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(54) **ROTOR FOR A ROTOR LOCKING DEVICE**

(57) Rotor (1) for a locking device that is at least opened by rotating along a rotation axis (X) the rotor (1) within a housing (H) of a stator by means of an operating key (3), said rotor comprising at least one weakening zone located between the front end (10E) and the first slot (11A) and adapted for generating a rupture or fracture (R) in the rotor (1) at least from the front end (10E) at least up to the first slot (11A) substantially in a plane parallel to the rotation axis (X).

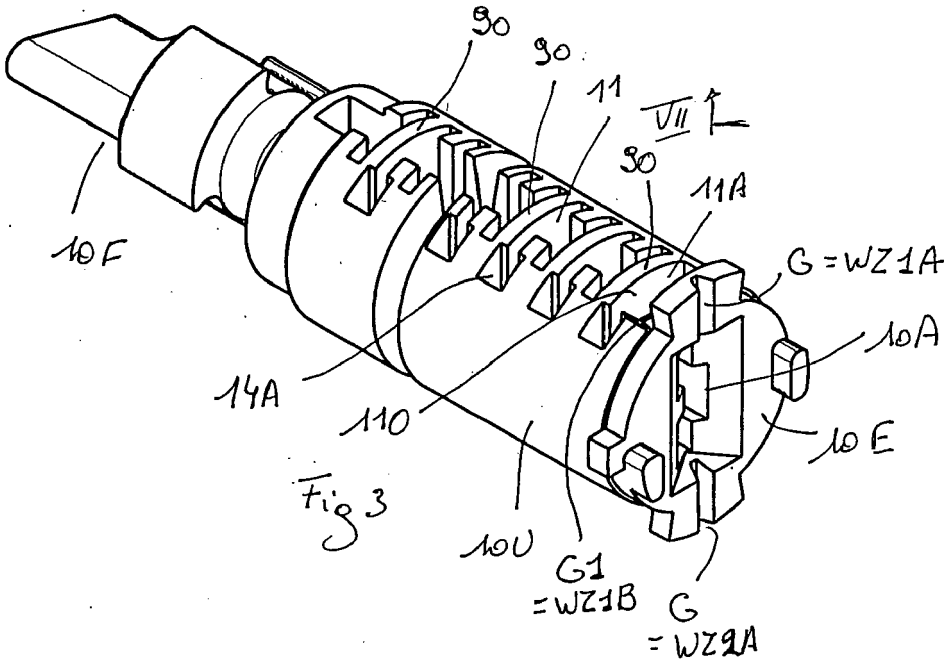

Fig 3

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Description

[0001] The invention relates to a rotor for a locking device which can at least partly be broken when turned with a tool not being the operating key.

[0002] A problem of existing locks is that the rotor can be broken by tools not being the operating key, whereby enabling the opening of the locking device. Such tools are marketed on the Web for professionals, but are more often used by non professionals for robbing bicycles or other articles.

[0003] Only for the Netherlands, about 600,000 bicycles have been stolen in 2014.

[0004] Rotors with weakening zone (see DE2822132; WO2012/138534, EP2208839) have been proposed but were unable to achieve correct protection, as even if the rotor was broken, the rotation of the broken part was still possible, whereby enabling the opening of the locking device.

[0005] The invention has for aim a rotor which when broken in the housing of the stator exerts sufficient friction forces on the wall of the stator, that the further turning of the part of the tool located outside the rotor will cause a rupture of the tool in two parts, one part being located within the rotor, while the other part is located outside of the rotor. Advantageously the rotor of the invention is such that the tool when broken will be at least partly be deformed within the rotor, whereby blocking completely any further theft attempt.

[0006] The invention relates to a rotor (1) for a rotor-type locking device that is at least opened by rotating along a rotation axis (X) the rotor (1) within a housing (H) of a stator by means of an operating key (3) provided with an operating channel on one of its faces, said rotor (1) comprising a body (B) with a front end and a back end, said body featuring:

- a central chamber (10) with at least one front aperture (10A) located at the front end (10E) and adapted for the introduction of at least one portion (4) of the key (3) into the chamber, said central chamber (10) having at least a first inner face (100) adapted to be in front of a face or edge of the operating key (3), and a second inner face (101) opposite to the first inner face (100) (said first and second inner faces of the central chamber being preferably the faces having the smallest width);
- a series of slots (11) which communicate with the central chamber (10), whereby a first slot (11) is adjacent to the front aperture (10A), and whereby adjacent slots are connected the one to the other by a bridge (90);
- at least four locking tumblers (12, 13) which respectively slide in a slot (11) under the action of one or more return means (14), each tumbler (12, 13) presenting a control nib (12A, 13A) designed to cooperate with the key (3) introduced into the central chamber (10), so as to bring each tumbler into the unlocking position against the action of one or more return means, more particularly one or more return springs (14); and
- at least one weakening zone adapted for enabling a rupture or fracture in the rotor (1) when a rotation of the rotor (1) in the housing (H) of the stator is commanded by means of a tool different from the operating key, whereby, when a rotation of the rotor is commanded by means of a tool not being the operating key, at least one weakening zone (WZ1 ,WZ2) is located between the front end (10E) and the first slot (11A), is adapted for generating a rupture or fracture (R) in the rotor (1) at least from the front end (10E) at least up to the first slot (11A) substantially in a plane comprising the rotation axis (X) or substantially in a plane parallel to the rotation axis (X).

[0007] The rotor of the invention has advantageously one or more of the following details or characteristics :

- The rotor (1) comprises a first weakening zone (WZ1) located between the front end (10E) and the first slot (11A) adjacent to the first inner face (100) of the central chamber (10), and a second weakening zone (WZ2) between the front end (10E) and the first slot (11A) adjacent to the second inner face (101) of the central chamber (10). When having two weakening zones (WZ1,WZ2), a weakening zone is adapted for generating a rupture or a fracture substantially in a plane comprising the rotation axis (X) or substantially in a plane parallel to the rotation axis (X) or for generating a deformation (the weakening zone forming an axis of rotation Z for deforming the broken sections of the rotor adjacent to the front end (10E), whereby two faces of the broken section of the rotor along a plane comprising the rotation axis X or substantially parallel to said rotation axis X are moved away the one from the other, and are at least partly kept away the one from the other, by a non elastic deformation of the front section of the rotor 1. and/or
- the first and/or second weakening zone (WZ1,WZ2) comprises two distinct portions, namely a first portion (WZ1A,WZ2A) located along the front end (10E) of the rotor and a second portion (WZ1B,WZ2B) located along the first slot (11A), said first and second portions of each weakening zone being separated the one with the other by a bridge (B) having an area with a maximum thickness (D) measured between the said first and second portions (WZ1A,WZ1B) of less than 3mm, advantageously less than 2mm. and/or
- the rotor (1) has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2) comprises at least a groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10).

and/or

- the groove (G) extends from the outer edge (10U) up to the first inner face (100) or the second inner face (101) of the central chamber (10). and/or
- the weakening zone (WZ1,WZ2) comprises at least a first groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10), advantageously up to the first inner face (100) of the central chamber, and a second groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10), advantageously up to the second inner face (101) of the central chamber (10).and/or
- the first groove and second groove (G) extending along the front end (10E) of the rotor extend each along an axis substantially perpendicular to the rotation axis (X), whereby said grooves being preferably substantially coaxial.

and/or

- the groove (G) extending along the front end of the rotor is associated to a pre-cut (PC) extending on the outer edge (10U) of the rotor from the said groove (G) up to the first slot (11A) or a groove or hollow part (G1) communicating with the first slot (11A).

and/or

- the rotor (1) has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2) comprises at least a groove (G1) extending along the first slot (11A), located in the volume between the front end (10E) of the rotor of the first slot (11A), advantageously from the outer edge (10U) up to the central chamber (10), preferably from the outer edge up to the first inner face (100) or the second inner face (101) of the central chamber (10).

