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(54) **HIGH-SECURITY LOCKING DEVICE**

(57) A high-security locking device comprising a lock and a flat key (1) and a flat key (1) in which the lock comprises a cylindrical rotor (2) presenting a slot (3) with rectangular section for the introduction of the flat key (1) and a stator (4) presenting a cylindrical housing (5) for the rotor (2), the lock comprising first and respectively at least second locking/unlocking means of the rotor (2) arranged on the opposite side of the slot (3), the first and respectively second locking/unlocking means comprising a first (14) and respectively a second (16) locking/unlocking member of rotor (2) and at least a first (15) and respectively at least a second (17a, 17b, 17c, 17d) slider housed in the rotor (2) that moves translatably in parallel to the long sides (3a) of the rectangular section of said slot (3), each slider (15, 17a, 17b, 17c, 17d) presenting a feeler member (18, 20a, 20b, 20c, 20d) of an encryption and a member (19, 21a, 21b, 21c, 21d) to enable the locking/unlocking of the rotor (2).

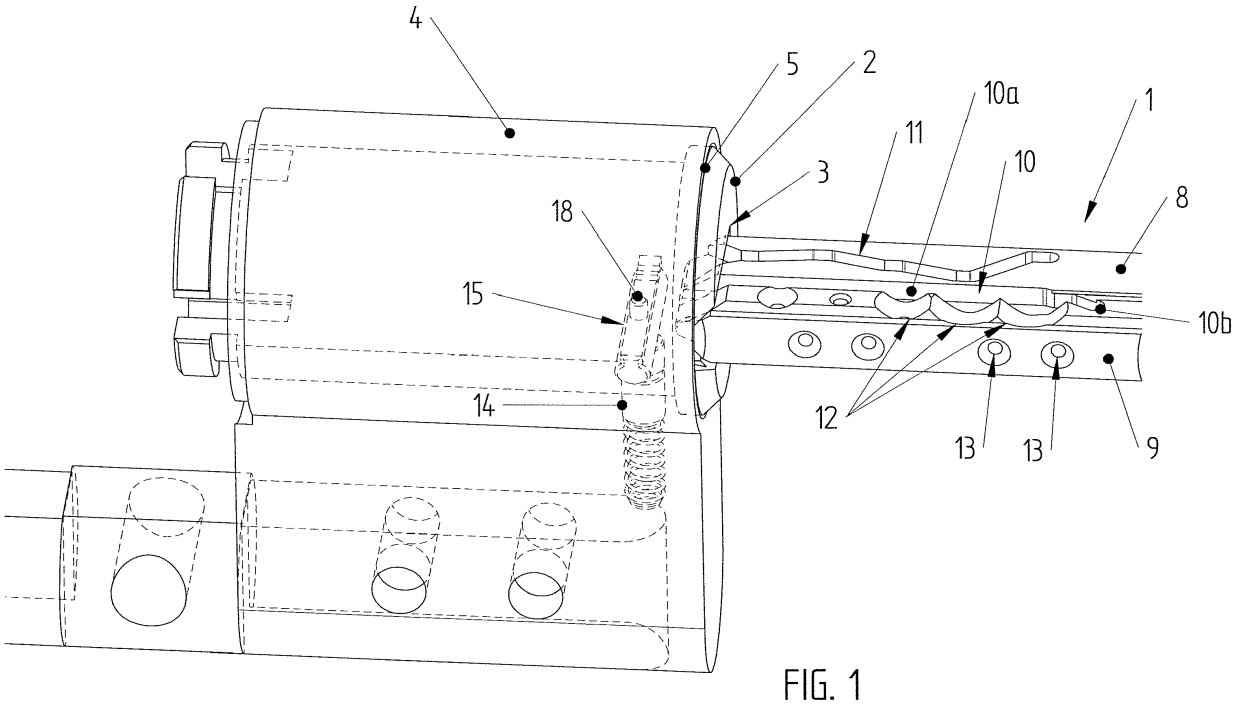

FIG. 1

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Description

[0001] The present invention relates to a high-security locking device comprising a barrel lock and a flat key.

[0002] At present locks comprise a stator provided with a cylindrical hole in which a rotor is rotatably inserted, which rotor has a slot for insertion of the key.

[0003] The stator and rotor have a plurality of transversal holes where, respectively, counter-pins and pins are housed and collaborate with the key to open and close the lock (standard or active lock). The key is provided with a mechanical encryption, defined by projections or recesses of the profile thereof.

[0004] In a particular example, the key has a mechanical encryption defined by a plurality of recesses realised on the flat part thereof, so that the pins, by inserting in the recesses, bring the lock into the open configuration or the closed configuration.

[0005] However the devices of traditional type have numerous drawbacks, mainly due to the fact that it is possible to realise blanks of the keys (i.e. the key without encryption) in a substantially simple way.

[0006] Thereafter, with the blanks available, it is possible to copy the key by creating the encryption thereon in a substantially simple way, using apparatus that are currently available on the market. Further, the locks and the keys of traditional type have a limited possible number of combinations.

[0007] Therefore, in order to increase the number of combinations possible, it is necessary to increase the number of pins (and therefore counter-pins and holes in the stator and the rotor) and consequently the number of recesses in the key, which significantly increases the complexity of the lock and the key itself.

[0008] Further, traditional locks can in some cases be brought into the open configuration even though the encryption of the key is not correct.

[0009] This occurs in particular when a passive-type lock is used.

[0010] A passive-type lock has a stator and rotor having the same structure as those used in locks of the active type, with the difference that the transversal holes of the stator do not contain counter-pins and are left empty.

[0011] Clearly a lock of this type is also opened when a key is inserted in the slot of the rotor that has deeper recesses with respect to the recesses of the correct key, due to the lack of the counter-pins which would prevent the rotation of the cylinder in this situation.

[0012] The technical task of the present invention is, therefore, to provide a high-security locking device which obviates the above-described technical drawbacks of the prior art.

[0013] In the context of this technical task an aim of the invention is to realise a high-security locking device in which the reproduction of the key is very difficult, thus limiting the risk that keys are duplicated illegally.

[0014] A further aim of the invention is to realise a high-security locking device in which the lock and the key have a very high number of possible combinations, without its being necessary to increase the number of the pins and, therefore, the complexity of the lock and the key.

[0015] A further aim of the present invention is to realise a high-security locking device in which the lock can be brought into the open configuration only when the encryption of the key is correct.

[0016] The technical task, as well as these and other aims, according to the present invention, are attained by realising a high-security locking device comprising a lock and a flat key, in which the flat key comprises a handle and a lance presenting a first encryption in the form of a first groove at its first main flat face and at least a second encryption in the form of a second groove at its second main flat face, and in which the lock comprises a cylindrical rotor presenting a slot with rectangular section for the introduction of said flat key and a stator presenting a cylindrical housing for said rotor, said lock comprising a first and respectively at least a second locking/unlocking means of the rotor arranged on the opposite side of said slot, characterised in that said first and respectively second locking/unlocking means comprises a first and respectively a second locking/unlocking member of the rotor and at least a first and respectively at least a second slider housed in the rotor that moves in parallel to the long sides of said rectangular section of said slot, each slider provided in said first and respectively second locking/unlocking means presenting a feeler member of said first and respectively second encryption and an enabling member to enable the locking/unlocking of the rotor.

[0017] In a preferred embodiment of the invention each slider presents a body which extends along a longitudinal axis oriented in the direction of translation of said slider.

