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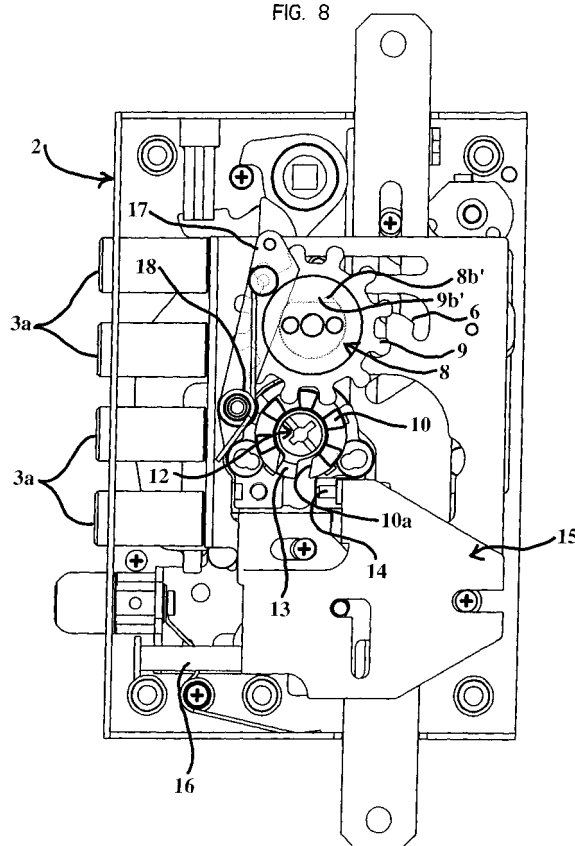
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(54) **Safety lock**

(57) A safety lock comprises a lock-bolt element (3), which can be controlled by means of a cylinder lock. The actuation of the latter by means of a key sets in rotation a radially extending control member (13), which is received in a radial slit of a ring gear (10) mounted so that it can turn coaxially with respect to the rotor of the cylinder lock. The rotation of the control member (13) impressed by the key then brings about a rotation of the ring gear (10). A mechanical transmission (7), including at least one gear (9) meshing with the ring gear (10), converts the rotation of the ring gear (10) into a rectilinear sliding of the lock bolt (3). In any point of the mechanical transmission (7) a coupling is provided between a driven member and a driving member that affords said members the possibility of a limited relative movement. Consequently, the movement of said driving member is transmitted to said driven member only after said members have reached one of their two relative end positions.

FIG. 8



Description

[0001] The present invention relates to the field of safety-lock devices of the type comprising:

- a rigid casing;
- a lock-bolt element mounted so that it can slide in the casing between a position of opening and a position of closing;
- a cylinder lock comprising a stator fixed to the casing and a rotor for driving in rotation a radially extending control member;
- a ring gear, which is mounted so that it can turn in the casing coaxially with respect to the rotor of the cylinder and has a radial slit engaged by the radial control member of the cylinder lock, so as to be driven in rotation by said radial control member when the cylinder lock is actuated with a key; and
- a mechanical transmission including at least one gear meshing with said ring gear for converting a movement of rotation of said ring gear into a movement of translation of said lock-bolt element.

[0002] A device of the above type is, for example, illustrated in the document No. FR 2707322.

[0003] A typical technique of effraction in the case of locks of this type consists in forcing the cylinder lock out of the device. Fixing of the cylinder lock within the device is determined only by a pin that is inserted in the body of the cylinder lock. The resistance of the pin is limited both on account of the dimensions of the pin, which are difficult to increase substantially because cylinder locks have standardized dimensions and above all because the pin is subject principally to shear stress.

[0004] In more recent devices, in order to achieve greater safety of blocking of the cylinder lock within the casing of the device, the approach adopted, when the lock is not actuated by the key and is at rest in conditions of complete opening or closing, is to get the radial control member of the cylinder lock to project laterally from the body of the cylinder lock so as to constitute an arrest against extraction of said body from the casing.

[0005] The problem that arises from this arrangement of the radial control member, in the resting condition of the lock either completely open or closed, consists in the fact that, when the cylinder lock is mounted within the casing, the radial control member can project laterally from the body of the cylinder lock either on one side or on the other indifferently, drawing along with it the ring gear with which it engages. This means that according to where the radial control element projects, the mechanical transmission, which follows the ring gear and actuates the lock-bolt element, will be in a position of advance or of delay in the travel of actuation. The lock is devoid then of a precise and unique adjustment, and operation thereof becomes less fluid and more inconvenient for the user, who according to his own sensitivity must evaluate whether the lock device is completely open or completely

closed.

[0006] The present invention proposes to overcome the drawbacks of the devices of the known art.

[0007] In order to achieve said purpose, the subject of the invention is a safety-lock device according to Claim 1.

[0008] Thanks to said characteristics, and in particular thanks to the possibility of limited relative movement between the driving member and driven member at any point along the mechanical transmission between the cylinder lock and the lock bolt, the movement of said driving member is designed to be transmitted to said driven member only after said members have reached a relative position of end-of-travel. In this way, the advantage is obtained that the actuation of the key brings about start of displacement of the lock bolt for one and the same angular position of the key, independently of whether the cylinder lock has been mounted with the radial control element that projects from one side or the other of the body of the cylinder lock. Consequently, the operation of the device is always precise and reliable, regardless of how the cylinder lock has been installed.

[0009] Further characteristics and advantages will emerge from the ensuing description with reference to the annexed plate of drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a perspective view of the safety-lock device according to the invention;
- Figure 2 is a perspective view of an enlarged detail of the safety-lock device illustrated in Figure 1;
- Figure 3 shows the detail of Figure 2, without some of its components for greater clarity of representation;
- Figure 4a shows a perspective view of two components of the safety-lock device;
- Figure 4b shows a perspective view of the components of Figure 4a assembled on one another;
- Figure 5 shows the detail of Figure 2, in which the elements are in an intermediate position of the travel of actuation of the safety-lock device;
- Figure 6 shows a cross section of the safety-lock device in a first condition of opening thereof, where the radial control element occupies a position shifted to the right;
- Figure 7 shows a cross section of the safety-lock device in a condition of opening, where the radial control element occupies a central position;
- Figure 8 shows a cross section of the safety-lock device in a condition of opening, where the radial control element occupies a position shifted to the left; and
- Figure 9 shows a cross section of the safety-lock device, where the components of the chain of gears occupy an intermediate position of the travel of actuation of the safety-lock device.