and/or

- the weakening zone (WZ1,WZ2) comprises at least a first groove (G1) extending along the first slot (11A), located within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge (10U) up to the first inner face (100) of the central chamber, and a second groove (G1) extending along the first slot (11A), within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge up to the second inner face or the second inner face of the central chamber.

and/or

- the first groove and second groove (G1) extending along the first slot (11A) of the rotor extend each along an axis (Y) substantially perpendicular to the rotation axis (X), whereby said grooves (G1) being preferably substantially coaxial.

and/or

- the groove(s) (G1) extending along the first slot (11A) of the rotor is associated to a pre-cut (PC) extending on the outer edge (10U) of the rotor from the said groove (G1) up to the front end (10E).

and/or

- the rotor has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2) comprises at least a front groove (G) extending along the front end of the rotor, from the outer edge (10U) up to the central chamber, advantageously up to the first inner face (100), and a back groove (G1) extending along the first slot (11A), partly within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge up to the first inner face (100) of the central chamber, said back groove (G1) and said front groove (G) being located the one behind the other, most preferably with a pre-cut (PC) along the outer edge (10U) extending between the front groove (G) and the back groove (G1), and/or, preferably and, at least another front groove (G) extending along the front end of the rotor, from the outer edge up to the central chamber, advantageously up to the second inner face (101), and a back groove (G1) extending along the first slot (11A), partly within the volume between the front end of the rotor and the first slot, advantageously from the outer edge up to the central chamber, preferably from the outer edge up to the second inner face of the central chamber, said back groove (G1) and said front groove (G) being located the one behind the other, most preferably with a pre-cut (PC) along the outer edge (10U) extending between the front groove (G) and the back groove (G1).

and/or

- The rotor further comprises a further weakening zone (WZ3) extending away from the front end (10E), preferably between two slots (11) away from the first slot (11A) adjacent to the front end, most preferably a weakening zone adapted for enabling a rupture or fracture of the rotor with a plane substantially perpendicular to the axis of rotation (X).

[0008] The invention further relates to a locking device having at least one housing cooperating with at least one rotor according to the invention as disclosed here above, said rotor having advantageously a means of retaining the rotor in the housing, notably a retainer, preferably adapted to cooperate with a key or master key as defined in any one of the preceding claims.

[0009] The invention still relates to the use of one or more locking devices according to the invention for the protection or closure or non-use of articles, property, bicycles, caravans, luggage carriers, and/or cabinets, as well as to articles, property, bicycles, caravans, luggage carriers, and/or cabinets using one or more locking devices of the invention for the protection or closure or non-

use thereof.

[0010] Tests have shown that when the front portion of the cylinder was broken, for example only in the portion adjacent to the first face of the central chamber, said front portion was clamped within the housing while preventing any rotation with a torque of less than about 25 Nm. By adapting the deformation of the front portion of the rotor, rotation of the rotor can be prevented with torque of less than 30Nm, 50Nm or even more. When using the opening tools in an attempt to open the locking device without using the operating key, the tool was broken outside the rotor, leaving a deformed part within the rotor, whereby preventing any further attempt to open the lock by means of such a tool or even a grip.

[0011] Details and characteristics of the invention will appear from the following description in which reference is made to the attached drawings showing preferred embodiments of the invention.

[0012] In said drawings :

Figure 1 is a schematic exploded view of a locking device for bicycles, said locking device being further disclosed in details in EP0443217;
Figure 2 is a perspective view of a first embodiment of a rotor of the invention with its operating key, the rotor being showing outside the housing of the stator;
Figure 3 is a further perspective view of the rotor of Figure 2, with the operating key and the tumblers removed;
Figure 4 is a front view of the rotor of figure 3;
Figure 5 is a lateral view of the rotor of figure 3;
Figure 6 is an upper view of the rotor of figure 3;
Figure 7 is a cross section view of the rotor of Figure 6 along the lines VII-VII;
Figure 8 is a perspective view of another embodiment of a rotor of the invention, with the operating key inserted in the central chamber 10,
Figure 9 is a further perspective view of the rotor of Figure 8, with the operating key and the tumblers removed;
Figure 10 is a front view of the rotor of figure 8;
Figure 11 is a lateral view of the rotor of figure 8;
Figure 12 is an upper view of the rotor of figure 8 (after complete breaking of the bridge 90);
Figure 13 is a cross section view of the rotor of Figure 12 along the lines XIII-XIII;
Figures 14 to 19 are view of an embodiment similar to the embodiment of figures 2 to 7;
Figures 20 and 21 show possible breaking or deformation of the portion of the rotor adjacent to the front end, and
Figures 22A and 22B, 23A and 23B, 24A and 24B, 25A and 25B, 26A and 26B are perspective views of preferred operating key, as well as front views thereof showing specific cross section of the part of the keys to be inserted within the central chamber.

[0013] Figure 1 shows a bicycle lock as disclosed in EP0443217. Reference is made to said document for specific details of said specific lock disclosed as example only. The lock comprises a housing H for receiving a rotor, the rotation of which is controlled by an operating key 3. The rotor of the invention can be used in housing of other lock devices.

[0014] Figures 2 and 3 are perspective views of a first embodiment of a rotor of the invention, with and without the key inserted in the central chamber 10. The embodiment of Figure 14 and 15 is similar to the embodiment of figures 2 and 3.

[0015] The rotor (1) for a rotor-type locking device that is at least opened by rotating along a rotation axis (X) the rotor (1) within a housing (H) of a stator by means of an operating key (3) provided with an operating means 4A (adapted to operate movement of the tumblers) on one of its faces, said rotor (1) comprising a body (BD) with a front end (10E) and a back end (10F), said body (B) featuring:

- a central chamber (10) with at least one front aperture (10A) located at the front end (10E) and adapted for the introduction of at least one portion (4) of the key (3) into the chamber, said central chamber (10) having at least a first inner face (100) adapted to be in front of a face or edge of the operating key (3), and a second inner face (101) opposite to the first inner face (100) (said first and second inner faces of the central chamber being preferably the faces having the smallest width);
- a series of slots (11) which communicate with the central chamber (10), whereby a first slot (11) is adjacent to the front aperture (10A), and whereby adjacent slots are connected the one to the other by one or more bridges (90);
- at least four locking tumblers (12, 13) which respectively slide in a slot (11) under the action of one or more return means (not shown), each tumbler (12, 13) presenting a control nib or means designed to cooperate with the operating key (3) introduced into the central chamber (10), so as to bring each tumbler into the unlocking position against the action of one or more return means, more particularly one or more return springs (said spring being placed in an open chamber 14A with a bottom or an abutment for an end of the spring, said open chamber 14A communicating with the slot 11, whereby the spring has the other end abutting on a part of the tumbler 12, so as to push the top end of the tumbler outside of the rotor towards the housing, such as towards recesses of the housing) ; and
- at least one weakening zone (WZ1,WZ2) adapted for enabling a rupture or fracture in the rotor (1) when a rotation of the rotor (1) in the housing (H) of the stator is commanded by means of a tool different from the operating key. The operating key is a key adapted for displacing the locking tumblers into the slots of the rotor 1, or in case the rotor comprises a

retainer or retaining tumbler, a key adapted for displacing the retaining tumbler and the locking tumblers in a position enabling the rotor to be removed from the housing.

[0016] The rotor 1 comprises at least two weakening zones (WZ1,WZ2) located between the front end (10E) and the first slot (11A), whereby, when a rotation of the rotor is commanded by means of a tool not being the operating key, at least a first zone is adapted for generating a rupture or fracture (R) in the rotor (1) at least from the front end (10E) at least up to the first slot (11A) substantially in a plane comprising the rotation axis (X) or substantially in a plane parallel to the rotation axis (X), while a second weakening zone is adapted for generating a rupture or a fracture substantially in a plane comprising the rotation axis (X) or substantially in a plane parallel to the rotation axis (X) or a deformation (the weakening zone forming an axis of rotation Z for deforming the broken sections of the rotor adjacent to the front end (10E), whereby two faces of the broken section of the rotor in a plane comprising the rotation axis X or substantially parallel to said rotation axis X are moved away the one from the other, and are at least partly kept away the one from the other, by a non elastic deformation of the front section of the rotor 1.