[0018] In a preferred embodiment of the invention the feeler member is formed by a cylindrical protrusion of said body oriented at right angles to said axis.

[0019] In a preferred embodiment of the invention, said enabling member is formed by a recess on the surface of said body.

[0020] In a preferred embodiment of the invention said enabling member and said feeler member are arranged on diametrically opposite sides of said axis of said body.

[0021] In a preferred embodiment of the invention only one first slider is included.

[0022] In a preferred embodiment of the invention a plurality of second sliders is comprised, separate and independent of one another.

[0023] In a preferred embodiment of the invention, said rotor houses a moving member in contrast to said first locking/unlocking member that can be engaged with said enabling member.

[0024] In a preferred embodiment of the invention, said first locking/unlocking member is in the form of a pin extractably housed in said stator and mobile in contrast to and by action of an elastic member.

[0025] In a preferred embodiment of the invention, said second locking/unlocking member is in the form of a bar extractably housed along said rotor and mobile in con-

trast to and by action of one or more elastic members.

[0026] In a preferred embodiment of the invention said plurality of second sliders present between them a different distance in the direction of said axis between said enabling member and said feeler member.

[0027] In a preferred embodiment of the invention, said first groove is configured to enable locking/unlocking only when it reaches a final position of introduction of said lance into said slot.

[0028] A preferred embodiment of the invention comprises a third locking/unlocking means of the rotor comprising mobile pins of different length supported in the rotor and interacting with first alveoli of a third encryption of said lance of said key and with counter-pins slidable in the stator in contrast with and by action of springs.

[0029] A preferred embodiment of the invention includes fourth locking/unlocking means of the rotor comprising mobile pins of equal length supported in the stator and interacting with second alveoli of a fourth encryption of said lance of said key.

[0030] The present invention further relates to a flat reversible key for a high-security lock presenting a lance and a handle, characterised in that said lance presents a first encryption in the form of a first groove at two of its main flat faces, a second encryption in the form of a second groove at two said main flat faces, a third encryption comprising a series of first alveoli with different depth at the two main flat faces, and a fourth encryption comprising a series of second alveoli with equal depth at two secondary faces of said lance, said first groove having a first straight section which extends along the axis of said lance towards said handle from the free end of said lance and a second section which extends obliquely towards said handle from said first section, said second groove extending from the free end of said lance towards said handle along a broken line that does not exceed said first section of said first groove in the direction of the axis of said lance, said first and second alveoli being arranged in succession towards said handle along respective lines parallel to the axis of said lance, in which said succession does not exceed said first section of said first groove in the direction of the axis of said lance.

[0031] Further characteristics and advantages of the invention will more fully emerge from the description of a preferred but not exclusive embodiment of the high-security barrel lock according to the invention, where the lock and the flat reversible key are illustrated by way of non-limiting example in the accompanying drawings, in which:

figure 1 is an axonometric view of the lock according to the invention with only the first locking/unlocking means in evidence;

figure 2 shows a section of the lock highlighting only the first locking/unlocking means in the unlocked configuration with the key completely inserted;

figure 3 shows a section of the lock highlighting only the first locking/unlocking means in the unlocked configuration with the key partly inserted;

figure 4 is an axonometric view of the lock according to the invention with only the second locking/unlocking means in the unlocked configuration with the key completely inserted (for the sake of clarity the key is only partly illustrated);

figure 5 is an axonometric view of the lock according to the invention with only the second locking/unlocking means illustrated in the locked configuration with the key partly-inserted;

figure 6 shows a section of the lock highlighting only the second locking/unlocking means in the unlocked configuration with the key completely inserted;

figure 7 shows a section of the lock highlighting only the second locking/unlocking means in the unlocked configuration with the key partly inserted;

figure 8 illustrates a plan view of the key of the invention;

figure 9 shows a side view of the key according to the invention;

figure 10 shows a section of the key along line E-E of figure 8; and

figure 11 shows a section of the key along line F-F of figure 8.

[0032] With reference to the mentioned figures, a high-security locking device comprising a lock and a key 1 is illustrated.

[0033] The lock comprises a cylindrical rotor 2 presenting a slot 3 with rectangular section for the introduction of the flat key 1 and a stator 4 presenting a cylindrical housing 5 in which the rotor 2 is coaxially positioned rotatably about the axis thereof.

[0034] The key 1 is advantageously a flat reversible key comprising a handle 6 and a lance 7 having a series of encryptions.

[0035] The lance 7 of the key 1 has a first pair of opposite main flat faces 8 and a second pair of opposite secondary faces 9.

[0036] A first encryption is present on each main flat face 8 of the lance 7 of the key 1, which first encryption comprises a first groove 10 and at least a second encryption which comprises a second groove 11.

[0037] A third encryption is also present on each main flat face 8 of the lance 7 of the key 1, which third encryption comprises a series of first alveoli 12 having different depths.

[0038] Lastly, a fourth encryption is also present on each secondary face 9 of the lance 7 of the key 1, which fourth encryption comprises a series of second alveoli 13 having the same depth.

[0039] In use, with reference to the solution illustrated in the drawings, the first encryption of the lower main flat face 8 of the lance 7 of the key 1, the second encryption of the upper main flat face 8 of the lance 7 of the key 1, the third encryption of the lower main flat face 8 of the lance 7 of the key 1, and the fourth encryption of the secondary face of the lance 7 of the key 1 exposed to

the stator 4 will be operative.

[0040] The first groove 10 has a first straight section 10a which originates from the free end of the lance 7 towards the handle 6 along the axis of the lance 7 and a second section 10b which extends obliquely from the first section 10a towards the handle 6.

[0041] The bottom wall of the first groove 10 is flat and parallel to the main flat face 8 of the lance 7 of the key 1.

[0042] The second groove 11 originates from the free end of the lance 7 towards the handle 6 along a broken line having a series of sections with a change of direction.

[0043] The bottom wall of the second groove 11 is flat and parallel to the main flat face 8 of the lance 7 of the key 1.

[0044] The second groove 11 is positioned laterally to the first groove 10 and extends towards the handle 6 not beyond the terminal end of the first section 10a of the first groove 10.

[0045] The first alveoli 12 are aligned in succession along a line that is parallel to the first section 10a of the first groove 10 and are positioned with respect to the second groove 11 on the opposite side to the first groove 10.

[0046] The first alveoli 12 are also positioned laterally along the lance 7 of the key 1 not beyond the terminal end of the first section 10a of the first groove 10.

[0047] The second alveoli 13 are aligned in succession along a line that is parallel to the axis of the lance 7 of the key 1.

[0048] The second alveoli 13 are also positioned laterally along the lance 7 of the key 1 not beyond the terminal end of the first section 10a of the first groove 10.

[0049] The lock comprises first and at least second locking/unlocking means of the rotor 2 arranged on opposite sides of said slot 3.

[0050] In the illustrated preferred embodiment there are also third and fourth locking/unlocking means of the rotor 2.

[0051] The first locking/unlocking means comprises a first locking/unlocking member 14 of the rotor 2 and at least a first slider 15 housed in the rotor 2 translatably parallel to the long sides 3a of the rectangular section of the slot 3.

[0052] In the illustrated preferred embodiment only one first slider 15 is included.

[0053] The second locking/unlocking means comprises a first locking/unlocking member 16 of the rotor 2 and at least a second slider 17a, 17b, 17c, 17d housed in the rotor 2 translatably parallel to the long sides 3a of the rectangular section of the slot 3.

