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(54) SAFETY LOCK UNIT

(57) A safety lock unit (1) is disclosed comprising a cylinder lock (2) that extends with a longitudinal axis (X) and including a stator part (4) and a rotatably drivable rotor part (5), and locking pin means (3) that is movable from a locked position (A) and an unlocked position (B) of the cylinder lock. The safety lock unit further comprises a key (6) for driving the cylinder lock including a blade portion (7) for rotating the rotor part, and a movable bit element (8) shaped to interact with the locking pin means and connected in a tilting manner to the blade portion. The locking pin means and the movable bit element are configured to cooperate together so as to reach the unlocked position to enable the rotor part to rotate.

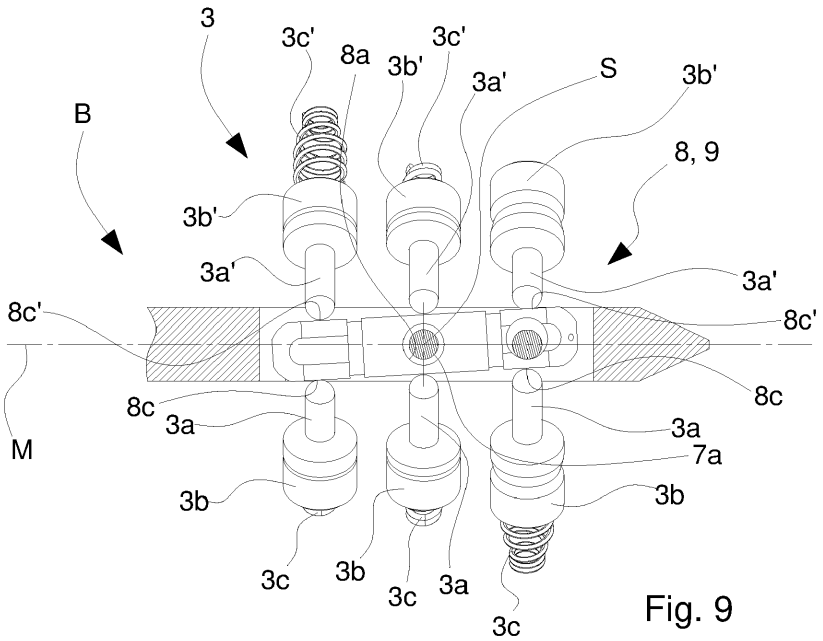

Fig. 9

EP 4 435 211 A1

Description

Background of the invention

[0001] The invention relates to a safety lock unit comprising a lock and a respective activating key for activating the lock itself, in particular, a safety lock unit usable in the field of locks of the European cylinder type.

Prior art

[0002] A safety lock unit is known comprising a cylinder lock, having a rotor and a stator with locking pins that are movable between a locked position in which the pins lock the rotating rotor with respect to the stator - thus enabling the lock to close - and an unlocked position in which the locking pins enable the rotor to rotate and the lock to thus open.

[0003] It is known to provide a key provided with a profile with specific encryption, or with a pre-defined contour to which a specific arrangement of the locking pins corresponds when the key is inserted into the lock. In fact, once the key is inserted by a user into a slot of the rotor the key moves the locking pins, arranging the locking pins in the unlocked position.

[0004] The lock is shaped so as to open only when all the locking pins adopt a precise position, adhering to the indented edge.

[0005] One limit of the safety unit is the fact that it is not sufficiently secure against lock-picking or tampering attempts. In particular, a person who is not authorized to open the lock can easily detect the specific profile of the key and reproduce the profile to open the respective lock. For example, a person who is not authorized can copy or photograph the profile of the key to produce a counterfeit key.

[0006] In addition to being photographed or copied, the profile of the key, however complex the geometry thereof, can be scanned in 3D, for example by a laser-scanner, and be reproduced by printing (for example by additive manufacturing means, like a 3D printer) or by stock removal (for example by a milling unit or other stock-removal means).

[0007] In the light of the disadvantages and risks set out above, it would be desirable to provide a safety lock unit that overcomes prior-art drawbacks.

[0008] Firstly, it is desired to have a lock unit that ensures greater security against a tampering or picking attempt.