[0017] In the embodiment of figures 2 and 3, the rotor (1) comprises a first weakening zone (WZ1) located between the front end (10E) and the first slot (11A) adjacent to the first inner face (100) of the central chamber (10), and a second weakening zone (WZ2) between the front end (10E) and the first slot (11A) adjacent to the second inner face (101) of the central chamber (10).

[0018] The first and second weakening zones (WZ1,WZ2) comprise each two distinct portions, namely a first portion (WZ1A,WZ2A) located along the front end (10E) of the rotor and a second portion (WZ1B,WZ2B) located along the first slot (11A), said first and second portions of each weakening zone being separated the one with the other by a bridge (B) having an area with a maximum thickness (D) measured between the said first and second portions (WZ1A,WZ1B) of less than 3mm, advantageously less than 2mm.

[0019] The rotor (1) has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), whereby each weakening zone (WZ1,WZ2) comprises at least a groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10). The groove (G) extends from the outer edge (10U) up to the first inner face (100) or the second inner face (101) of the central chamber (10).

[0020] The first groove and second groove (G) extending along the front end (10E) of the rotor extend each along an axis substantially perpendicular to the rotation axis (X), whereby said grooves being preferably substantially coaxial.

[0021] The groove (G) extending along the front end of the rotor is associated to a pre-cut (PC) extending on the outer edge (10U) of the rotor from the said groove (G) up to the first slot (11A) or a groove or hollow part (G1) communicating with the first slot (11A).

[0022] The rotor (1) has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), while the weakening zones (WZ1,WZ2) comprise each at least a groove (G1) extending along the first slot (11A), located in the volume between the front end (10E) of the rotor of the first slot (11A), advantageously from the outer edge (10U) up to the central chamber (10), preferably from the outer edge up to the first inner face (100) or the second inner face (101) of the central chamber (10).

[0023] Each weakening zone (WZ1,WZ2) comprises at least a first groove (G1) extending along the first slot (11A), located within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge (10U) up to the first inner face (100) of the central chamber, and a second groove (G1) extending along the first slot (11A), within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge up to the second inner face or the second inner face of the central chamber.

[0024] The first groove and second groove (G1) extending along the first slot (11A) of the rotor extend each along an axis (Y) substantially perpendicular to the rotation axis (X), whereby said grooves (G1) being preferably substantially coaxial.

[0025] The groove(s) (G1) extending along the first slot (11A) of the rotor is associated to a pre-cut (PC) extending on the outer edge (10U) of the rotor from the said groove (G1) up to the front end (10E). This embodiment is shown in Figures 14 to 19.

[0026] Pre cuts PC can also extend in the bridge 90 extending between the slot 11A and the adjacent slot 11

[0027] In the embodiment, the rotor has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2) comprises at least a front groove (G) extending along the front end of the rotor, from the outer edge (10U) up to the central chamber, advantageously up to the first inner face (100), and a back groove (G1) extending along the first slot (11A), partly within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge up to the first inner face (100) of the central chamber, said back groove (G1) and said front groove (G) being located the one behind the other, most preferably with a pre-cut (PC) along the outer edge (10U) extending between the front groove (G) and the back groove (G1), and/or, preferably and, at least another front groove (G) extending along the front end of the rotor, from the outer edge up to the central chamber, advantageously up to the second inner face (101), and a back groove (G1)

extending along the first slot (11A), partly within the volume between the front end of the rotor and the first slot, advantageously from the outer edge up to the central chamber, preferably from the outer edge up to the second inner face of the central chamber, said back groove (G1) and said front groove (G) being located the one behind the other, most preferably with a pre-cut (PC) along the outer edge (10U) extending between the front groove (G) and the back groove (G1).

[0028] The rotor further comprises a further weakening zone (WZ3) extending away from the front end (10E), preferably between two slots (11) away from the first slot (11A) adjacent to the front end, most preferably a weakening zone adapted for enabling a rupture or fracture of the rotor with a plane substantially perpendicular to the axis of rotation (X).

[0029] The embodiment of Figures 8 to 13 is similar to the embodiment of the Figures 2 to 7, except that the bridges 90 between the slots 11 of the section of the rotor located between the front end 10E and the weakening zone WZ3 are each provided with a weakening zone or with a complete cross cut CC, whereby facilitating the breaking and deformation of the front section of the rotor when attempting to open the rotor with an inappropriate tool.

[0030] The rotor can be used with stator for the protection or closure or non-use of articles, property, bicycles, caravans, luggage carriers, and/or cabinets.

[0031] Figures 20 and 21 are view showing possible breaking or deformation of the front section of the rotor when attempting to rotate it with an inappropriate tool. When deformed or broken, the friction of the rotor within the housing is high enough to break the inappropriate tool substantially at the level of the font end of the rotor. The part of the broken tool remaining within the central chamber 10 forms then a further means for preventing the opening of the rotor.

[0032] Figures 22 to 26 are views of preferred keys and their cross section profiles.

Claims

1. Rotor (1) for a rotor-type locking device that is at least opened by rotating along a rotation axis (X) the rotor (1) within a housing (H) of a stator by means of an operating key (3) provided with operating means on one of its faces to operate movement of tumblers, said rotor (1) comprising a body (BD) with a front end and a back end, said body featuring:

   - a central chamber (10) with at least one front aperture (10A) located at the front end (10E) and adapted for the introduction of at least one portion (4) of the key (3) into the chamber, said central chamber (10) having at least a first inner face (100) adapted to be in front of a face or edge of the operating key (3), and a second inner face (101) opposite to the first inner face (100), said first and second inner faces of the central chamber being preferably the faces of the central chamber having the smallest width;
   - a series of slots (11) which communicate with the central chamber (10), whereby a first slot (11) is adjacent to the front aperture (10A), and whereby adjacent slots are connected the one to the other by one or more bridges (90);
   - at least four locking tumblers (12, 13) which respectively slide in a slot (11) under the action of one or more return means (14), each tumbler (12, 13) presenting a control nib (12A, 13A) designed to cooperate with the key (3) introduced into the central chamber (10), so as to bring each tumbler into the unlocking position against the action of one or more return means, more particularly one or more return springs (14); and
   - at least one weakening zone adapted for enabling a rupture or fracture in the rotor (1) when a rotation of the rotor (1) in the housing (H)of the stator is commanded by means of a tool different from the operating key, whereby, when a rotation of the rotor is commanded by means of a tool not being the operating key, at least one weakening zone (WZ1,WZ2) is located between the front end (10E) and the first slot (11A), is adapted for generating a rupture or fracture (R) in the rotor (1) at least from the front end (10E) at least up to the first slot (11A) substantially in a plane comprising the rotation axis (X) or substantially in a plane parallel to the rotation axis (X).

2. The rotor (1) of claim 1, which comprises a first weakening zone (WZ1) located between the front end (10E) and the first slot (11A) adjacent to the first inner face (100) of the central chamber (10), and a second weakening zone (WZ2) between the front end (10E) and the first slot (11A) adjacent to the second inner face (101) of the central chamber (10).

3. The rotor (1) of claim 1 or 2, in which the first and/or second weakening zone (WZ1,WZ2) comprises two distinct portions, namely a first portion (WZ1A,WZ2A) located along the front end (10E) of the rotor and a second portion (WZ1 B,WZ2B) located along the first slot (11A), said first and second portions of each weakening zone being separated the one with the other by a bridge (B) having an area with a maximum thickness (D) measured between the said first and second portions (WZ1A,WZ1B) of less than 3mm, advantageously less than 2mm.

4. The rotor (1) of any one of the claims 1 to 3, in which the rotor (1) has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2)

comprises at least a groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10).

5. The rotor (1) of the preceding claim, in which the groove (G) extends from the outer edge (10U) up to the first inner face (100) or the second inner face (101) of the central chamber (10).