[0054] In the illustrated preferred embodiment a plurality of second sliders 17a, 17b, 17c, 17d is comprised, separate from one another and independent, arranged in succession in a parallel direction to the axis of the rotor 2.

[0055] The first slider 15 has a feeler member 18 of the first encryption 10 and an enabling member 19 of the locking/unlocking of the rotor 2.

[0056] Each second slider 17a, 17b, 17c, 17d has a feeler member 20a, 20b, 20c, 20d of the second encryption 11 and an enabling member 21a, 21b, 21c, 21d of the locking/unlocking of the rotor 2.

[0057] The first slider 15 presents a body 22 which extends along a longitudinal axis oriented in the translation direction thereof.

[0058] In the first slider 15 the feeler member 18 and the enabling member 19 are arranged on diametrically opposite sides with respect to the axis of the longitudinal body 22.

[0059] In the first slider 15 the feeler member 18 is formed by a cylindrical protrusion of the longitudinal body 22 orientated perpendicularly to the axis of the longitudinal body 22, while the enabling member 19 is formed by a surface recess of the longitudinal body 22 having a truncoconical shape.

[0060] In particular the feeler member 18 extends from a flat surface of the longitudinal body 22 arranged parallel to the main flat face of the slot 3.

[0061] The enabling member 19 is instead positioned at a cylindrical surface of the longitudinal body 22.

[0062] The first locking/unlocking member 14 is in the form of a pin having a truncoconical head extractably housed in the stator 4 and mobile in contrast to an elastic member 27 and by action thereof.

[0063] The first locking/unlocking member 14 is in particular housed in a guide channel 28 which extends on the extension of a diameter of the rotor 2 and opens on the surface of the cylindrical housing 5 of the rotor 2.

[0064] The elastic member 27 is in particular a helical spring positioned between the blind bottom of the guide channel 28 and the first locking/unlocking member 14.

[0065] The rotor 2 further houses a moving member 24 in contrast to the first locking/unlocking member 14 that can be engaged with said enabling member 19.

[0066] The contrasting member 24 is housed in a guide channel 25 which extends along a diameter of the rotor 2.

[0067] The guide channel 25 of the contrasting member 24 opens on one side on the guide channel 26 of the first slider 15 and on the other side on the surface of the cylindrical housing 5 of the rotor 2. Each second slider 17a, 17b, 17c, 17d presents a body 23a, 23b, 23c, 23d which extends along a longitudinal axis oriented in the translation direction of movement of the slider.

[0068] In each second slider 17a, 17b, 17c, 17d the feeler member 20a, 20b, 20c, 20d and the enabling member 21a, 21b, 21c, 21d are arranged on diametrically opposite sides with respect to the axis of the longitudinal body 23a, 23b, 23c, 23d.

[0069] In each second slider 17a, 17b, 17c, 17d the feeler member 20a, 20b, 20c, 20d is formed by a cylindrical protrusion of the longitudinal body 23a, 23b, 23c, 23d orientated perpendicularly to the axis of the longitudinal body 23a, 23b, 23c, 23d, while the enabling member 21a, 21b, 21c, 21d is formed by a recess on the surface of the longitudinal body 22, 23a, 23b, 23c, 23d.

[0070] In particular the feeler member 20a, 20b, 20c,

20d extends from a flat surface of the longitudinal body 23a, 23b, 23c, 23d arranged parallel to the main flat face of the slot 3.

[0071] The enabling member 21a, 21b, 21c, 21d is instead positioned at a cylindrical surface of the longitudinal body 23a, 23b, 23c, 23d.

[0072] The second locking/unlocking member 16 is in the form of a bar extractably housed in a guide channel 29 of the rotor 2 and engageable, with a tapered first longitudinal edge thereof, in a tapered first longitudinal groove 33 fashioned along an axial generatrix of the surface of the cylindrical housing 5 of the rotor 2.

[0073] The second longitudinal edge of the bar has gaps in material 32 at the engaging zones with the second sliders 17a, 17b, 17c, 17d.

[0074] The guide channel 29 of the second locking/unlocking member 16 extends in a diametric plane of the rotor 2 and opens on one side on the surface of the cylindrical housing 5 and on the other side on the guide channel 30a, 30b, 30c, 30d of each second slider 17a, 17b, 17c, 17d.

[0075] The second locking/unlocking member 16 is mobile in contrast to one or more elastic members 31 advantageously housed in the rotor 2.

[0076] The second sliders 17a, 17b, 17c, 17d diversify from one another due to the distance existing, in the direction of the axis of the longitudinal body 23a, 23b, 23c, 23d thereof, between the enabling member 21a, 21b, 21c, 21d and the feeler member 20a, 20b, 20c, 20d.

[0077] The locking device also comprises thirst and fourth locking/unlocking means (not illustrated) of the rotor 2 of a known type which will for this reason not be described in detail.

[0078] Briefly, the third locking/unlocking means comprises mobile pins of different length radially mobile in the cylindrical rotor 2 and able to interact at a first end thereof with the first alveoli 12 and at an opposite second end thereof with sliding counter-pins that are slidable in the stator 4 in contrast to and by action of springs.

[0079] The fourth locking/unlocking means instead comprises pins of different length radially mobile in the rotor 2 and able to interact at a first end thereof with the second alveoli 13 and at an opposite second end thereof with special internal grooves (visible in figures 2 and 3 at 90° from the groove 33) of the stator 4.

[0080] The operation of the locking device is briefly as follows.

[0081] With the key 1 extracted the locking device has the following configuration.

[0082] The first slider 15 is in the position illustrated in figure 3 in which the contrasting moving member 24 is aligned to the enabling member 19 and, by effect of the elastic member 27, the contrasting member 24 remains engaged with the enabling member 19 and the first locking/unlocking member 14 remains protracted in the guide channel 25 of the contrasting moving member 24 in the locked position of the rotor 2.

[0083] The second sliders 17a, 17b, 17c, 17d are in the position illustrated in figures 5 and 7 in which the enabling members 21a, 21b, 21c, 21d are dealigned from the second locking/unlocking member 16 which by the action of the elastic members 31 remains protracted in the groove 33 of the stator 4 in the locked position of the rotor 2. In this position of the second sliders 17a, 17b, 17c, 17d the extraction of the second locking/unlocking member 16 from the groove 33 would be prevented by the friction coupling with the cylindrical surface of the longitudinal body of the second sliders 17a, 17b, 17c, 17d.

[0084] When the lance 7 of the key 1 is inserted in the slot 3 the first slider 15, by effect of the interaction of the first feeler member 18 with the first encryption 10, displaces towards the position illustrated in figure 2, in which the contrasting member 24 is dealigned from the enabling member 19. The contrasting member 24, by effect of the disengaging from the enabling member 19, is subjected to a centrifugal radial movement in the guide channel 25 thereof and consequently it also displaces the first locking/unlocking member 14 with which it is in contact up to being arranged completely externally of the guide channel 25 in the unlocked position of the rotor 2. At the same time the second sliders 17a, 17b, 17c, 17d, by effect of the interaction of the second feeler members 20a, 20b, 20c, 20d with the second encryption 11, displace towards the position illustrated in figure 4 or 6, in which the enabling members 21a, 21b, 21c, 21d are aligned with the locking/unlocking member 16. In this position of the second sliders 17a, 17b, 17c, 17d the extracting movement of the second locking/unlocking member 16 from the groove 33 is no longer prevented as it can find place in the recesses defined by the enabling members 21a, 21b, 21c, 21d.