[0009] Secondly, it would be desirable to provide a lock unit the key of which is not reproducible or which is extremely difficult, practically impossible to reproduce.

[0010] Further, it would be desirable to provide a key whose specific encryption enabling the lock to be opened is not definable by the simple detection of the profile.

Objects of the invention

[0011] One object of the invention is to improve current lock units.

[0012] Another object of the invention is to provide a lock unit having a cylinder lock and a key that are alternative to those of the prior art.

[0013] A further object is to provide a key that is so configured as to prevent the key being duplicated by detecting the profile of the key, so as to make an unauthorized opening of the lock extremely difficult.

[0014] A still further object is to provide a solution that involves an interaction between the cylinder lock and the key that is not easily identifiable from the outside of the lock unit so as to increase extremely the security levels and make tampering with the lock practically impossible.

[0015] A still further object is to provide a lock unit that is constructionally simple and compact dimensionally.

Summary of the invention

[0016] These objects and also others are achieved by a lock unit as defined in the appended claims.

[0017] The lock unit that is thus configured, particularly owing to a movable bit element, is able to provide an encryption profile that it is difficult, practically impossible, to reproduce.

[0018] Owing to the tilting coupling between the movable bit element and the key it is possible to provide cooperation between the movable bit element and the locking pin means according to different configurations.

[0019] Owing to the provision of elastic means for exerting an elastic force on the movable bit element it is possible to obtain a set movement of the movable bit element that is such as to reach an unlocked position of the lock unit.

[0020] Owing to the reciprocal cooperation between the stroke stop means and the movable bit element it is possible to improve the positioning repeatability of the movable bit element in the cylinder lock and thus the facility of opening and locking the cylinder lock.

Short description of the drawings

[0021] The invention can be better understood and implemented with reference to the appended drawings that illustrate embodiments thereof by way of non-limiting example, in which:

Figure 1 is an exploded perspective view of the lock unit according to a first embodiment along a longitudinal axis of the lock unit, in which a cylinder lock and a respective key are shown;

Figure 2 is a perspective view of the lock unit of Figure 1 in which the key is inserted into the cylinder lock;

Figure 3 is a perspective view according to a view plane other than that of Figure 1 and 2 of a key of

the first embodiment in which, in particular, a movable bit element is shown;

Figure 4 is a perspective view of the key according to the first embodiment of the lock unit that engages respective locking pin means;

Figure 5 is a section view taken along a median plane of the key according to the first embodiment, in which the movable bit element engages the locking pin means;

Figure 6 is a section view taken along a median plane of the key according to the first embodiment of the lock unit in a configuration in which the key is disengaged from the cylinder lock;

Figure 7 is a partial section of the cylinder lock taken on a plane that is transverse to the longitudinal axis in which the lock unit is in a locked position;

Figure 8 is a partial section of the lock unit taken along the same plane as Figure 7 in which the key is inserted into the cylinder lock, the lock unit adopting an unlocked position;

Figure 9 is an enlargement of Figure 5 in which the components of the locking pin means are shown engaging the movable bit element 8 in the unlocked position;

Figure 10 is an enlargement of Figure 6;

Figure 11 is a perspective view of a key according to a second embodiment of the lock unit, in which there are two movable bit elements.

Detailed description

[0022] With reference to the aforesaid figures, a safety lock unit 1 according to the invention is disclosed below. Specifically but not exclusively, the safety lock unit 1 according to the invention can be used in locks of the European cylinder type. Nevertheless, the configuration of the safety lock unit can also be used in types of lock that are different from the European cylinder type. The safety lock unit according to the present invention can be used in locks for doors or hatches. Further, this lock unit can be used in padlocks. The safety lock unit can be used in indoor or outdoor environments, in a domestic, industrial environment or in public transport.

[0023] The safety lock unit 1 comprises a cylinder lock 2 and a key 6 configured for driving (opening and closing) the cylinder lock 2 (Figures 1 and 2).

[0024] The cylinder lock 2 extends with a longitudinal axis X (Figure 1). The cylinder lock 2 can be a lock of European cylinder type (like the one illustrated in Figures 1, 2, 7 and 8).