6. The rotor (1) of claim 4 or 5, in which the weakening zone (WZ1,WZ2) comprises at least a first groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10), advantageously up to the first inner face (100) of the central chamber, and a second groove (G) extending along the front end (10E) of the rotor, from the outer edge (10U) up to the central chamber (10), advantageously up to the second inner face (101) of the central chamber (10), and in which advantageously the first groove and second groove (G) extending along the front end (10E) of the rotor extend each along an axis substantially perpendicular to the rotation axis (X), whereby said grooves being preferably substantially coaxial.

7. The rotor of anyone of the claims 4 to 6, in which the groove (G) extending along the front end of the rotor is associated to a pre-cut (PC) extending on the outer edge (10U) of the rotor from the said groove (G) up to the first slot (11A) or a groove or hollow part (G1) communicating with the first slot (11A).

8. The rotor of anyone of the preceding claims, in which the rotor (1) has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2) comprises at least a groove (G1) extending along the first slot (11A), located in the volume between the front end (10E) of the rotor of the first slot (11A), advantageously from the outer edge (10U) up to the central chamber (10), preferably from the outer edge up to the first inner face (100) or the second inner face (101) of the central chamber (10).

9. The rotor (1) of the preceding claim, in which the weakening zone (WZ1,WZ2) comprises at least a first groove (G1) extending along the first slot (11A), located within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge (10U) up to the first inner face (100) of the central chamber, and a second groove (G1) extending along the first slot (11A), within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge up to the second inner face or the second inner face of the central chamber, whereby advantageously the first groove and second groove (G1) extending along the first slot (11A) of the rotor extend each along an axis (Y) substantially perpendicular to the rotation axis (X), whereby said grooves (G1) being preferably substantially coaxial.

10. The rotor of anyone of the claims 8 to 9, in which the groove(s) (G1) extending along the first slot (11A) of the rotor is associated to a pre-cut (PC) extending on the outer edge (10U) of the rotor from the said groove (G1) up to the front end (10E).

11. The rotor of anyone of the claims 4 to 10, in which the rotor has an outer edge (10U) provided with a series of openings (11O) corresponding to the slots (11), and in which the weakening zone (WZ1,WZ2) comprises at least a front groove (G) extending along the front end of the rotor, from the outer edge (10U) up to the central chamber, advantageously up to the first inner face (100), and a back groove (G1) extending along the first slot (11A), partly within the volume between the front end (10E) of the rotor and the first slot (11A), advantageously from the outer edge (10U) up to the central chamber, preferably from the outer edge up to the first inner face (100) of the central chamber, said back groove (G1) and said front groove (G) being located the one behind the other, most preferably with a pre-cut (PC) along the outer edge (10U) extending between the front groove (G) and the back groove (G1), and/or, preferably and, at least another front groove (G) extending along the front end of the rotor, from the outer edge up to the central chamber, advantageously up to the second inner face (101), and a back groove (G1) extending along the first slot (11A), partly within the volume between the front end of the rotor and the first slot, advantageously from the outer edge up to the central chamber, preferably from the outer edge up to the second inner face of the central chamber, said back groove (G1) and said front groove (G) being located the one behind the other, most preferably with a pre-cut (PC) along the outer edge (10U) extending between the front groove (G) and the back groove (G1).

12. The rotor of anyone of the preceding claims, which further comprises a further weakening zone (WZ3) extending away from the front end (10E), preferably between two slots (11) away from the first slot (11A) adjacent to the front end, most preferably a weakening zone adapted for enabling a rupture or fracture of the rotor with a plane substantially perpendicular to the axis of rotation (X).

13. Locking device having at least one housing cooperating with at least one rotor according to any one of the preceding claims, said rotor having advanta-

geously a means of retaining the rotor in the housing, notably a retainer, preferably adapted to cooperate with a key or master key as defined in any one of the preceding claims.

14. Use of one or more locking devices according to claim 13 for the protection or closure or non-use of articles, property, bicycles, caravans, luggage carriers, and/or cabinets.

15. Articles, property, bicycles, caravans, luggage carriers, and/or cabinets using one or more locking devices of claim 13 for the protection or closure or non-use thereof.

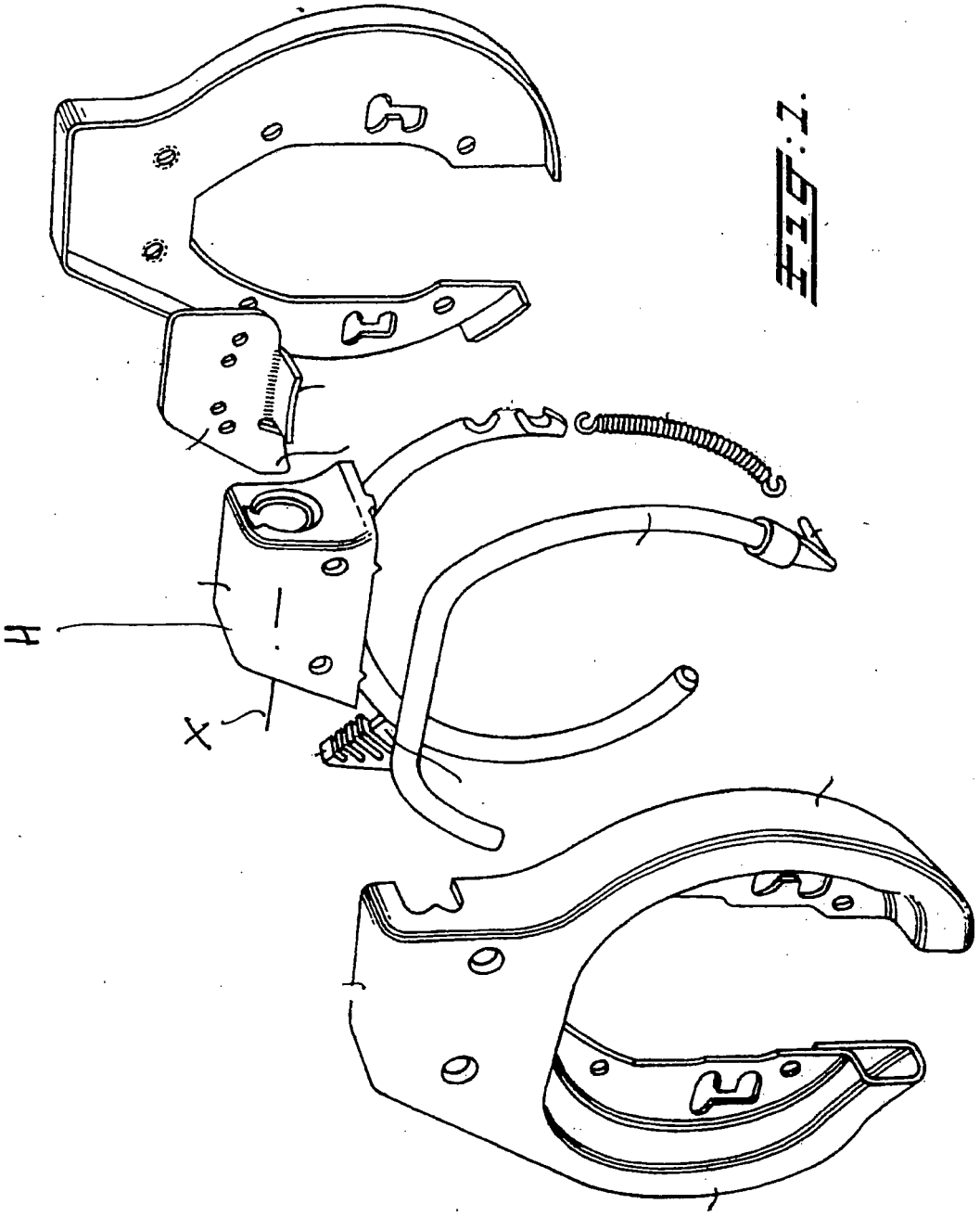
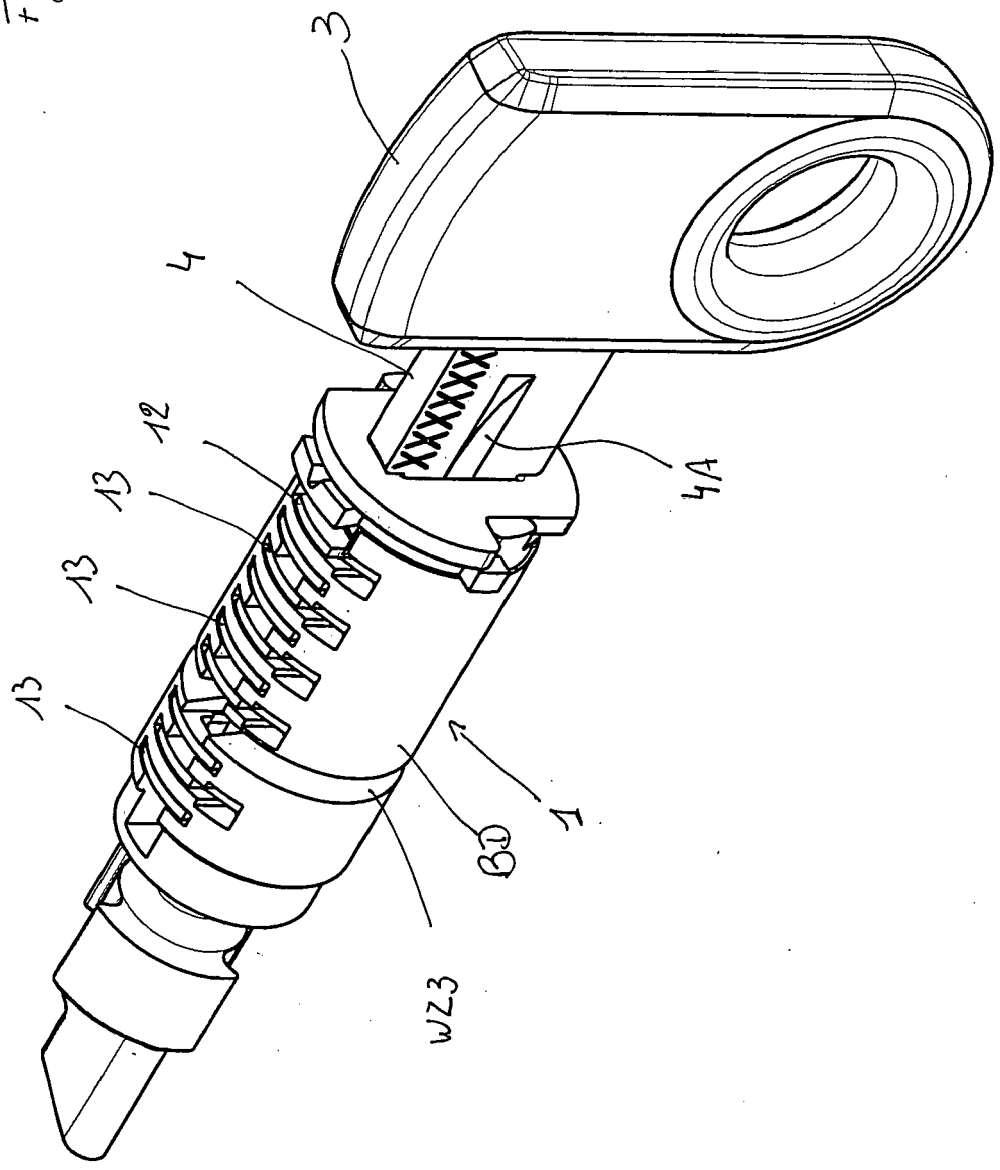