[0085] At this point, when the key 1 starts rotating, the rotor 2, the first locking/unlocking member 14 is already in unlocked position while the second locking/unlocking member 16, initially in the locked position, progressively extracts from the groove 33 in opposition to the action of the elastic members 31 up to reaching the unlocked position in which it is completely extracted from the groove 33 and engaged with the enabling members 21a, 21b, 21c, 21d.

[0086] The third and fourth locking/unlocking means operate in a known way which will therefore not be described in detail.

[0087] Briefly, with the lance of the key completely inserted in the slot, the alveoli 13, 14 align with corresponding pins and the pins can thus protract into the alveoli 13, 14 so as to free the rotation of the rotor 2. When a wrong key is inserted in the slot, or when the right key is not completely inserted in the slot, the alveoli 13, 14 are dealigned from the corresponding pins: in the case of the third locking/unlocking means the counter-pins and in the case of the fourth locking/unlocking means the pins remain wedged between the stator 4 and the rotor 2, not enabling rotation of the rotor 2.

[0088] The first groove 10 is advantageously config-

ured for enabling the unlocking of the rotor 2 only on achieving full introduction position of the lance 7 of the key 1 in the slot 3, when the feeler member 18 moves to the terminal end of the second section 10b of the first groove 10.

[0089] The locking device has a high number of encryptions with locking/unlocking systems that are independent of one another and different by nature, so as to increase security.

[0090] The invention is also useful for obstructing unauthorised duplication of the key, in view of the fact that partly-encrypted blank keys are available on the market. The producer can provide an authorised duplicator with an already-encrypted blank key, in particular the first and third encryption, to which the installer will have to add another two encryptions, in particular the second and fourth encryption.

[0091] The number of encryptions present on the key provide the installer with a high number of combinations for customising the finished key.

[0092] The high-security locking device as conceived herein is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept; furthermore, all the details are replaceable by technically equivalent elements.

[0093] In practice the materials used, as well as the dimensions, can be any according to the needs and the state of the art.

Claims

1. A high-security locking device comprising a lock and a reversible flat key (1), in which the reversible flat key (1) comprises a handle (6) and a lance (7) presenting at each of its two main flat faces (8) a first encryption in the form of a first groove (10), a second encryption in the form of a second groove (11), and a third encryption comprising a series of first alveoli (12) with different depth, said lance (7) further presenting at each of its two secondary faces (9) a fourth encryption comprising a series of second alveoli (13) with equal depth, said first groove (10) having a first straight section (10a) which extends along the axis of said lance (7) towards said handle (6) from the free end of said lance (7) and a second section (10b) which extends obliquely towards said handle (6) from said first section (10a), said second groove (11) extending from the free end of said lance (7) towards said handle (6) along a broken line that does not exceed said first section (10a) of said first groove (10) in the direction of the axis of said lance (7), said first and second alveoli (12, 13) being arranged in succession towards said handle (6) along respective lines parallel to the axis of said lance (7), in which said succession does not exceed in the direction of the axis of said lance (7) said first section (10a) of said first groove (10), and in which the lock comprises a cylindrical rotor (2) presenting a slot (3) with rectangular section for the introduction of said reversible flat key (1) and a stator (4) presenting a cylindrical housing (5) for said rotor (2), said lock comprising a first and respectively at least second locking/unlocking means of rotor (2) arranged on the opposite side of said slot (3), said first and respectively second locking/unlocking means comprising one single first (14) and respectively one single second (16) locking/unlocking member of rotor (2) and one single first (15) and respectively a plurality of second (17a, 17b, 17c, 17d) sliders housed in said rotor (2) on the opposite side of said slot (3) and movable in parallel to the long sides (3a) of said rectangular section of said slot (3), each slider (15, 17a, 17b, 17c, 17d) provided in said first and respectively second locking/unlocking means presenting a feeler member (18, 20a, 20b, 20c, 20d) of said first and respectively second encryption and a member (19, 21a, 21b, 21c, 21d) to enable the locking/unlocking of rotor (2).

2. The high-security locking device according to claim 1, **characterised in that** each slider (15, 17a, 17b, 17c, 17d) presents a body (22, 23a, 23b, 23c, 23d) which extends along a longitudinal axis oriented in the direction of movement of said slider (15, 17a, 17b, 17c, 17d).

3. The high-security locking device according to claim 2, **characterised in that** said feeler member (18, 20a, 20b, 20c, 20d) is formed by a cylindrical protrusion of said body (22, 23a, 23b, 23c, 23d) oriented at right angles to said axis.

4. The high-security locking device according to any of claims 2 and 3, **characterised in that** said enabling member (19, 21a, 21b, 21c, 21d) is formed by a recess on the surface of said body (22, 23a, 23b, 23c, 23d).

5. The high-security locking device according to any of claims 2 to 4, **characterised in that** said enabling member (19, 21a, 21b, 21c, 21d) and said feeler member (18, 20a, 20b, 20c, 20d) are arranged on the diametrically opposite side of said axis of said body (22, 23a, 23b, 23c, 23d).

6. The high-security locking device according to any of the preceding claims, **characterised in that** said rotor (2) houses a moving member (24) in contrast to said first locking/unlocking member (14) that can be engaged with said enabling member (19).

7. The high-security locking device according to any of the preceding claims, **characterised in that** said first locking/unlocking member (14) is in the form of a pin extractably housed in said stator (4) and mobile in contrast to an elastic member (27) and by action

thereof.

8. The high-security locking device according to any of the preceding claims, **characterised in that** said second locking/unlocking member (16) is in the form of a bar extractably housed in said rotor (2) and mobile in contrast to one or more elastic members (31) and by action thereof.

9. The high-security locking device according to any of claims 5 to 8, **characterised in that** said second sliders (17a, 17b, 17c, 17d) present between them a different distance in direction of said axis between said enabling member (21a, 21b, 21c, 21d) and said feeler member (20a, 20b, 20c, 20d).

10. The high-security locking device according to any of the preceding claims, **characterised in that** said first groove (10) is configured to enable unlocking only when it reaches a final position of introduction of said lance (7) in said slot (3).

11. The high-security locking device according to any of the preceding claims, **characterised in that** it presents a third locking/unlocking means of rotor (2) comprising mobile pins of different length supported in the rotor (2) and interacting with said first alveoli (12) of said third encryption of said lance (7) of said key (1) and against which are sliding pins in the stator (4) in contrast to springs and by action thereof.

12. The high-security locking device according to the preceding claims, **characterised in that** it presents a fourth locking/unlocking means of rotor (2) comprising mobile pins of equal length supported in the stator (2) and interacting with said second alveoli (13) of said fourth encryption of said lance (7) of said key (1).

13. A flat reversible key (1) for high-security lock presenting a lance (7) and a handle (6), **characterised in that** said lance (7) presents a first encryption in the form of a first groove (10) at two of its main flat faces (8), a second encryption in the form of a second groove (11) at said two main flat faces (8), a third encryption comprising a series of first alveoli (12) with different depth at said two flat faces (8), and a fourth encryption comprising a series of second alveoli (13) with equal depth at two secondary faces (9) of said lance (7), said first groove (10) having a first straight section (10a) which extends along the axis of said lance (7) towards said handle (6) from the free end of said lance (7) and a second section (10b) which extends obliquely towards said handle (6) from said first section (10a), said second groove (11) extending from the free end of said lance (7) towards said handle (6) along a broken line that does not exceed said first section (10a) of said first groove (10) in the direction of the axis of said lance (7), said first and second alveoli being arranged in succession towards said handle (6) along respective lines parallel to the axis of said lance (7), in which said succession does not exceed in the direction of the axis of said lance (7) said first section (10a) of said first groove (10).