[0025] The skilled person in the technical field, can however easily integrate the safety lock unit 1 into a lock provided with a technology other than the aforesaid technology of the European cylinder.

[0026] The cylinder lock 2 includes a stator part 4 and a rotatable rotor part 5 rotatable around the longitudinal axis X with respect to the stator part 4.

[0027] The rotor part 5 and the stator part 4 have a cylindrical symmetry and engage with one another coaxially with the longitudinal axis X.

[0028] As mentioned, the safety lock unit 1 can be used for safely locking doors or hatches, in a domestic and/or industrial environment and/or means of transport. Further, the safety lock unit 1 can be used in an indoor or outdoor environment.

[0029] The cylinder lock 2 further includes locking pin means 3 that is movable from a locked position A (Figure 7) in which it prevents a rotation of the rotor part 5 with respect to the stator part 4, and an unlocked position B (Figures 8 and 9) in which the locking pin means 3 enables the rotor part 5 to rotate (relatively) with respect to the stator part 4.

[0030] The key 6 comprises a blade portion 7 that is insertible into a slot 5a to rotate the rotor part 5 (Figure 1).

[0031] The slot 5a can be obtained in a front portion of the rotor part 5 that, during operation, faces a user.

[0032] The blade portion 7 extends with a further longitudinal axis Y that is, during operation, substantially parallel to the longitudinal axis X of the cylinder lock 2 (Figure 1).

[0033] The key 6 comprises at least one movable bit element 8 shaped to interact with the locking pin means 3 (Figures 1, 3, 8, 9, 10 and 11). As will be disclosed below, the movable bit element 8 is connected tiltingly to the blade portion 7.

[0034] The locking pin means 3 and the movable bit element 8 are configured to cooperate together so as to reach the unlocked position B to enable the rotor part 5 to rotate (Figures 8 and 9).

[0035] In addition to the movable bit element 8, the blade portion 7 can comprise a series of fixed bit elements (not illustrated because known). By way of non-exhaustive example, these fixed bit elements can include cavities, or indentations, or ridges; these fixed bit elements are configured, in particular, to interact with further locking pin means (which is not illustrated) contributing to the definition of the locked position A and of the unlocked position B identically to prior art safety lock units.

[0036] With reference to the first embodiment of the safety lock unit 1 illustrated in particular in Figures 1 and 3, the key 6 is provided with a single movable bit element 8.

[0037] In the second embodiment of the safety lock unit, in which a key 6' is illustrated (Figure 11) there are two movable bit elements 8, 8'. In this second embodiment, each movable bit element 8, 8' is configured, in particular, to interact with respective locking pin means (which is not illustrated) set up inside a respective cylinder lock. In this embodiment, there is a second movable bit element 8' arranged behind a first movable bit element 8 (i.e. nearer a grip of the key 6'), the second movable bit element 8' being smaller than the first movable bit element 8.

[0038] Again with reference to the illustrated embodiments, the movable bit element 8 comprises an elongated element, like a bar element. In the illustrated embod-

iments, the movable bit element has a cylindrical shape.

[0039] The movable bit element 8 extends with a longitudinal axis along a direction that is transverse to that of the tilting axis S.

[0040] However, in one embodiment that is not illustrated, a movable bit element with a substantially parallelepipedon shape can be provided.

[0041] In particular, the movable bit element 8 has a substantially uniform thickness along the longitudinal axis thereof.

[0042] In particular, in the illustrated embodiments, the ends of the movable bit element 8 are rounded. However, in a further embodiment that is not illustrated it is possible to provide a movable bit element with a sharp edge end.

[0043] In the embodiment illustrated, the movable bit element 8 is made as a single piece.

[0044] The locking pin means 3 can comprise at least one contact portion 3a, 3a' intended to contact a respective drive surface 8c, 8c' of the movable bit element 8, and at least one thrust and locking portion 3b, 3b' suitable for pushing the at least one contact portion 3a, 3a' to the respective drive surface 8c, 8c' (Figure 7, 8 and 9).

[0045] In the illustrated embodiments, the drive surfaces 8c, 8c' are arranged at end portions of the movable bit element 8.