FIG. 1.

Fig 2



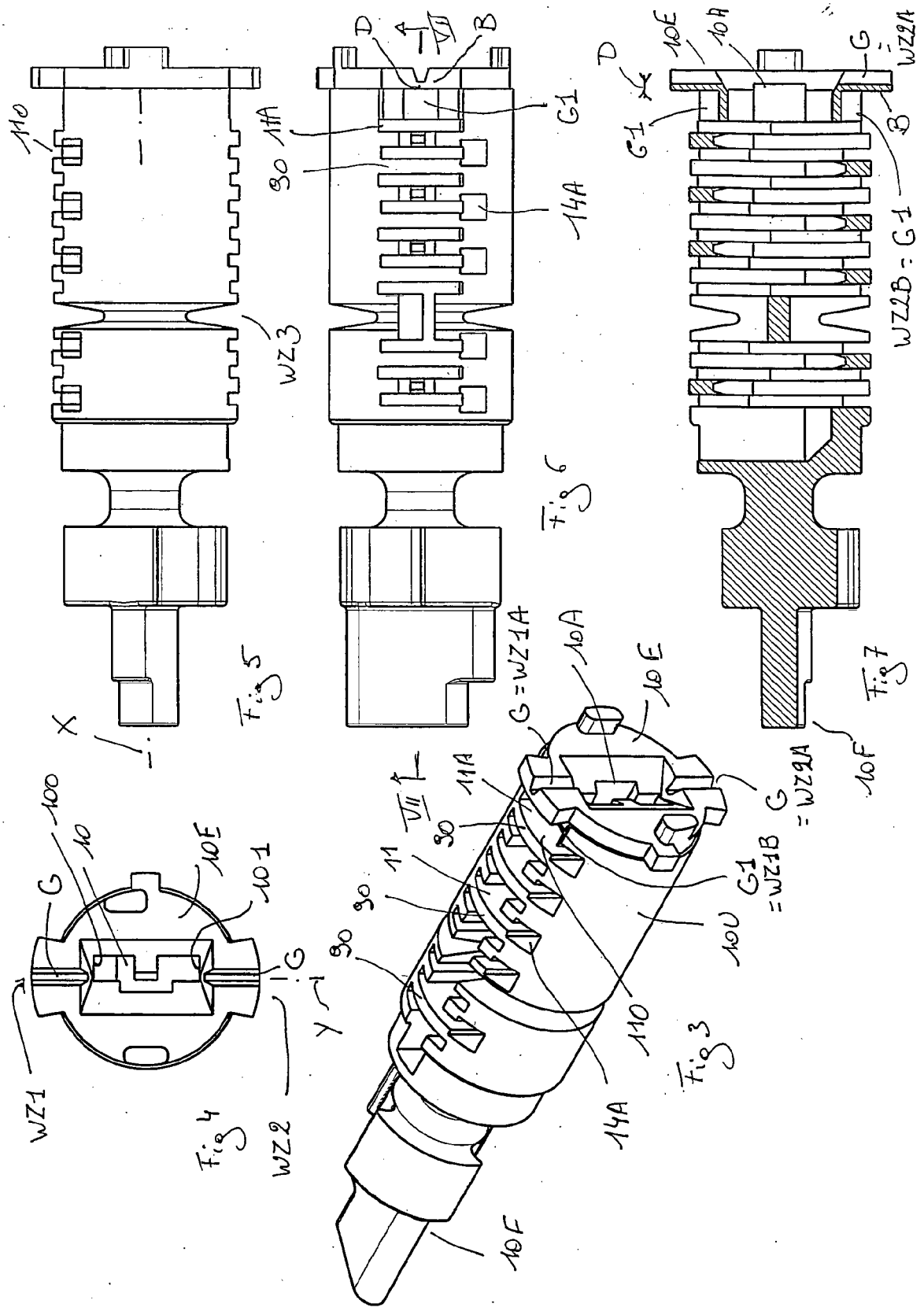
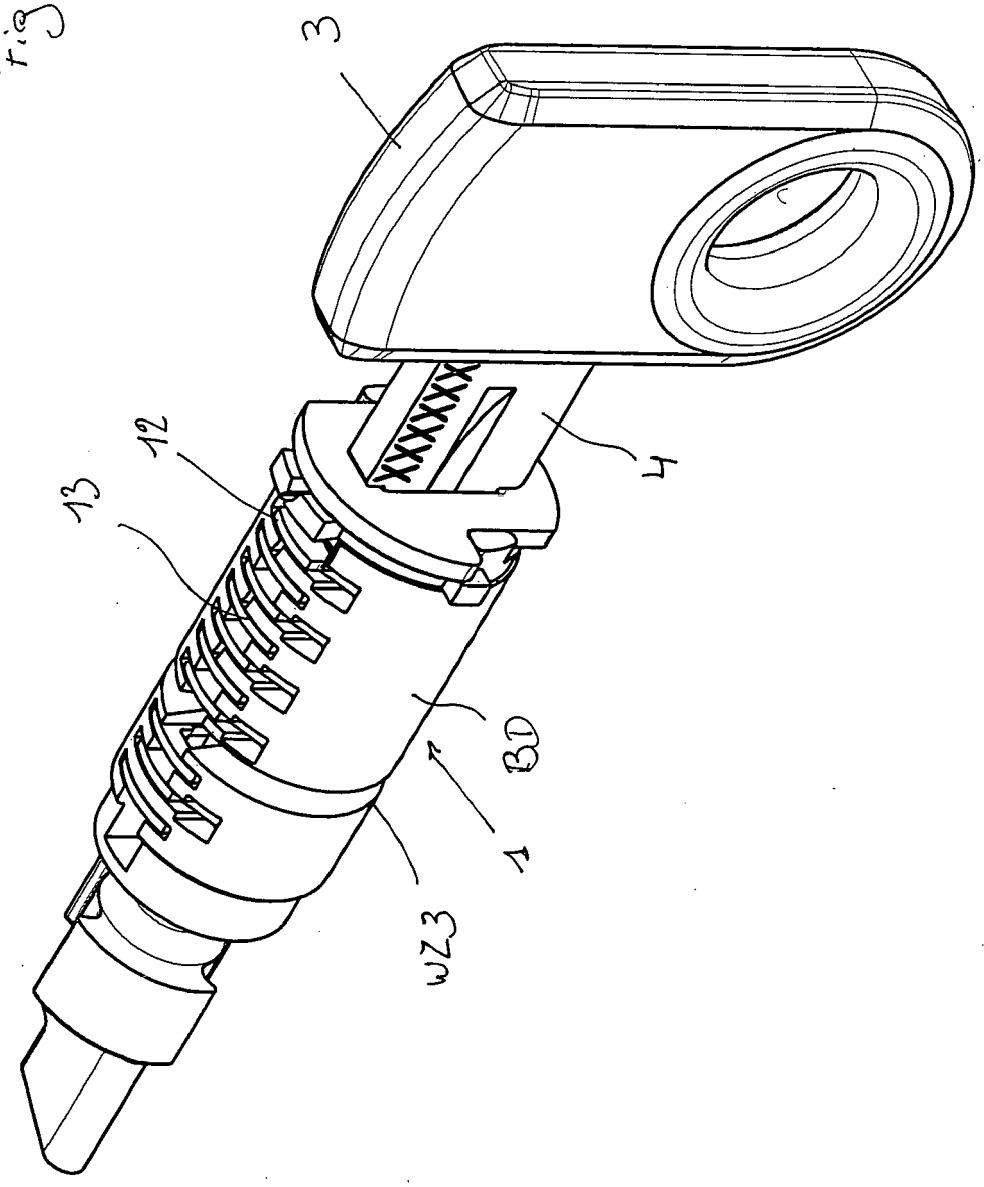