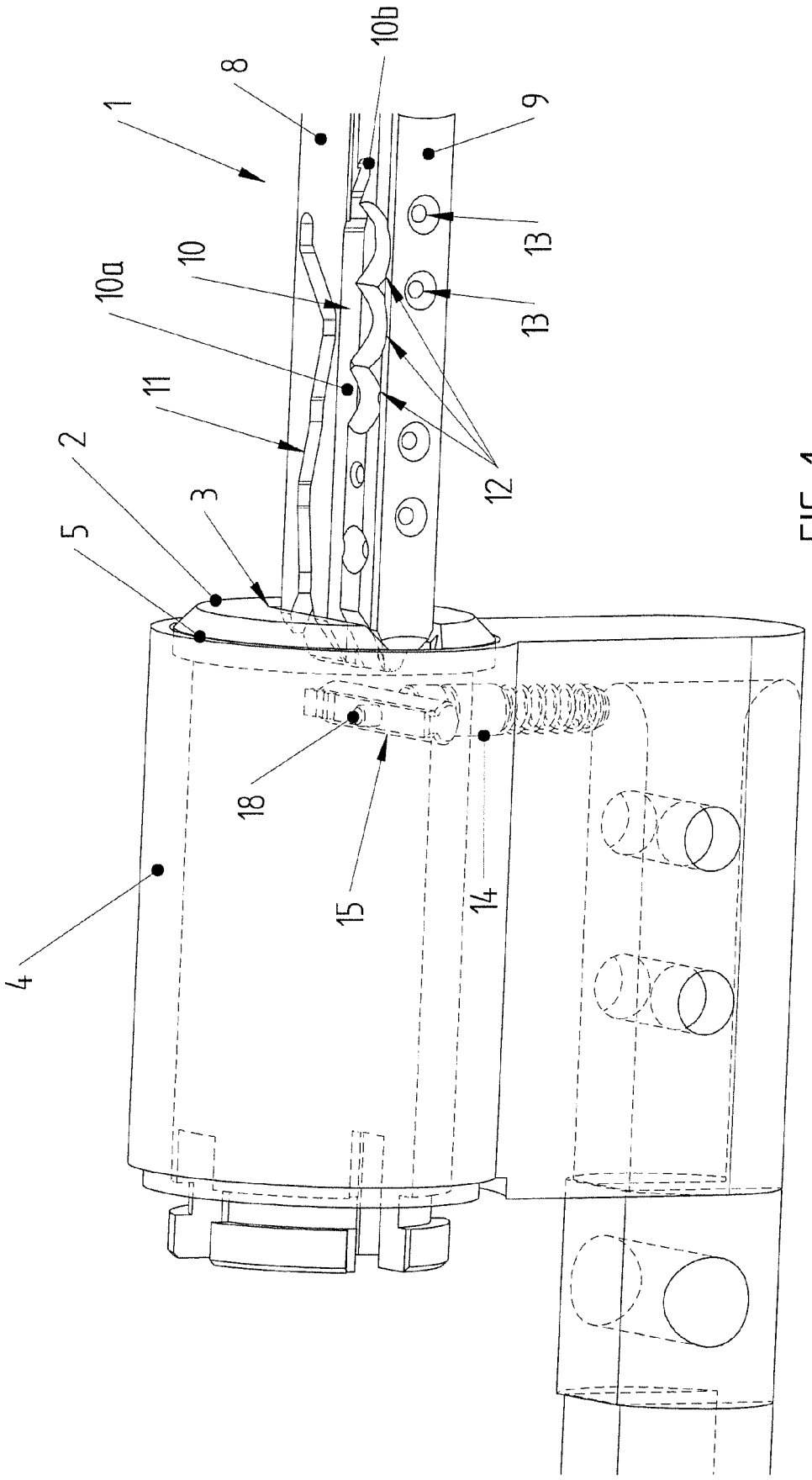
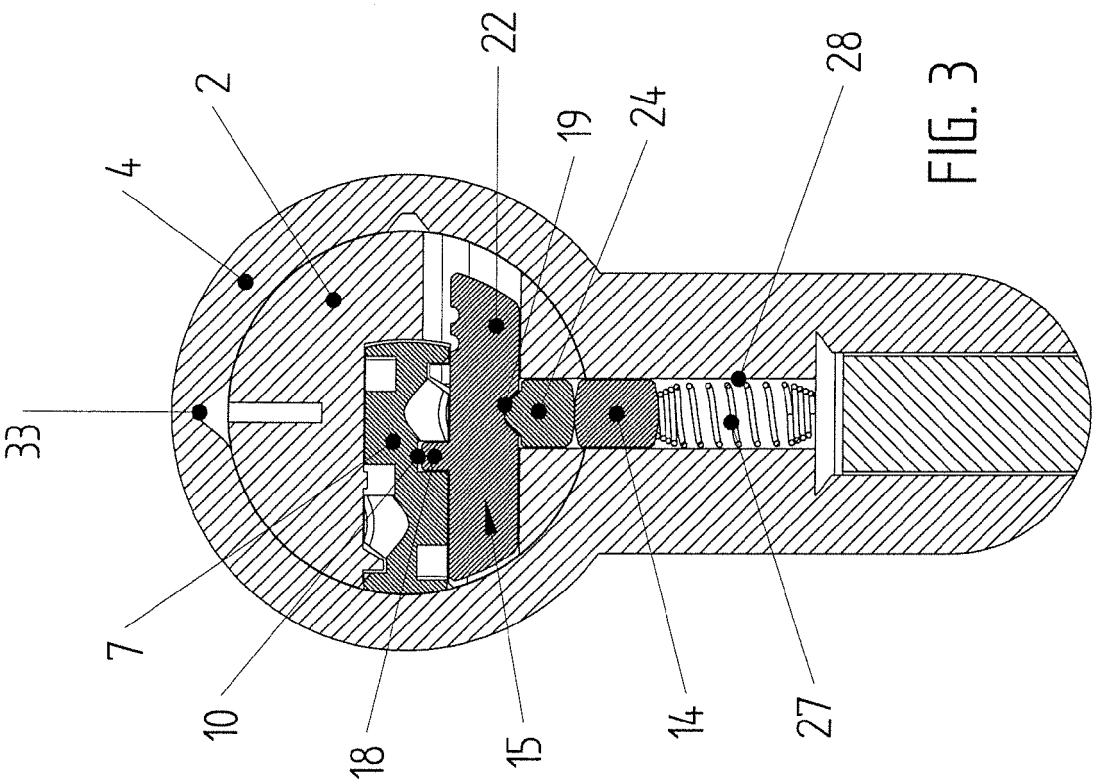