[0046] The at least one contact portion 3a, 3a' can be housed at least partially in a respective slot 5b, 5b' obtained inside the rotor part 5.

[0047] The at least one thrust and locking portion 3b, 3b' can be housed at least partially in a respective recess 4b, 4b' obtained inside the stator part 4.

[0048] The slot 5b, 5b' and the recess 4b, 4b' in particular face reciprocally and are contiguous both in the locked position A (Figure 7) and in the unlocked position B (Figure 8).

[0049] The locking pin means 3 can comprise elastic means 3c, 3c' (Figures 7, 8 and 9) that is configured, in particular, to exert an elastic force on the movable bit element 8.

[0050] In the illustrated embodiments, the elastic means 3c, 3c' can comprise elastic elements. The elastic elements can comprise springs, like compression springs.

[0051] The elastic force exerted by these springs is directed transversely, in particular radially to the longitudinal axis X of the cylinder lock 2 (or equivalently transversely, in particular radially to the longitudinal axis Y of the key 6).

[0052] The elastic means 3c, 3c' can be housed in the at least one recess 4c, 4c' inside the stator part 4 to exert elastic force between the stator part 4 and the at least one thrust and locking portion 3b, 3b'.

[0053] In the embodiments of the safety lock units illustrated, the locking pin means comprises a plurality of locking members 3. In such illustrated embodiments, each locking member 3 is defined by a contact portion 3a, 3a' and a locking and thrust portion 3b, 3b'; the contact portion 3a, 3a' and the locking and thrust portion 3b, 3b' are pushed into reciprocal contact with one another by the elastic means 3c, 3c' in the locked position A and in the unlocked position B (i.e. in configurations in which the recesses 4c, 4c' are contiguous to respective slits 5b, 5b', Figure 7).

[0054] Several slits 5b, 5b' can be provided, each for a respective locking member 3. The slits can pass through a transverse (radial) thickness of the rotor part 4.

[0055] Several recesses 4c, 4c' each for a respective locking member 3 can be provided. The recesses 4c, 4c' can be blind with respect to a (radial) cross section of the stator part 4.

[0056] The movable bit element 8 can be connected to the blade portion 7 by a rotatable coupling that includes pivot means 7a. The pivot means 7a defines, in particular, a tilting axis S and engages respective hole means 8a (Figures 9 and 10). The hole means 8a is obtained in the movable bit element 8, in particular at a median region of the movable bit element 8. Owing to this particular symmetry configuration, on the movable bit element 8 a balanced distribution of the forces can be determined that the locking pin means 3 exerts on the two half portions that are opposite one other with respect to the tilting axis S that make up the movable bit element 8.

[0057] The hole means 8a comprises, in particular, a through hole. The hole means 8a extends along a direction defined by the tilting axis S.

[0058] The pivot means 7a, together with the hole means 8a, define the pivot around which the movable bit element 8 tilts.

[0059] The movable bit element 8 can be connected with clearance to the pivot means 7a. In one embodiment of the safety lock unit in which there is this clearance the movable bit element 8 is capable of translating (by an amount equal to the clearance) with respect to the blade portion 7 (in addition to being able to oscillate around the tilting axis S).

[0060] In the blade portion 7, at least one housing opening 7b for the movable bit element 8 can be provided. The at least one housing opening 7b can be of the through type through the transverse thickness of the blade portion 7.

[0061] In these illustrated embodiments, the movable bit element 8 is surrounded by the blade portion 7.

[0062] In the first embodiment of the safety lock unit 1 (equipped with the key marked by the numeric reference 6) illustrated in Figures 1 to 10 a single housing opening 7b is provided.

[0063] In the second embodiment of the safety lock unit (equipped with the key marked by the numeric reference 6') two housing openings are provided, each arranged for housing the respective movable bit element 8, 8'.

[0064] In the illustrated embodiments, the pivot means 7a comprises a pin element. The pivot means 7a can be arranged at the housing opening 7b.

[0065] In one embodiment that is not illustrated, the pivot means can be obtained as a single block together

with the blade portion 7 of the key 6. In this embodiment that is not illustrated, the movable bit element 8 can comprise two (or more) half shells that are firmly couplable with one another around the pivot means.