110
WZ3
Fig 5
30
11A
D
VII
B
G1
14A
Fig 6
10E
10A
G
WZ2A
WZ2B = G1
Fig 7
G = WZ1A
10A
10E
11A
VII
90
11
G1 = WZ1B
10D
110
14A
10F
Fig 3
100
10
10F
101
G
WZ1
WZ2
Fig 4
X
Y

Fig 8



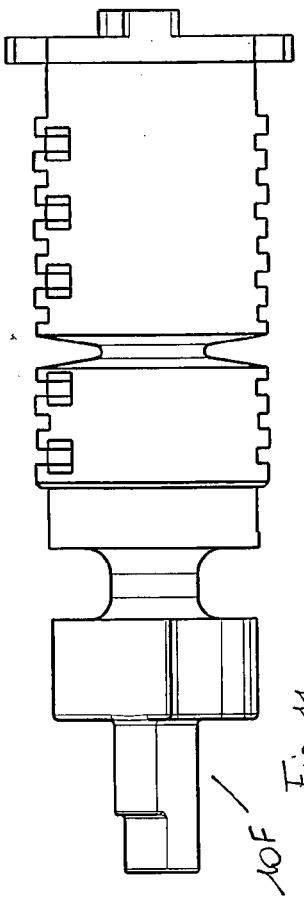


Fig 11

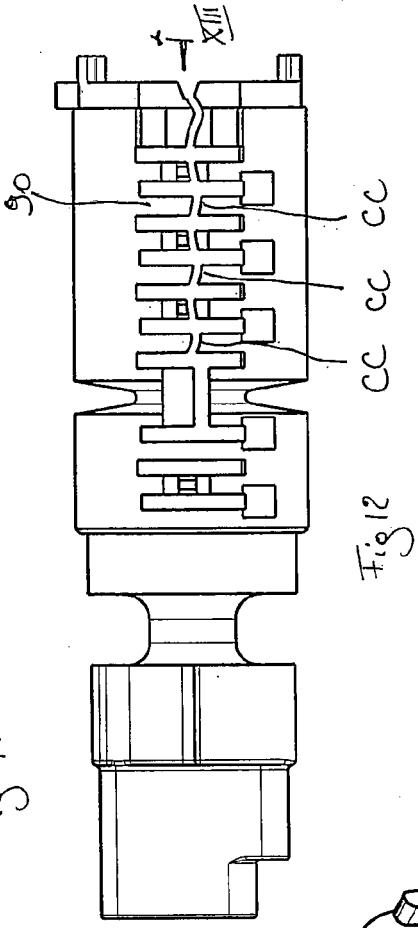