FIG. 1


22
2
19
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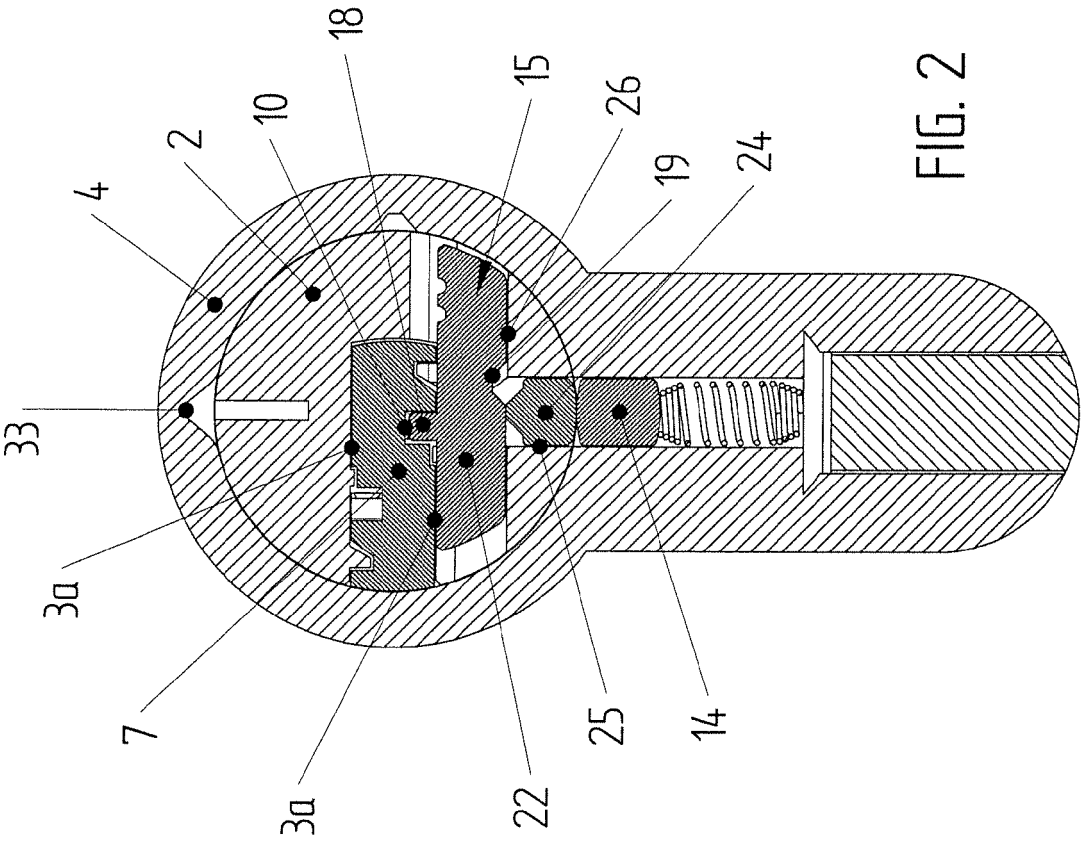
28
4
33
7
10
18
15
14
27

FIG. 3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26
10
2
19
24
4
33
3a
7
3a
22
25
14