[0010] With reference to Figures 1 and 2, number 1 designates the safety-lock device. This comprises a cas-

ing 2, within which a lock-bolt element 3 slides between a position of opening and a position of closing. The lock-bolt element 3 is formed by locking elements, such as cylindrical bars 3a fixed to a plate 3b. The plate 3b has guide slits 5 and a slit shaped so as to define a tothing 6. The movement of the plate 3b is controlled by a mechanical transmission 7. Said mechanical transmission 7 is constituted by a disk 8 and by a gear 9 (Figures 4a, 4b). Fixed on a face of the disk 8 are two axial pins 8a (not visible in Figures 4a, 4b and illustrated in Figure 3), designed to mesh with the tothing 6 of the plate 3b (Figure 3). The disk 8 moreover has a projecting portion 8b, designed to couple with the central hole 9b of the gear 9 (Figure 4a). The portion 8b has a substantially circular shape with a plane side 8b'. The hole 9b has a corresponding circular shape, interrupted by two plane sides 9b', which are set at angles with respect to one another and define contrast surfaces co-operating with the surface 8b' to define two end positions in the relative rotation between the disk 8 and the gear 9. The arrangement is in fact such that the circular portion of the hole 9b has an angular extension greater than that of the portion 8b of the disk 8. This creates a play (in the sense of possibility of relative rotation) between the disk 8 and the gear 9, the value of which is equal to the difference between said angular extensions.

[0011] The gear 9 meshes with a ring gear 10, the seat of which is made on a block 11 fixed to the casing 2 of the safety-lock device 1. The ring gear 10 has a radial slit 10a having a width equal to the thickness of the bottom part of the body of the cylinder lock (not visible in the drawings). The ring gear 10 surrounds the cylinder lock, which comprises, according to the conventional technique, a stator (not illustrated) fixed to the casing 2, and a rotor (not illustrated either), which can be actuated by means of a key (not illustrated) for driving a member 12 in rotation, from which a radial control element or "penna" 13 projects.

[0012] The radial control element 13 is set within the slit 10a of the ring gear 10 and, as may be seen in Figure 2, between the radial control member 13 and the side walls of the slit 10a there is present a play equal to the difference of width between the slit 10a and the radial member 13.

[0013] When the cylinder lock is actuated with the key, the radial element 13 comes to bear upon one of the walls of the ring gear 10 delimiting the slit 10a and pushes the latter in rotation.

[0014] The stator of the cylinder lock is fixed within the casing 2 via a pin 14 that is inserted transversely in the bottom part of the body of the cylinder lock. This pin 14 is carried by a plate 15, which can slide within the casing 2 between a position of engagement and a position of disengagement of the pin 14 within the body of the cylinder lock. The plate 15 is controlled by a bar 16 accessible from outside. Since said blocking of the cylinder lock within the lock device is not considered sufficient for the purpose of safety, in the conditions of rest of the de-

vice, in a position of complete opening or closing, the radial control element 13 is set in such a way as to project laterally from the body of the cylinder lock. During installation of the cylinder lock within the casing, the radial control element 13 is kept temporarily centred by keeping the key rotated with respect to its neutral position, after which the key is brought back into said neutral position, so that the element 13 projects laterally from the body of the cylinder lock. Said projection can indifferently be situated on one side or on the other of the body, according to whether the body itself is inserted in the device starting from one of its ends or from the other.

[0015] Consequently, when the cylinder lock is mounted in the casing and the key is brought back, as has been mentioned above, into its neutral position, the element 13 performs a small oscillation out of the body of the lock (on one side or on the other, as has been said, according to the orientation of the body in the installed condition). Said small oscillation is transmitted to the ring gear 10, which then rotates either in the direction of actuation of the lock bolt or in the opposite direction. The same small rotation is transmitted obviously by the ring gear 10 to the gear 9.

[0016] With reference, for example, to Figure 8, it is assumed therein that the cylinder lock has been mounted in such a way that, in the neutral position of the key, the element 13 projects to the left (as viewed in the figure) with respect to its centred position. This means that in the installation of the cylinder lock, the element 13 has performed a small oscillation in a clockwise direction (as viewed in the figure), drawing along with it the ring gear 10 up to the position illustrated in Figure 8, in which the element 13 is in contact with the left-hand side (once again as viewed in the figure) of the slit 10a. In the case of an actuation of closing of the lock using the key, the element 13 is rotated in a counterclockwise direction as viewed in the figure. Consequently, the element 13 will not draw the ring gear 10 in rotation until it has come into contact with the right-hand side of the slit 10a. Starting from said condition, and continuing the rotation of the key, the element 13 will draw in rotation the ring gear 10, which in turn will cause a corresponding rotation of the gear 9. However, the rotation of the gear 9 will not be transmitted immediately to the disk 8, which carries the pins 8a meshing with the tothing 6 of the lock bolt, until the contrast surfaces 8b' and 9b' come into contact with one another. Once the rotation of the key has reached the position in which the aforesaid contact takes place, the further rotation of the key will cause displacement of the lock bolt.

[0017] If, instead, the cylinder lock is mounted in such a way that, in the resting condition, the element 13 projects to the right (as viewed in the drawings), as illustrated for example in Figure 6, the small oscillation that the element 13 performs upon installation will cause a first initial rotation of the ring gear 10 in a counterclockwise direction. Said rotation brings about a corresponding rotation of the gear 9 such as to bring already into

contact the contrast surfaces 8b', 9b'. Starting from said condition, a rotation of the key will immediately cause displacement of the lock bolt. As may be seen then, whether the element 13 is mounted projecting to the left (Figure 8) or to the right (Figure 6), the active movement of the lock bolt is brought about always starting from one and the same position of the actuation key.

[0018] The lock device is, at rest, in conditions of safety when the pins 8a of the disk 8 reside within the notches constituting the teeth of the toothing 6 of the plate 3b, i.e., when they are aligned in the direction of movement of the lock-bolt element 3. But the presence of the play enables the disk 8 to be rotated into a position in which one of the pins 8a is out of this position, in this way rendering reversible the travel of closing of the safety-lock device in the case where any thrust were to be exerted on the cylindrical bars 3a. As may be seen in Figure 5, there is then provided a lever 17, pushed by an elastic element 18 to bear upon a flattened area 8c (Figure 4a) of the side surface of the disk, designed to co-operate with the contrast surface of the lever 17, to recall the disk 8, in the condition of opening and closing, into a position where the pins 8a are in the safety condition.

[0019] As already recalled above, starting from the condition of rest in complete opening of the device illustrated in Figure 8, in which the radial element 13 projects to the left of the body of the cylinder lock 12, via the key the radial element 13 is rotated in a counterclockwise direction, to set the device in a closing condition. There is a first idle travel, in which the radial element 13 is brought to bear upon the right-hand wall of the radial slit 10a in the ring gear 10, and a second idle travel, in which the radial element 13 pushes along with it the ring gear 10, which in turn actuates the gear 9, which is released from the disk 8 on account of the presence of the play of coupling between the latter elements. At the end of the second idle travel, the radial element 13 reaches the position illustrated in Figure 8. As has been mentioned above, if the cylinder lock 12 is mounted in such a way that, at rest, the radial element 13 is located already in the position illustrated in Figure 6, the actuation of the key will immediately cause closing of the device, without any initial idle travel.

[0020] In the condition illustrated in Figure 6, the contrast surface 9b' of the central hole 9b of the gear 9 is in contact with the contrast surface 8b' of the central portion 8b of the disk 8, and hence the subsequent rotation, in a counterclockwise direction, of the radial element 13 will cause rotation of the disk 8 and consequently movement of the pins 8a of the disk 8 within the toothing 6 of the plate 3b of the lock-bolt element 3, such as to carry the same lock-bolt element 3 in translation up to complete closing.