[0066] The tilting axis S can be transverse, in particular substantially orthogonal, to the longitudinal axis X of the cylinder lock 2 (or equivalently to the longitudinal axis Y of the key 6).

[0067] The elastic means 3c, 3c' is configured, in particular, to exert on the movable bit element 8 a distribution of loads that is such as to orient stably the movable bit element 8 on the unlocked position B to enable the rotor part 5 to rotate (Figure 9).

[0068] The elastic means 3c, 3c' can exert forces asymmetrically on the movable bit element, such forces can result in torque that is such as to rotate the movable bit element around the tilting axis S.

[0069] At least two locking members 3 can be provided that are configured, in particular, to act on respective drive surfaces 8c, 8c' of the movable bit element 8 with different forces and/or with arms of forces that are such as to generate an asymmetric load and thus rotate the movable bit element 8 to reach the unlocked position B.

[0070] The elastic means 3c, 3c' of the at least two locking members 3 can have stiffness features different from one another and/or degrees of preloading that are different from one another so as to generate the asymmetric load and thus rotate the movable bit element 8 to reach the unlocked position B.

[0071] The stiffness features can comprise stiffness coefficients (expressed in N/m) that are different from one another.

[0072] In the embodiment of the safety lock unit 1 illustrated in Figures 1 to 10 there are six locking members 3 arranged in pairs opposite one another with respect to a median plane M (Figures 7 and 8) of the safety lock unit 1. In other words, in the embodiment illustrated in Figures 1 to 10, there are three locking members 3 on one side of the median plane M of the safety lock unit 1 and another three locking members 3 arranged on another side of the median plane. In this embodiment, the six locking members 3 are arranged for contacting the movable bit element 8 on six respective drive portions (Figure 9).

[0073] The force exerted by the locking pin means 3 is directed according to one or more drive directions that lie on a reference plane tilted by an acute angle with respect to the median plane M of the safety lock unit 1.

[0074] With reference to Figures 7 and 8, the locking pin means 3 is arranged to exert opposing forces along drive directions that lie on two inclined planes opposite the median plane M.

[0075] However, in one embodiment that is not illustrated, the locking pin means 3 can be arranged, in particular, to exert opposite forces along a single reference plane that can be transverse, in particular orthogonal, to the median plane M.

[0076] In a further embodiment that is not illustrated, there can be a single locking pin arranged, in particular, to interact with a single respective drive surface of the movable bit element.

[0077] In the second embodiment of the safety lock unit 1, having the key 6' with a double movable bit element 8, 8', the number of locking members 3 will be greater than, in particular twice, the number of locking members provided for cooperating with the key 6 according to the first embodiment.

[0078] The drive surfaces 8c, 8c' can be positioned at different distances from the tilting axis S so as to generate the asymmetric load, at the same forces exerted by the elastic means 3c, 3c', and thus rotate the movable bit element 8 to reach the unlocked position B.

[0079] In the blade portion 7, stroke end means 9 can be shaped, in particular, to limit a movement of the movable bit element 8 at the unlocked position B (Figures 9 and 10).

[0080] The stroke end means 9 comprises, in particular, rod means 9a that is constrained on a zone of the blade portion 7 and is intended to be surrounded by cavity means 8b obtained in the movable bit element 8. In the embodiment illustrated, the cavity means 8b surrounds the rod means 9a completely. In other words, the rod means 9a traverses the movable bit element 8 from one side to the other, traversing the thickness thereof. The rod means 9a can be coupled with clearance at the cavity means 8b so as to permit the movable bit element 8 a limited oscillating movement. The rod means 9a can be arranged inside the housing opening 7b. In other words, the cavity means 8b defines an abutment for the rod means 9a so as to limit the movement of the movable bit element 8. This movement of the movable bit element 8 is limited in both a first rotation direction, for example anticlockwise (Figure 9), and in a second rotation direction opposite the first rotation direction, for example clockwise.

