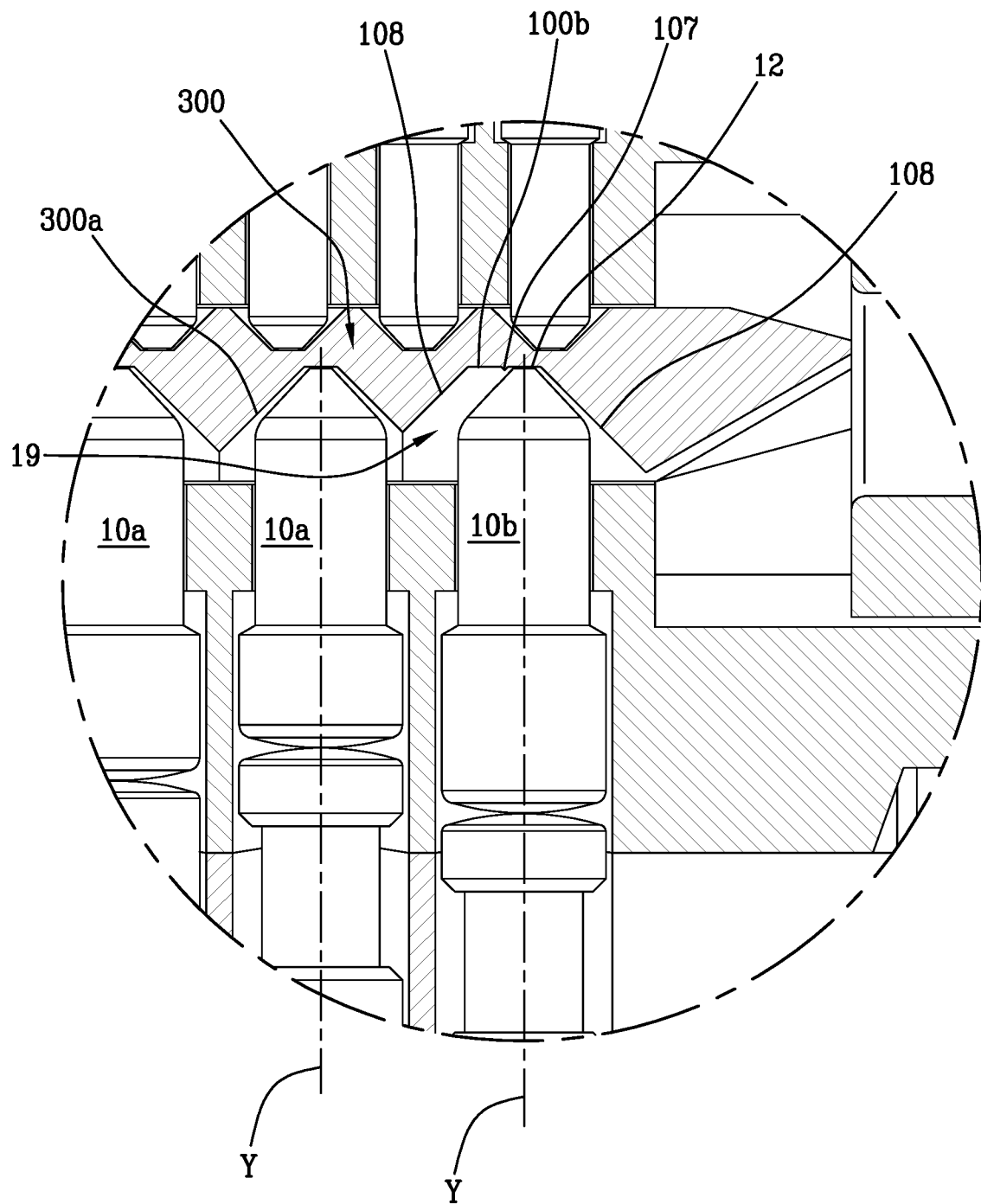


Fig.11