[0021] Illustrated in Figure 9 is the safety-lock device in which the chain of gears is in an intermediate position of the travel of actuation. It may be noted that the radial control member 13 acts as a tooth of the ring gear 10, and the transmission in the chain of gears continues flu-

idly in the travel of actuation.

[0022] The above is possible because the play between the side walls of the slit 10a and the radial control member 13 is such as not to create interference with the teeth of the gear 9.

[0023] As is evident from the foregoing description, the lock according to the invention is characterized in that it presents precise, reliable and convenient operation for the user, without on the other hand leading to a particularly complex structure. In particular, unlike known solutions, the lock according to the invention can make use of gears all having their teeth with conformations and dimensions identical to one another. A further advantageous characteristic of the preferred embodiment illustrated herein lies in the fact that the mechanical transmission that converts the rotation of the ring gear 10 into the movement of the lock bolt comprises a single gear 9 and the pair of pins 8a co-operating with the toothing 6.

[0024] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to what is described and illustrated herein purely by way of example, without thereby departing from the scope of the present invention.

Claims

1. A safety-lock device, comprising:

- a rigid casing (2);
- a lock-bolt element (3) mounted so that it can slide in the casing (2) between a position of opening and a position of closing;
- a cylinder lock comprising a stator fixed to the casing (2) and a rotor (12) for driving a radially extending control member (13) in rotation;
- a ring gear (10), which is mounted so that it can turn in the casing (2) coaxially with respect to the rotor of the cylinder and has a radial slit (10a), said slit being engaged by the radial control member (13) of the cylinder lock, so as to be driven in rotation by said radial control member (13) when the cylinder lock is operated with a key; and
- a mechanical transmission (7) including at least one gear (9) meshing with said ring gear (10), for converting a movement of rotation of said ring gear (10) into a movement of translation of said lock-bolt element (3),

said device being **characterized in that**, at any point along the aforesaid mechanical transmission (7), a coupling is provided between a driven member and a driving member that affords said members the possibility of a limited relative movement.

2. The safety-lock device according to Claim 1, **char-**

- acterized in that** the aforesaid mechanical transmission (7) includes a member (8) able to turn in the casing (2) and carries two diametrically opposite axial pins (8a), designed to engage a part shaped like a movable toothing (6) of said lock-bolt element (3). 5
3. The safety-lock device according to Claim 2, **characterized in that** said coupling with play is between said rotatable member (8) and said gear (9). 10
4. The safety-lock device according to Claim 1, **characterized in that** the lock device moreover comprises an element (17) for referencing the position of opening and the position of closing of the lock-bolt element (3) pushed elastically against a side surface (8c) of said rotatable member (8), which carries the aforesaid pins (8a) and is designed to recall, in the aforesaid condition of opening and in the aforesaid condition of closing, said rotatable member (8) to a position in which said pins (8a) are aligned in the direction of movement of the lock-bolt element (3). 15 20
5. The safety-lock device according to Claim 1, **characterized in that** said rotatable member is formed by a disk (8) presenting in a face thereof a projecting central portion (8b) designed to engage in the central hole (9b) of said gear (9). 25
6. The safety-lock device according to Claim 5, **characterized in that** said projecting portion (8b) of said disk (8) has a shape having a circular portion delimited in its angular extension by contrast surfaces (8b'). 30
7. The safety-lock device according to Claim 6, **characterized in that** said central hole (9b) of said gear (9) has a shape having a circular portion delimited in its angular extension by contrast surfaces (9b'). 35
8. The safety-lock device according to Claim 7, **characterized in that** said play is equal to the difference of angular extension between the circular portion of the projecting portion (8b) of said disk (8) and the circular portion of the central hole (9b) of said gear (9). 40 45
9. The safety-lock device according to Claim 4, **characterized in that** said reference element is formed by a lever (17) fixed to the casing (2) and pushed to bear upon the side surface of the disk (8) via an elastic element (18). 50
10. The safety-lock device according to Claim 4, **characterized in that** said side surface of the disk has, in a position corresponding to the portion bearing upon said lever (17), a flattened section (8c) designed to co-operate with the contrast profile of said lever (17). 55
11. A safety-lock device, substantially as described and illustrated herein.