[0081] The cavity means 8b can comprise a through hole in the thickness of the movable bit element 8. In the illustrated embodiments, the through hole extends parallel to the tilting axis S. In other words, in the illustrated embodiments, the hole means 8a and the cavity means 8b are both obtained in the movable bit element 8 and extend parallel to one another.

[0082] The cavity means 8b is obtained in an end zone of the engaging portion of the movable bit element 8. In other words, the cavity means 8b is obtained in a position that is off-centre with respect to the hole means 8a.

[0083] The movable bit element 8 can be considered to be divided into two half-portions that extend equally from the tilting zone to the respective opposite ends: these half-portions, precisely, comprise a free portion and the engaging portion that couples with clearance with the rod means 9a. The fact that the movable bit element 8 is pivoted in a median zone thereof, and the fact that the rod means 9a interacts with the engaging portion near the end thereof, enables a configuration to be obtained in which a lever is created that is disadvantageous or

indifferent with respect to the force acting on the free portion, so as to ensure coupling solidity and reliability between the movable bit element 8 and the blade portion 7 to the advantage of the integrity of the entire key 6.

[0084] In the illustrated embodiments, the rod means 9a can comprise a further pin element.

[0085] In one embodiment that is not illustrated, the rod means 9a is obtained as a single block with the blade portion 7.

[0086] The operation of the safety lock unit will be disclosed below, with particular reference to the first embodiment of the safety lock unit, the unit provided with a key with a single movable bit element 8. Nevertheless, this operation can extend identically to the second embodiment in which two movable map elements 8, 8' are present.

[0087] When the key 6 is not inserted into the cylinder lock 2 (for example when it is held in the hand or pocket by a user or when it rests on a table) it can adopt a disengaged configuration C (Figures 6 and 10) in which the movable bit element 8 adopts a random position (i.e. does not adopt a preset position) because the movable bit element 8 is free to oscillate (with an oscillation width around the tilting axis S more or less limited by the stroke end means 9) with respect to the blade portion 7.

[0088] In this condition, the cylinder lock is in the locked position A (Figure 7). In the locked position A, the locking pin means 3 is partially arranged in the recesses 4b, 4b' and in the slits 5b, 5b' preventing relative rotation between the rotor part 5 and the stator part 4 around the longitudinal axis X of the cylinder lock 2.

[0089] The locked position A corresponds to a configuration in which the safety lock unit 1 is closed.

[0090] At this point the user, by gripping the key 6, inserts the blade portion 7 taking the movable bit element 8 into the slot 5a of the rotor part 5.

[0091] During insertion, i.e. during movement of the blade portion along the longitudinal axis X inside the rotor part 5, the movable bit element 8 interacts with the locking pin means 3 until it reaches the unlocked position B (Figure 8).

[0092] In the unlocked position B, the locking pin means 3 is so arranged that the parts that make up the locking means 3 (the contact portions 3a, 3a' and the thrust and locking portions 3b, 3b') align with the circumference of the rotor part 5 so as to enable the thrust and locking portions 3b, 3b' to rotate around the stator part 4 (Figure 8).

[0093] In the unlocked position B, the locking pin means 3 moves the movable bit element 8 by rotating the locking pin means 3 around the tilting axis S and arranging the locking pin means 3 in a preset position. In the unlocked position B, the locking pin means 3 moves the movable bit element 8 until the movable bit element 8 is made to interact with the cavity means 8b and rod means 9a.

[0094] The preset position that the movable bit element 8 adopts inside the lock, and defines the unlocking encryption of the cylinder lock 2 is not visible from the outside, preventing detection by an unauthorized user.

[0095] In fact, positioning the movable bit element 8 is defined by the particular configuration of the locking pin means 3, in particular by the corresponding position of the contact parts 3a, 3a' with respect to the drive surfaces of the movable bit element 8 and by the elastic properties of the elastic means 3c, 3c'. This positioning is further defined by the contact between the movable bit element 8 (or equivalently the cavity means 8b) and the stroke end means 9 (or equivalently the rod means 9a).

[0096] From what has been disclosed above it is clear that the lock unit reaches all the preset objects.