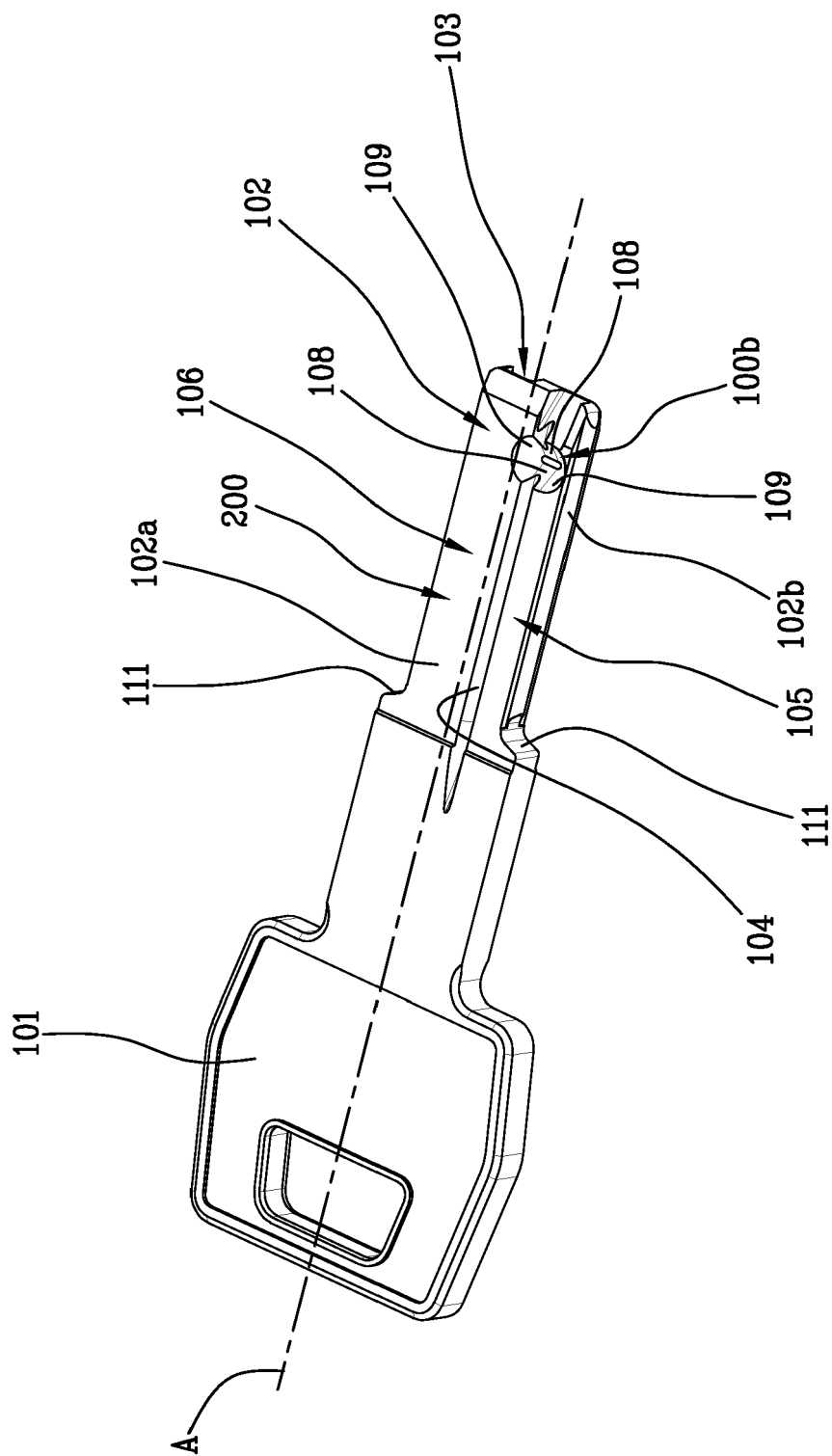
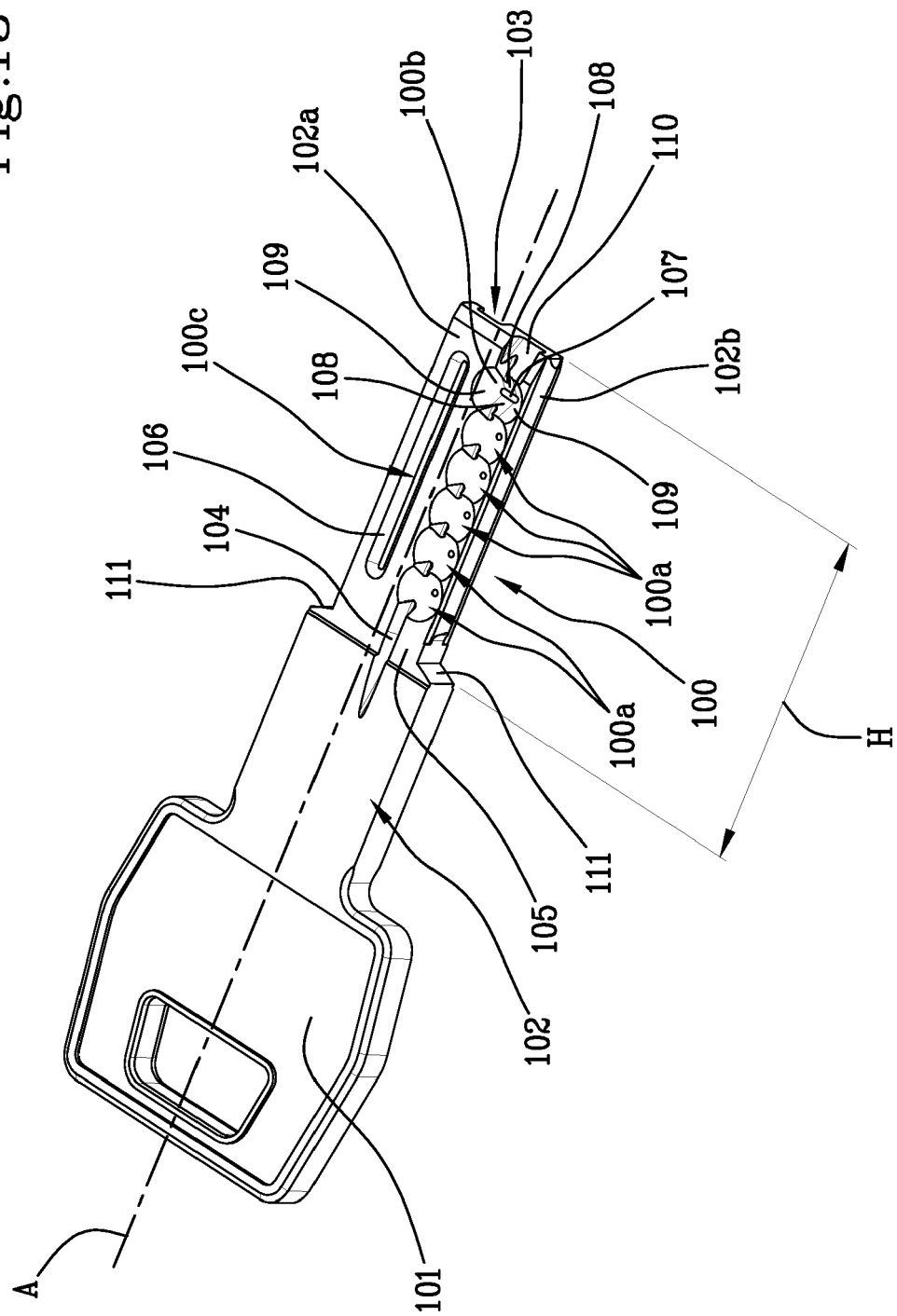