FIG. 1

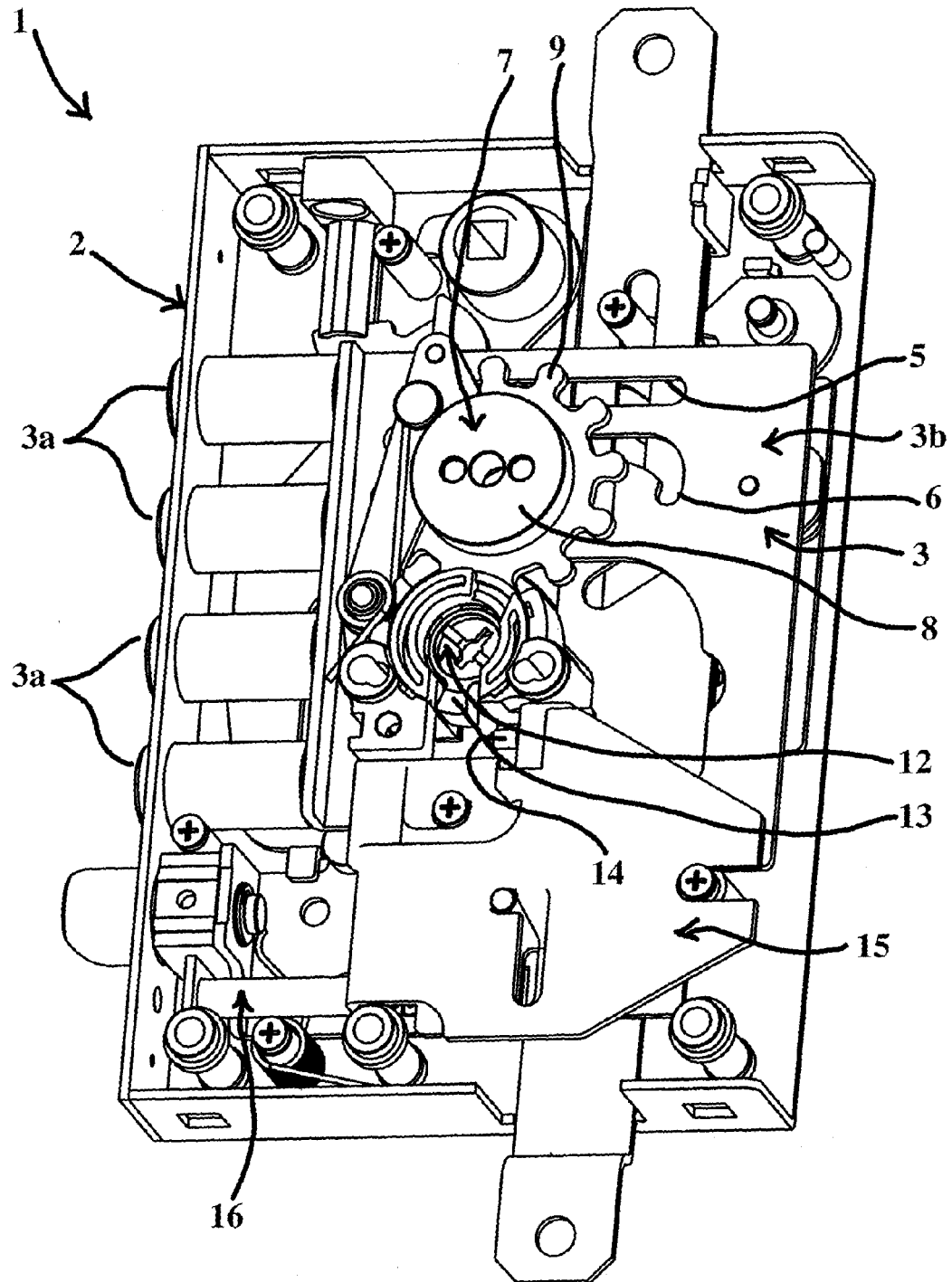


FIG. 2

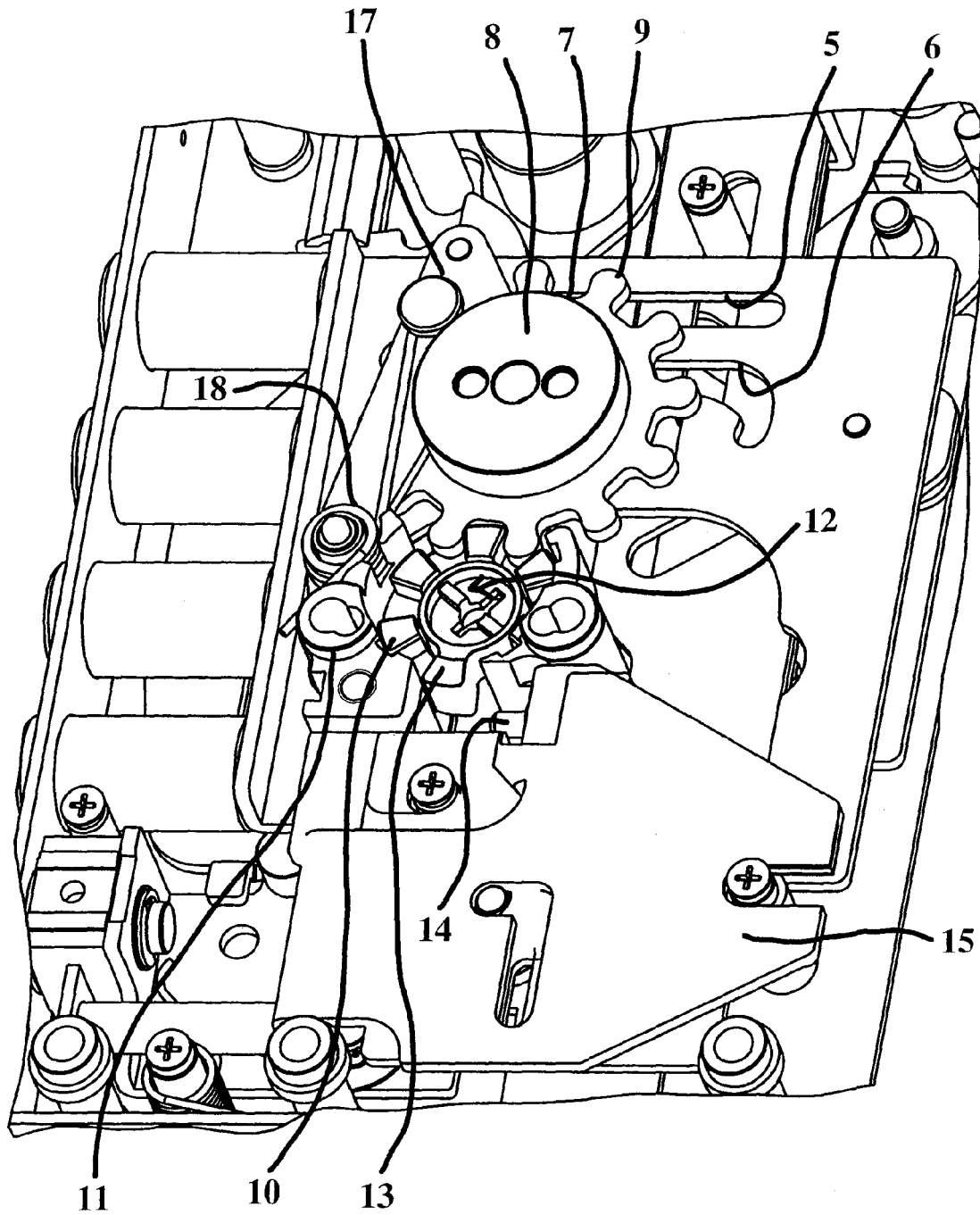


FIG. 3

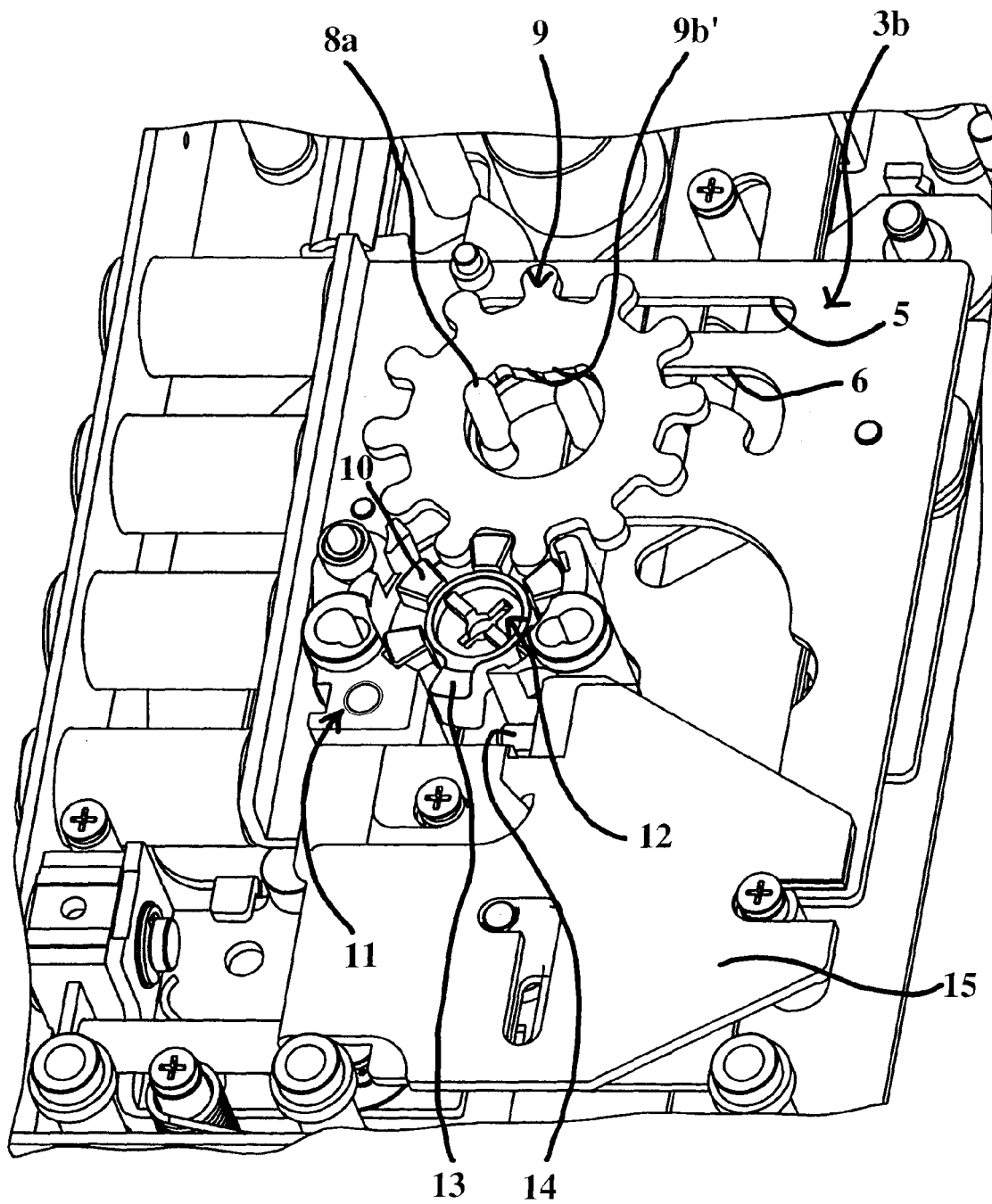


FIG. 4A