[0097] The thus configured safety lock unit 1, particularly owing to the movable bit element 8, is able to provide an encryption profile that is hardly reproducible. In fact, as the movable bit element 8 does not have a preset orientation when extracted from the respective cylinder lock 2 it is not possible to know beforehand and thus reproduce the encryption of the safety lock unit 1.

[0098] Further, owing to the tilting coupling between the movable bit element 8 and the key 6 it is possible to provide cooperation between the movable bit element and the locking pin means according to different configurations.

[0099] In fact, owing in particular to the pivot means 7a, it is possible to orient the movable bit element 8 by the opposing action of several locking members 3 that act from the same side (with respect to the median plane M of the safety lock unit 1) or from opposite sides.

[0100] In particular, owing to the provision of elastic means 3c, 3c' to exert a force on the movable bit element 8 it is possible to obtain a set movement of the movable bit element 8 so as to reach the unlocked position B of the safety lock unit 1.

[0101] Further, owing to the reciprocal cooperation between the stroke end means 9 and the movable bit element 8 it is possible to improve the positioning repeatability of the movable bit element 8 in the cylinder lock 2 and thus the opening or clamping facility of the cylinder lock 2.

[0102] The coupling with clearance between the rod means 9a and the cavity means 8b, together with the fact that the rod means 9a is surrounded (completely) by the cavity means 8b, enables the movable bit element 8 to be arrested effectively in the unlocked position B and confers stiffness and durability on the entire key 6.

[0103] The offset position of the cavity means 8b with respect to the hole means 8a permits reduced oscillation of the movable bit element 8 with respect to the blade portion 7, which enables the movable bit element 8 to remain (in the unlocked position B) within the overall dimensions defined by the blade portion 7 (Figures 5, 9 and 10), thus preventing the movable bit element 8 from getting caught up in an external object or getting damaged.

[0104] Further, the offset position of the cavity means 8b with respect to the hole means 8a enables the un-

locked position B to be reached maintaining at the same time a uniform thickness of the movable bit element 8, thus making the construction of the movable bit element 8 simpler and cheaper.

[0105] What has been said and shown in the enclosed drawings has been provided by way of illustrative example of the innovative features of the safety unit 1.

[0106] It is possible to configure and size the safety unit 1, or parts thereof in a desired manner in function of specific applicational contexts. In practice, the materials, as far as they are compatible with the specific use and with the respective single components for which they are intended, can be chosen appropriately according to the required requirements and according to the available prior art. Variations on and/or additions to what has been disclosed illustrated in the enclosed drawings are possible.

Claims

1. Safety lock unit (1) comprising:

a cylinder lock (2) that extends with a longitudinal axis (X), said cylinder lock (2) including:

a stator part (4) and a rotor part (5) that is rotatable around said longitudinal axis (X) relative to said stator part (4),
locking pin means (3) that is movable from a locked position (A) in which said locking pin means (3) prevent a rotation of said rotor part (5) relative to said stator part (4) and an unlocked position (B) in which said locking pin means (3) allows said rotor part (5) to rotate relative to said stator part (4); and

a key (6) configured to activate said cylinder lock (2) and comprising a blade portion (7) that is insertible into a slit (5a) to rotate said rotor part (5), and at least one movable bit element (8) that is shaped to interact with said locking pin means (3) and connected in a tilting manner to said blade portion (7);
wherein said locking pin means (3) and said at least one movable bit element (8) are configured to cooperate mutually so as to reach said unlocked position (B) to enable said rotor part (5) to rotate; and

in which in said blade portion (7) stroke end means (9) are obtained that is shaped to limit a movement of said movable bit element (8; 8') at said unlocked position (B); and wherein
said stroke end means (9) comprises rod means (9a) that traverses the thickness of said movable bit element (8) and is surrounded by cavity means (8b) obtained in said movable bit element (8), said rod means (9a) being coupled with clearance with said cavity means (8b) so as to allow said movable bit element (8) a limited oscillating movement.

2. Safety lock unit (1) according to claim 1, wherein said movable bit element (8) is connected to said blade portion (7) by a rotatable coupling that includes pivot means (7a) defining a tilting axis (S) and engaging respective hole means (8a) obtained in said movable bit element (8), said tilting axis (S) being transverse to said longitudinal axis (X).