Fig 12

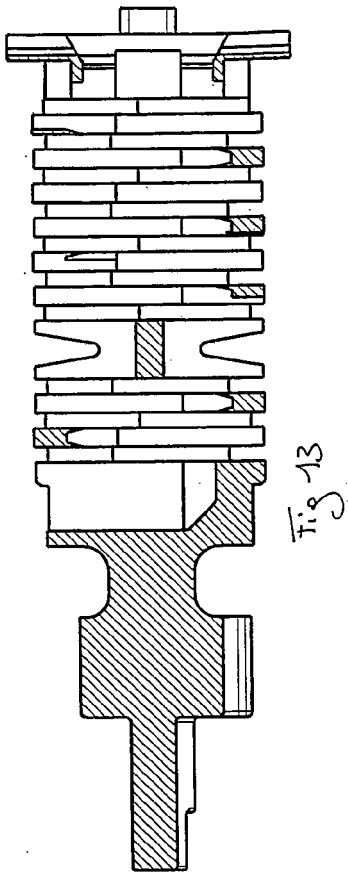


Fig 13

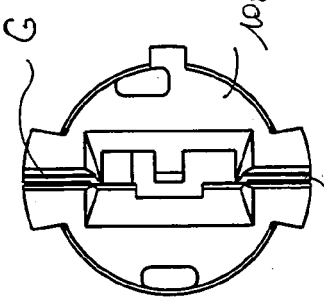


Fig 10

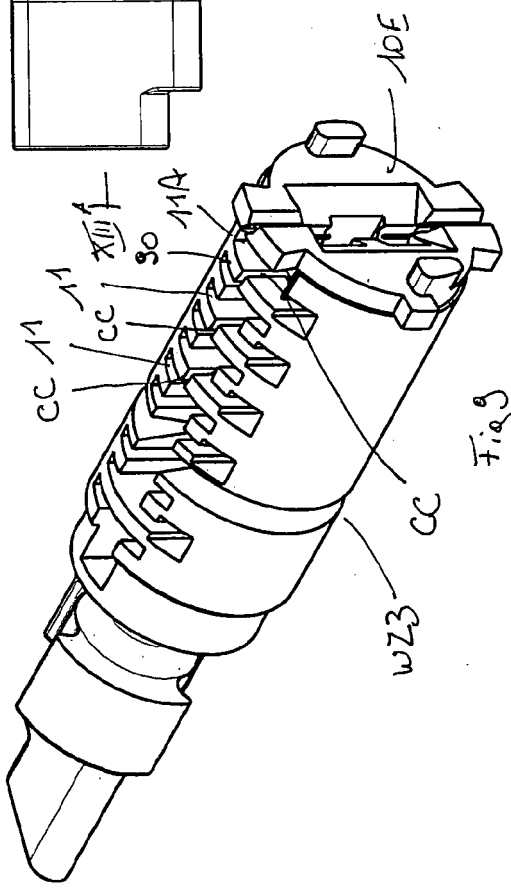


Fig 9

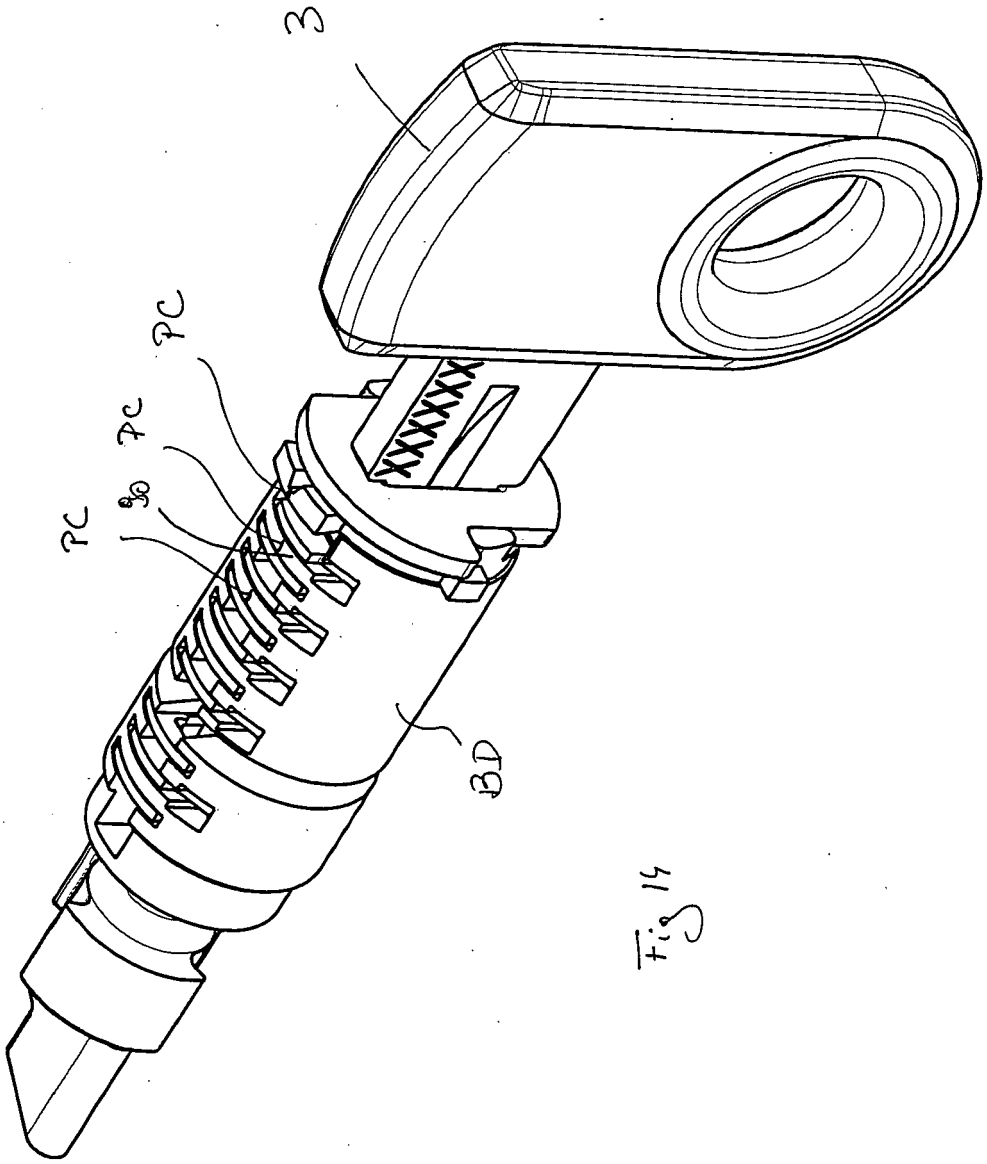
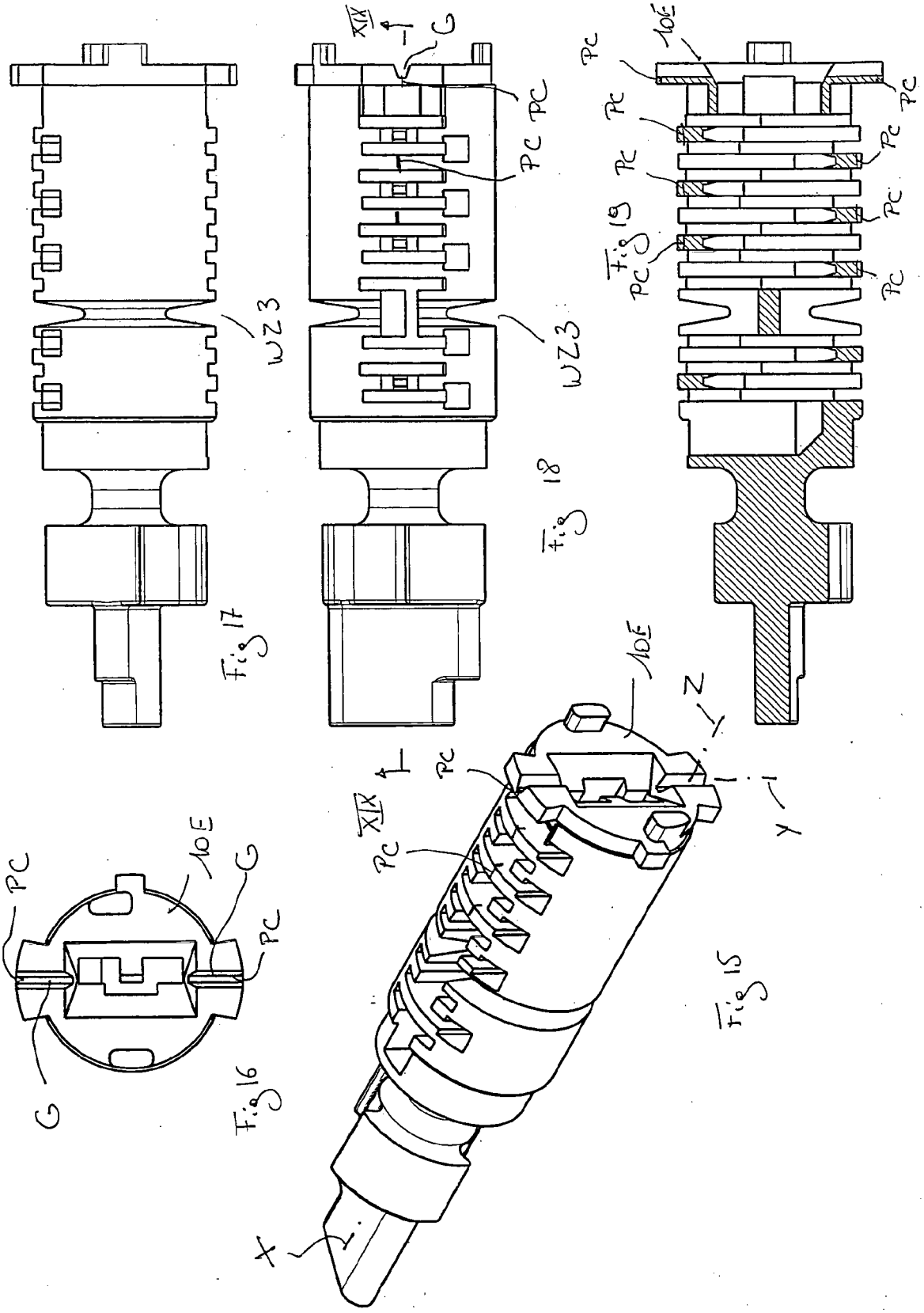