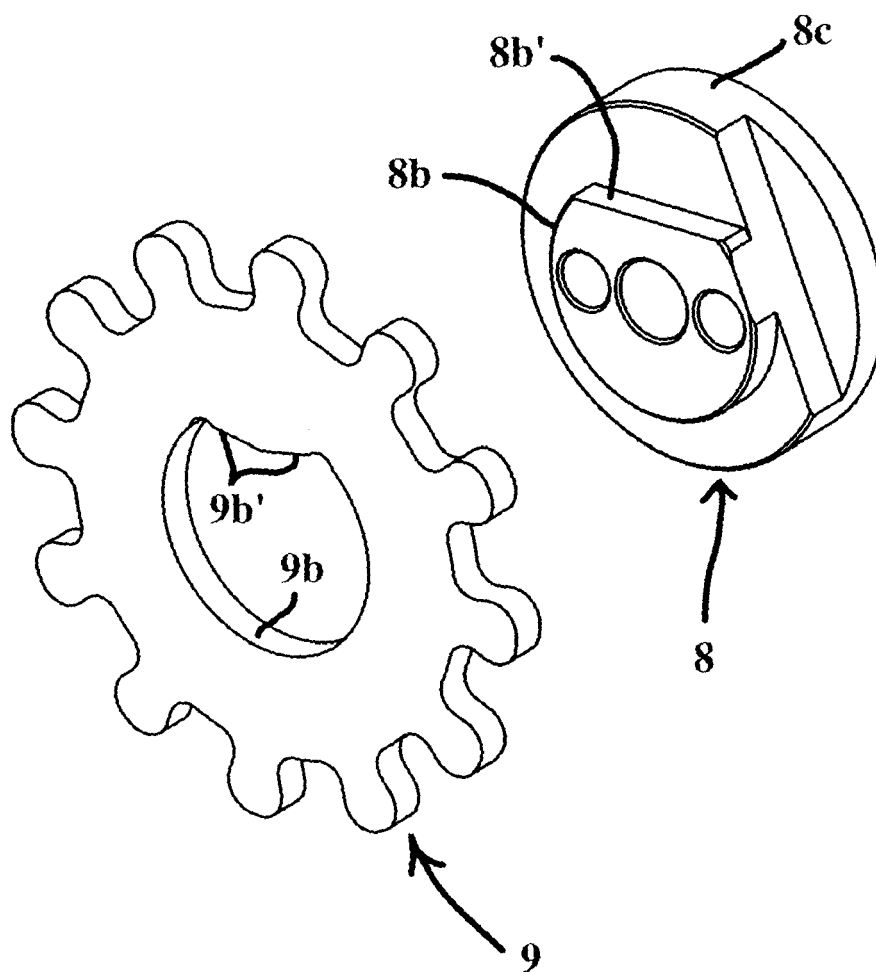


FIG. 4B

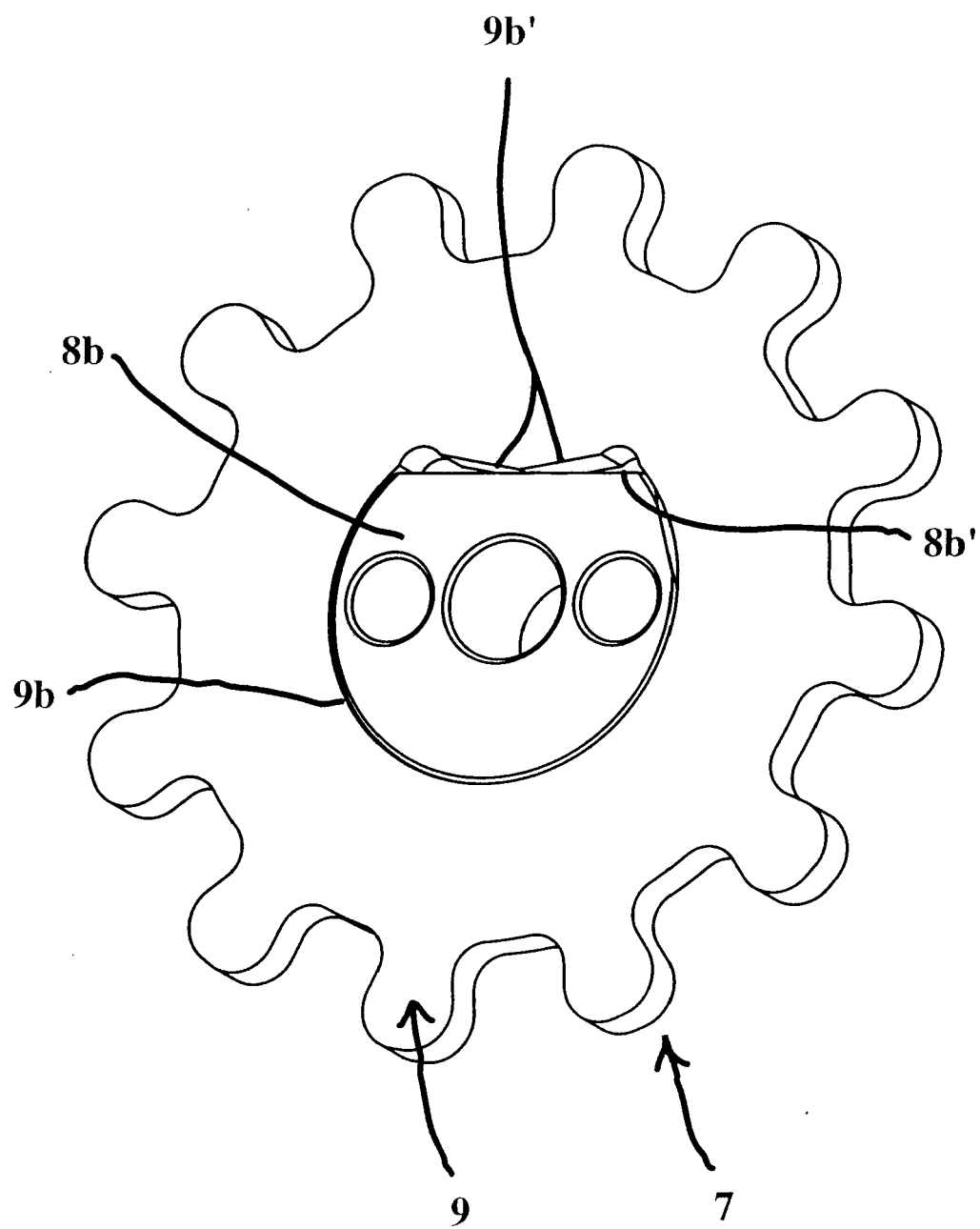


FIG. 5

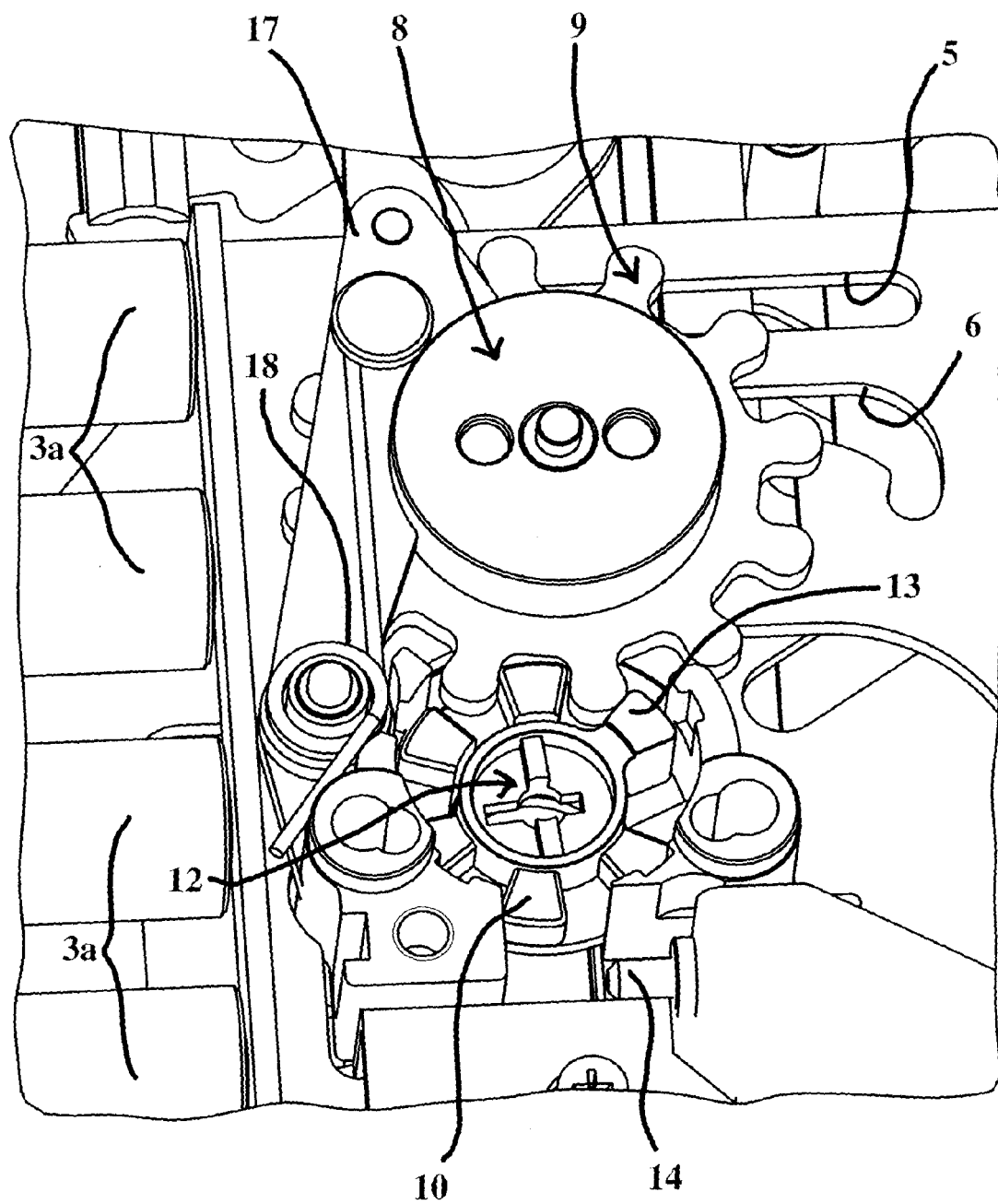


FIG. 6

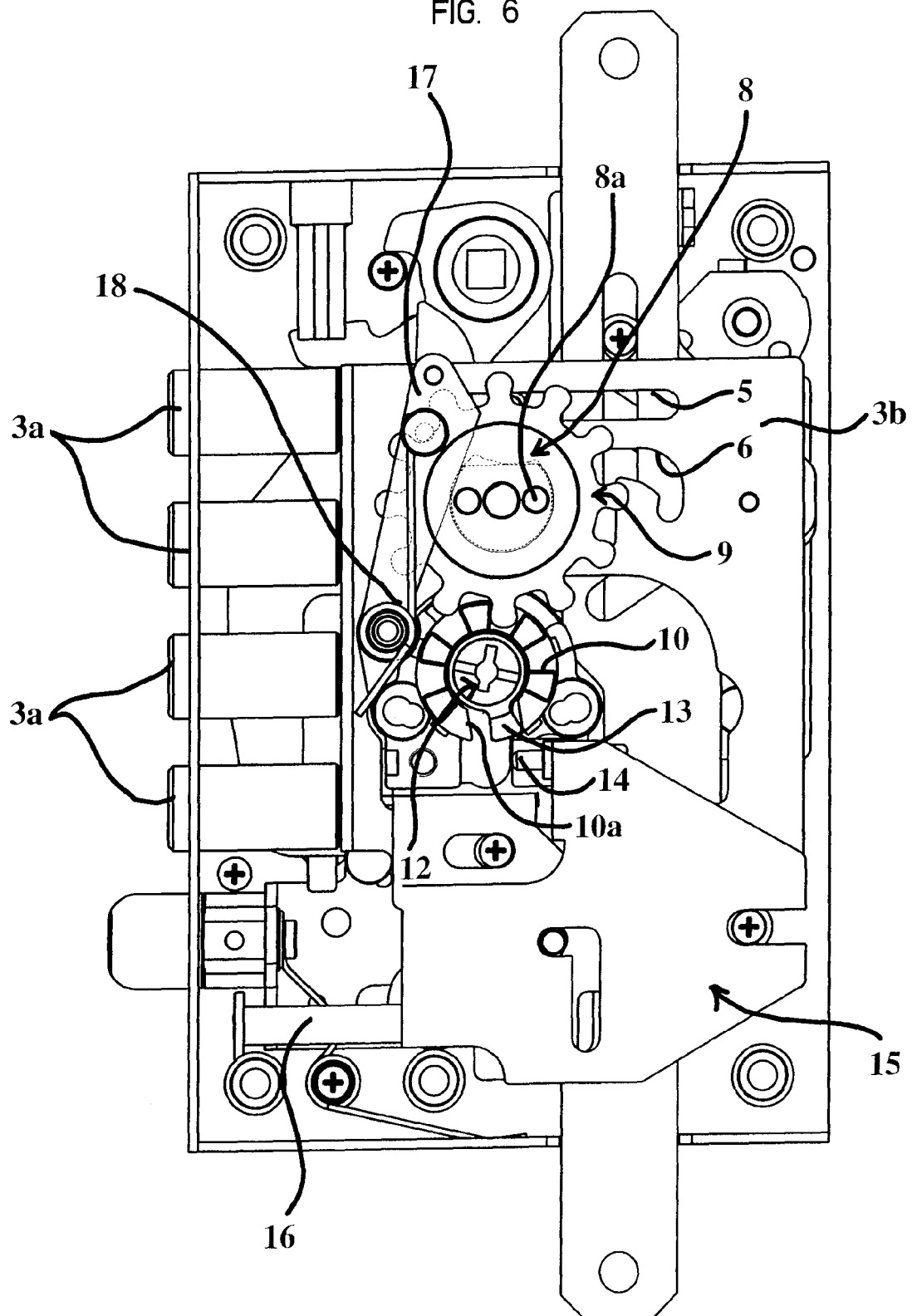