FIG. 2

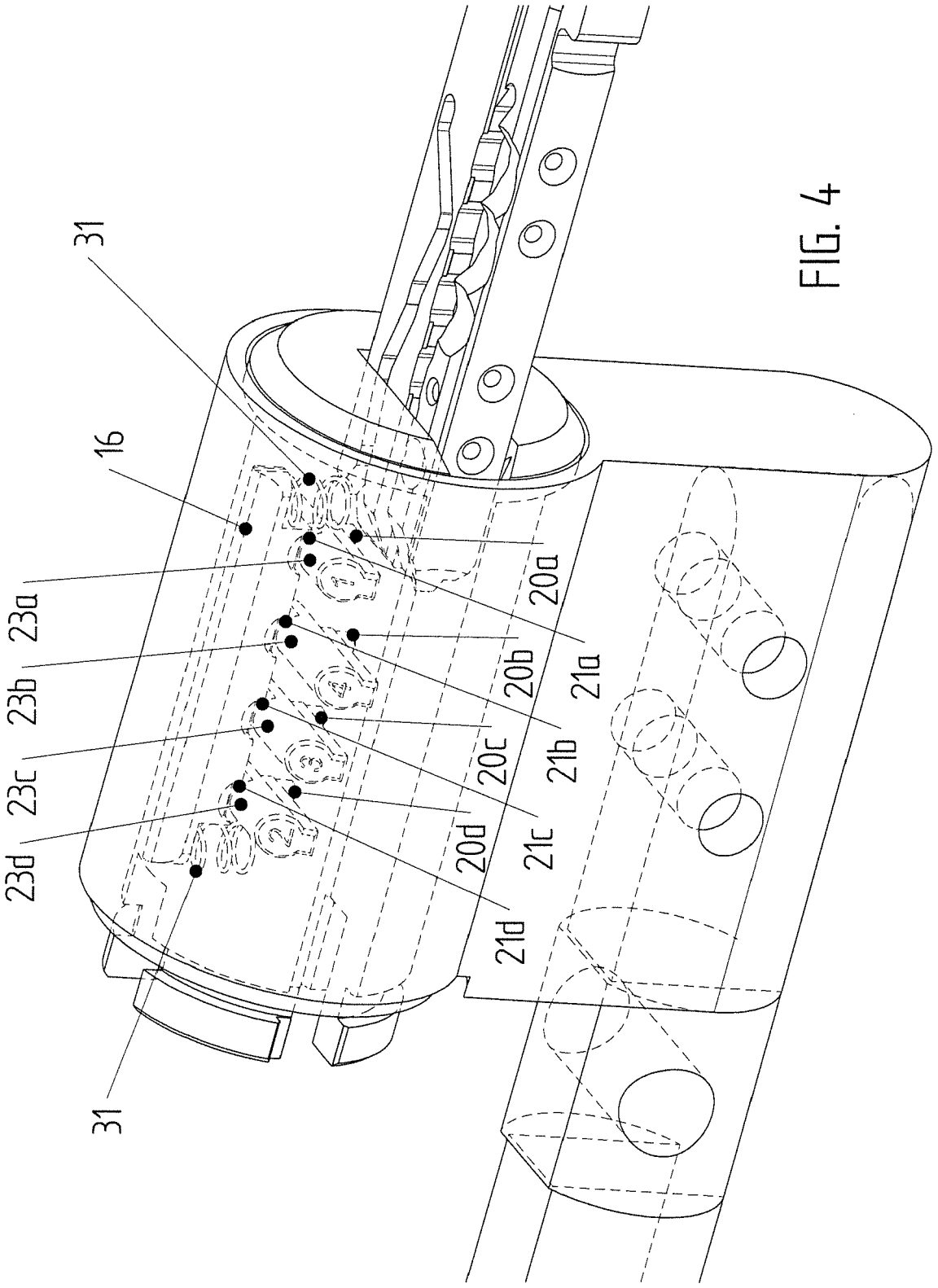

FIG. 4

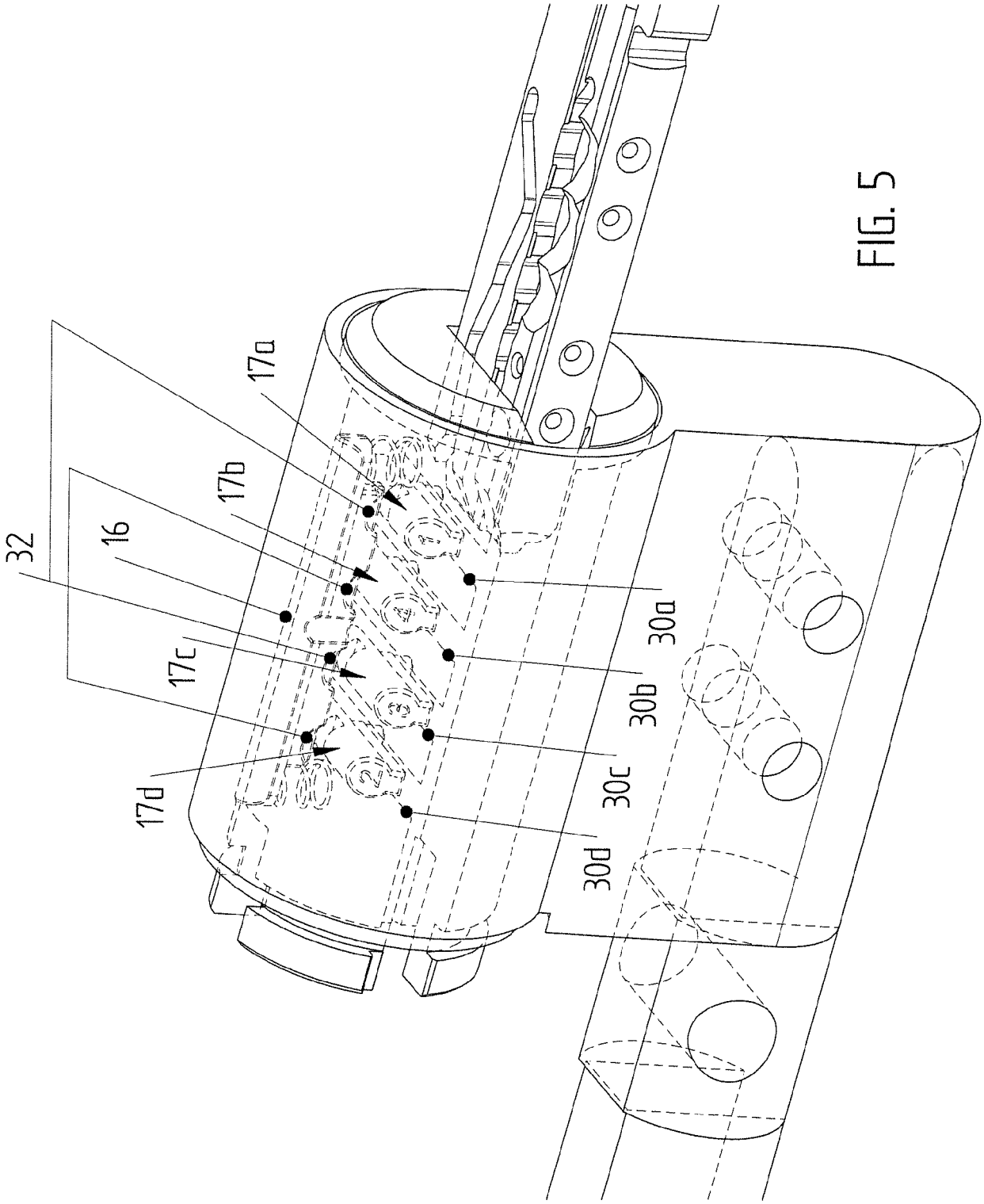

FIG. 5

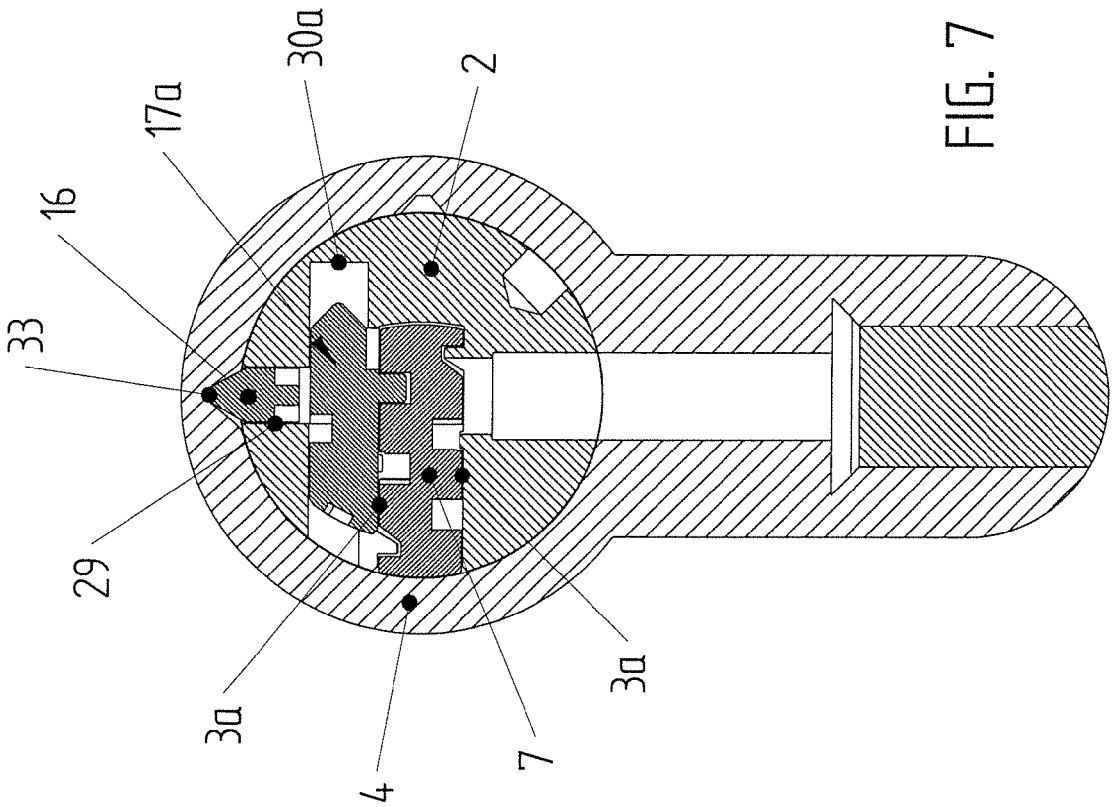

FIG. 7

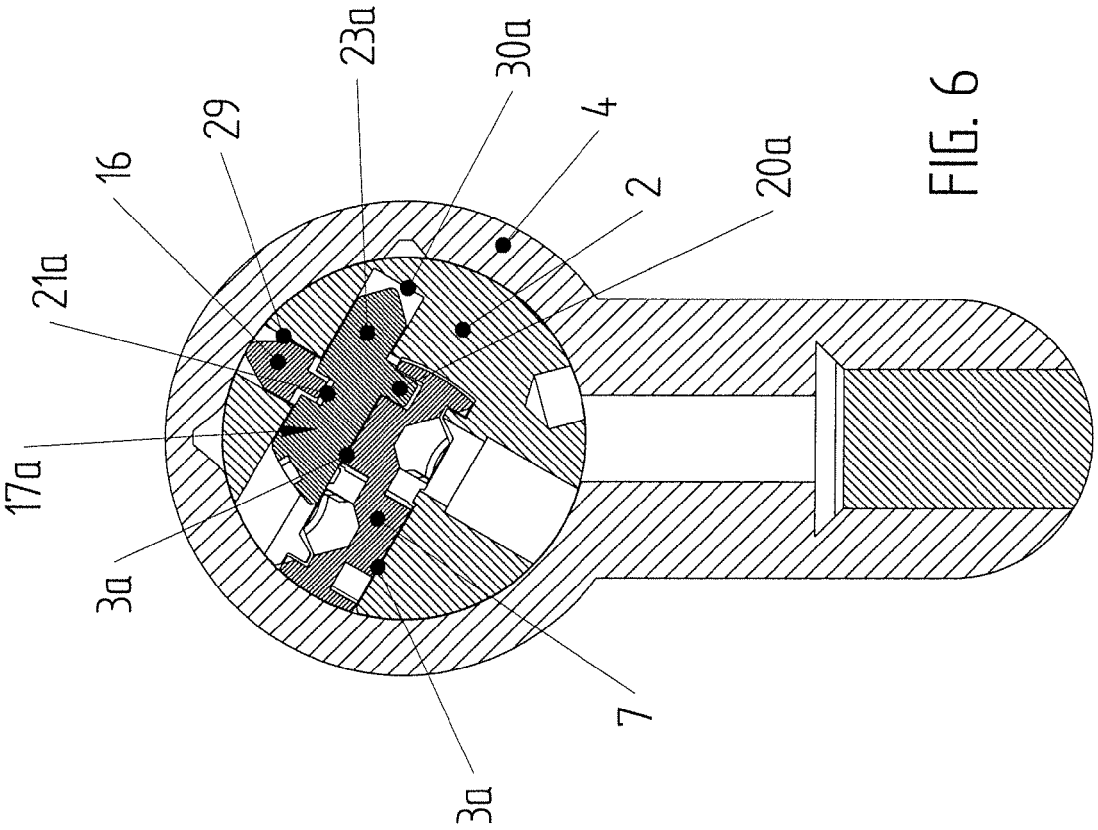

FIG. 6

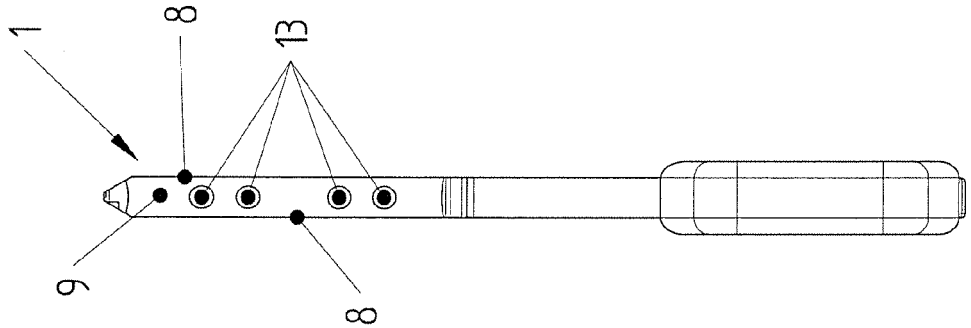

FIG. 9

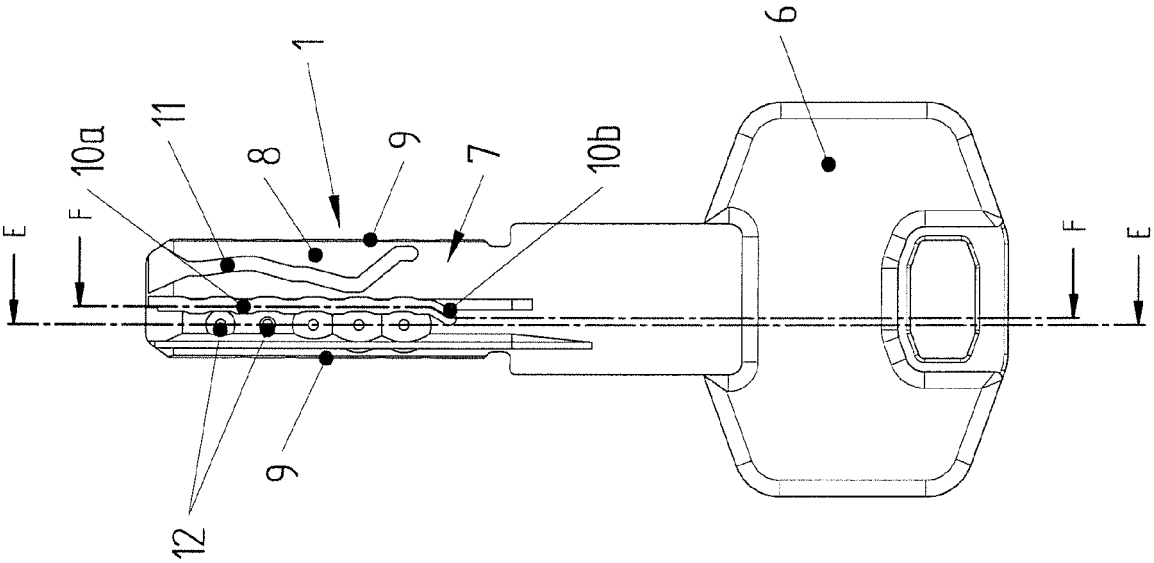

FIG. 8

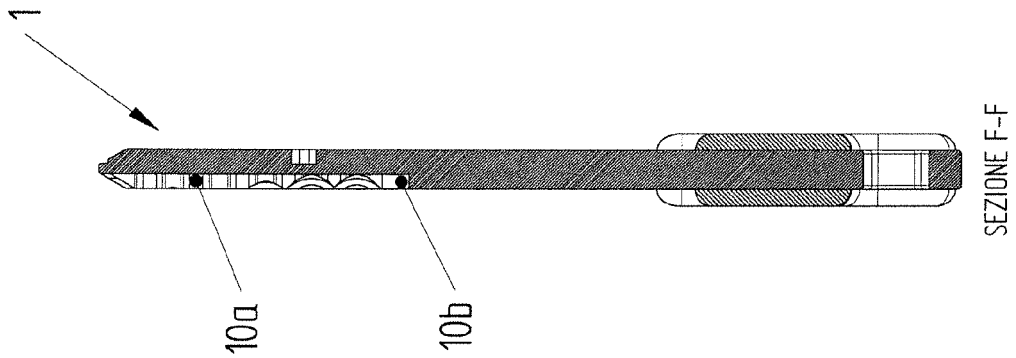

FIG. 11

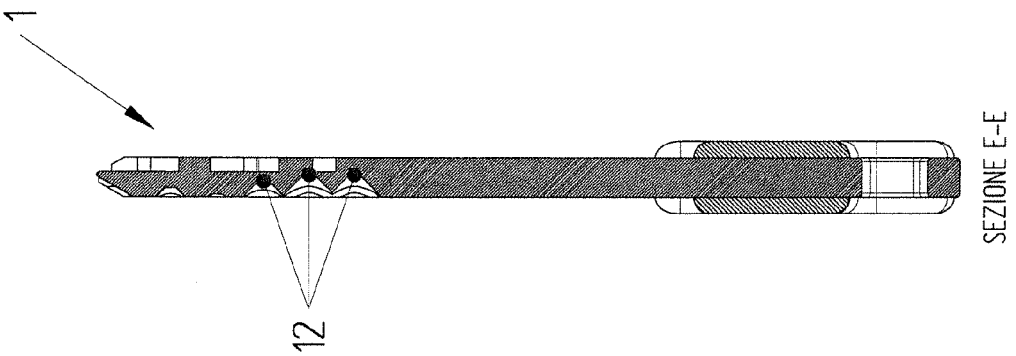

FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 0127

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A	* paragraph [0013] - paragraph [0025] * * paragraph [0035] * * figures 1-13 *	1-12	E05B29/10 ADD. E05B19/00
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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	22 February 2018	Antonov, Ventseslav

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