Fig 14


WZ3
Fig 17
XIX
G
PC
WZ3
Fig 18
PC
10E
Fig 19
PC
10E
G
PC
G
Fig 16
PC
XIX
10E
Z
Y
Y
X
Fig 15

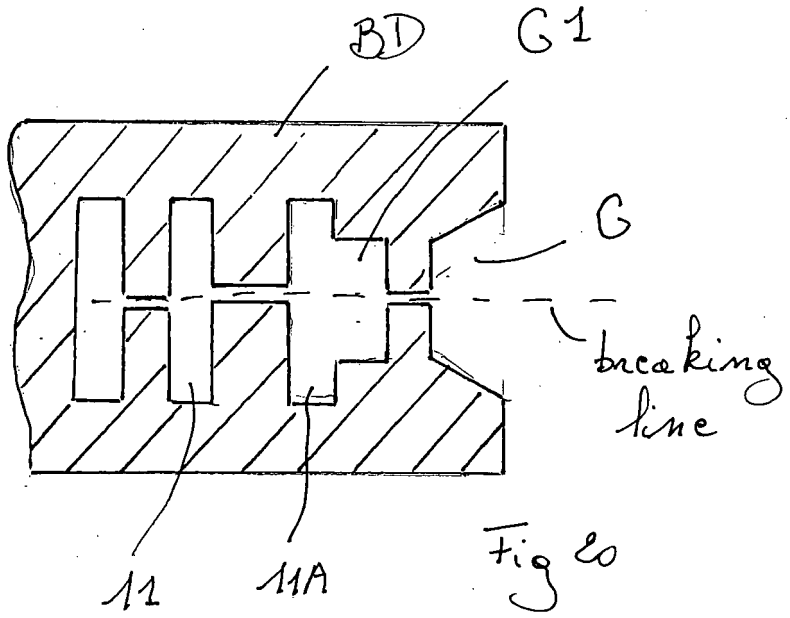


Fig 20

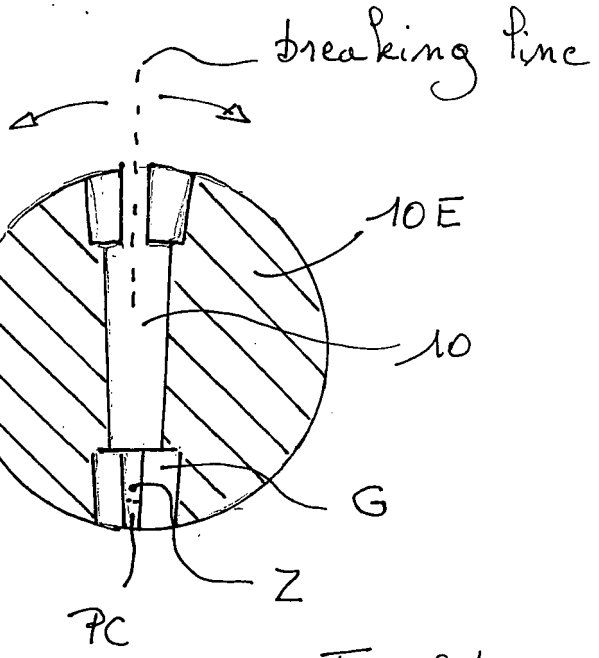


Fig 21

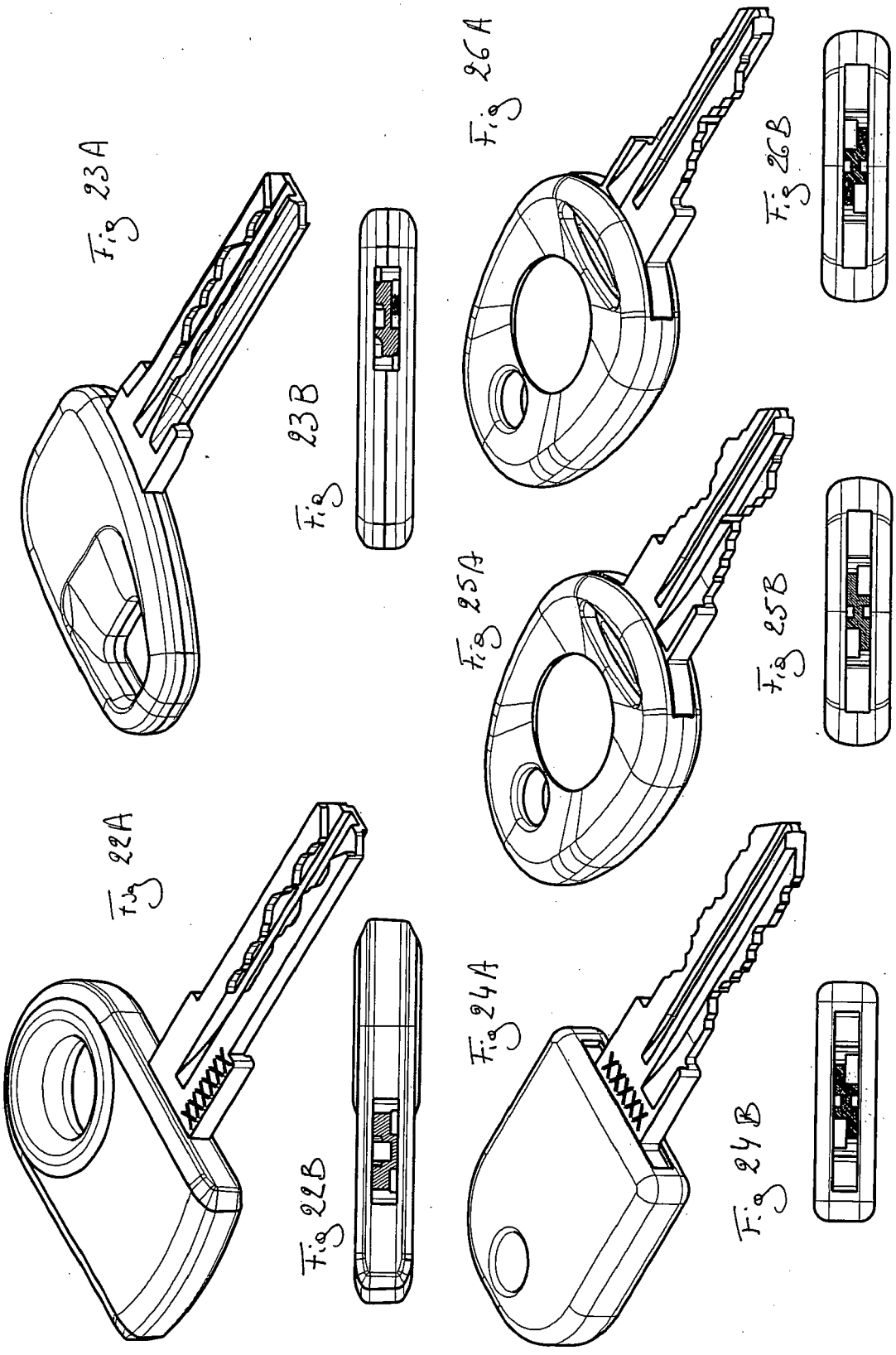


Fig 22A
Fig 22B
Fig 23A
Fig 23B
Fig 24A
Fig 24B
Fig 25A
Fig 25B
Fig 26A
Fig 26B

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EUROPEAN SEARCH REPORT

Application Number
EP 15 00 3003

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 March 2016	Geerts, Arnold

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30-03-2016

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