Fig. 12

Fig.13





EUROPEAN SEARCH REPORT

Application Number
EP 18 19 6591

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 40 36 158 A1 (BAUER KABA AG) 20 June 1991 (1991-06-20)	10-16	INV. E05B27/00 E05B19/00
A	* column 8, line 32 - column 9, line 10; figures 13a-c *	1,17	
X	US 6 105 404 A (FIELD ET AL) 22 August 2000 (2000-08-22)	10-17	
A	* column 7, lines 1-4; column 8, lines 48,49; figures 1a,2c *	1	
X	EP 2 281 985 A2 (EVVA SICHERHEITSTECHNOLOGIE) 9 February 2011 (2011-02-09)	17	
A	* paragraphs [0014], [0015] *	1	
X	EP 2 108 767 A2 (ALBAN GIACOMO SPA) 14 October 2009 (2009-10-14)	17	TECHNICAL FIELDS SEARCHED (IPC) E05B
A	* the whole document *	1	
A	DE 43 13 066 A1 (GOLUB) 27 October 1994 (1994-10-27) * figures 4-11,14,16,26,45,35 *	1-9	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 March 2019	Examiner Van Beurden, Jason
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 19 6591

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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07-03-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4036158 A1	20-06-1991	AT 396500 B	27-09-1993
		AU 638292 B2	24-06-1993
		BE 1003468 A5	31-03-1992
		CA 2030265 A1	16-06-1991
		CH 679507 A5	28-02-1992
		DE 4036158 A1	20-06-1991
		DK 273090 A	16-06-1991
		ES 2028559 A6	01-07-1992
		FI 906137 A	16-06-1991
		FR 2656027 A1	21-06-1991
		GB 2239672 A	10-07-1991
		HK 118694 A	04-11-1994
		IT 1246504 B	19-11-1994
		JP 2541699 B2	09-10-1996
		JP H0598855 A	20-04-1993
		KR 970001690 B1	13-02-1997
		LU 87959 A1	03-03-1992
		NL 9002734 A	01-07-1991
		NO 905343 A	17-06-1991
		SE 511008 C2	19-07-1999
		SE 9003997 L	16-06-1991
		US 5438857 A	08-08-1995
US 6105404 A	22-08-2000	AU 1124999 A	17-01-2000
		CA 2300263 A1	06-01-2000
		US 6105404 A	22-08-2000
		WO 0000711 A1	06-01-2000
		ZA 9902571 B	07-10-1999
EP 2281985 A2	09-02-2011	AT 508869 A1	15-04-2011
		EP 2281985 A2	09-02-2011
EP 2108767 A2	14-10-2009	NONE	
DE 4313066 A1	27-10-1994	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82