FIG. 7

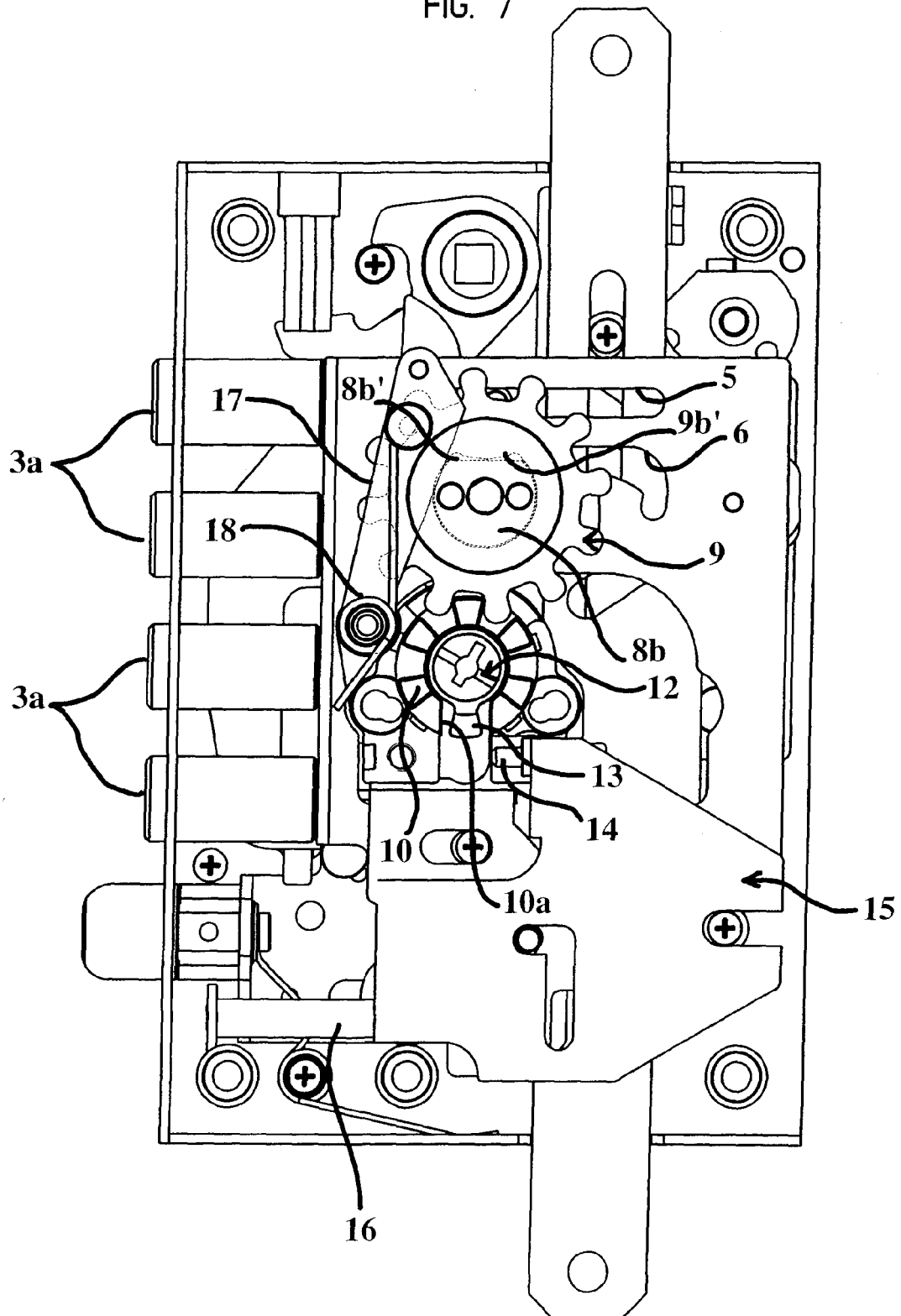


FIG. 8

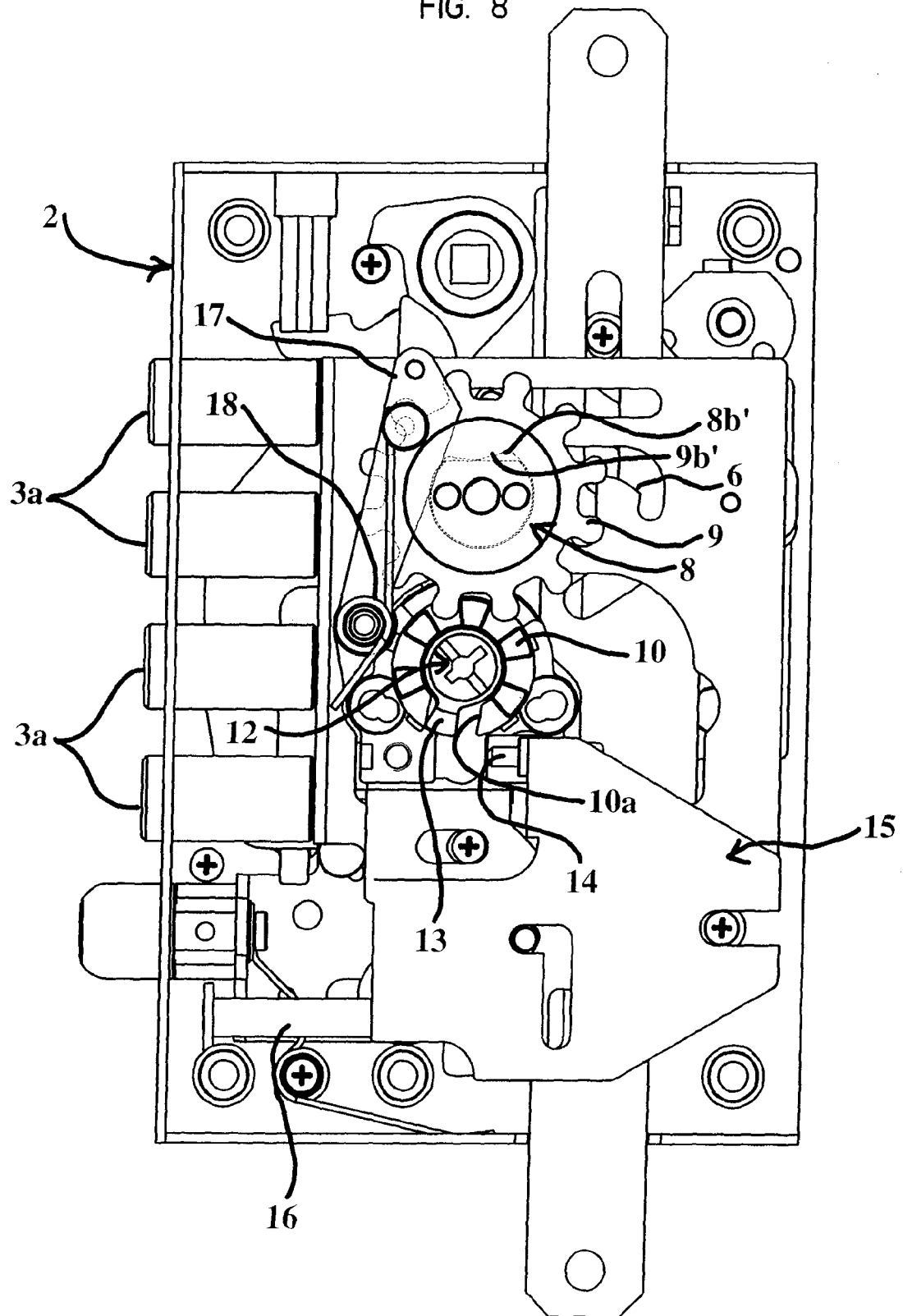
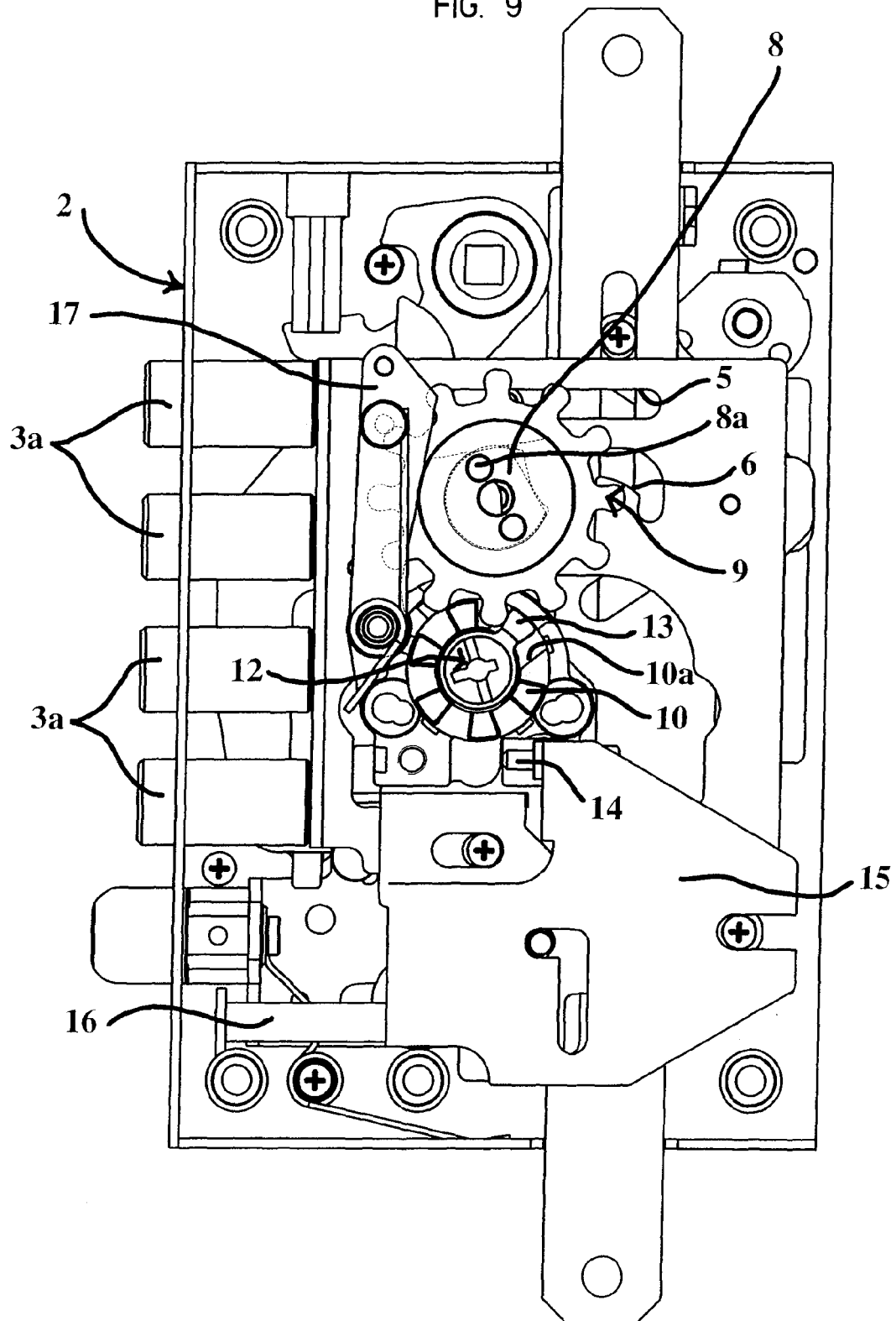


FIG. 9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 0224

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Place of search The Hague		Date of completion of the search 19 July 2007	Examiner Westin, Kenneth
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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19-07-2007

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