3. Safety lock unit (1) according to claim 2, wherein said hole means (8a) is obtained in a median region of said movable bit element (8), so that in said movable bit element (8) there is a free portion and an engaging portion engaging said rod means (9a) and wherein said cavity means (8b) is obtained in an end zone of said engagement portion.

4. Safety lock unit (1) according to claim 3, wherein said free portion and said engaging portion are substantially of equal longitudinal extent so as to effectively counteract the forces acting on the free portion.

5. Safety lock unit (1) according to one of claims 2 and 4, wherein said movable bit element (8) extends with uniform thickness along its own longitudinal axis oriented transversely to said tilting axis (S).

6. Safety lock unit (1) according to any one of the preceding claims, wherein said locking pin means (3) comprises at least one contact portion (3a, 3a') intended to contact a respective drive surface (8c, 8c') of said at least one movable bit element (8), and at least one thrust and locking portion (3b, 3b') suitable for thrusting said at least one contact portion (3a, 3a') to said respective drive surface (8c, 8c'); wherein said at least one contact portion (3a, 3a') is housed at least partially in a respective slot (5b, 5b') obtained inside said rotor part (5), and said at least one thrust and locking portion (3b, 3b') is housed at least partially in a respective recess (4b, 4b') obtained inside said stator part (4), said slot (5b, 5b') and said recess (4b, 4b') facing one another and being contiguous in said locked position (A) and in said unlocked position (B); wherein said locking pin means (3) comprises elastic means (3c, 3c') configured to exert an elastic force on said movable bit element (8); and wherein said elastic means (3c, 3c') is housed in said at least one recess (4c, 4c') inside said stator part (4) to exert elastic force between said stator part (4) and said at least one thrust and locking portion (3b, 3b').

7. Safety lock unit (1) according to any one of the pre-

ceding claims, wherein said locking pin means comprises a plurality of locking members (3) each locking member (3) being defined by a contact portion (3a, 3a') and a locking and thrust portion (3b, 3b') that are pushed into reciprocal contact by respective elastic means (3c, 3c') in said locked position (A) and in said unlocked position (B).

8. Safety lock unit (1) according to claim 6 or 7, wherein said elastic means (3c, 3c') is configured to perform on said movable bit element (8) a distribution of loads that is such as to orient stably said movable bit element (8) towards said unlocked position (B) to enable said rotor part (5) to rotate.

9. Lock unit according to any one of claims 6 to 8, wherein said elastic means (3c, 3c') exerts forces asymmetrically on said movable bit element, the result of such forces determining a torque that is such as to rotate said movable bit element around said tilting axis (S).

10. Safety lock unit (1) according to one of claims 7 to 9, wherein there are at least two locking members (3) configured to act on respective drive surfaces (8c, 8c') of said movable bit element (8) with different forces and/or with arms of forces that are such as to generate an asymmetric load and thus rotate said movable bit element (8) to reach said unlocked position (B).

11. Safety lock unit (1) according to any one of claims 7 to 10, wherein respective elastic means (3c, 3c') of said at least two locking members (3) have stiffness features that are different from one another and/or preload degrees that are different from one another so as to generate said asymmetric load and thus rotate said movable bit element (8) to reach said unlocked position (B).

12. Safety lock unit (1) according to any one of claims 6 or 11, wherein said drive surfaces (8c, 8c') are positioned at different distances from said tilting axis (S) so as to generate said asymmetric load, at the same forces exerted by said elastic means (3c, 3c'), and thus rotate said movable bit element (8) to reach said unlocked position (B).

13. Safety lock unit (1) according to any one of the preceding claims, wherein in said blade portion (7) there is at least one housing opening (7b) for said movable bit element (8), said at least one housing opening (7b) passing through a transverse thickness of said blade portion (7).

14. Safety lock unit (1) according to any one of the preceding claims, wherein said pivot means (7a) comprises a pin element and said rod means (9a) comprises a further pin element.

15. Safety lock unit (1) according to any one of claims 2 to 14, wherein said pivot means (7a) and said rod means (9a) are made as one piece with said blade portion (7).

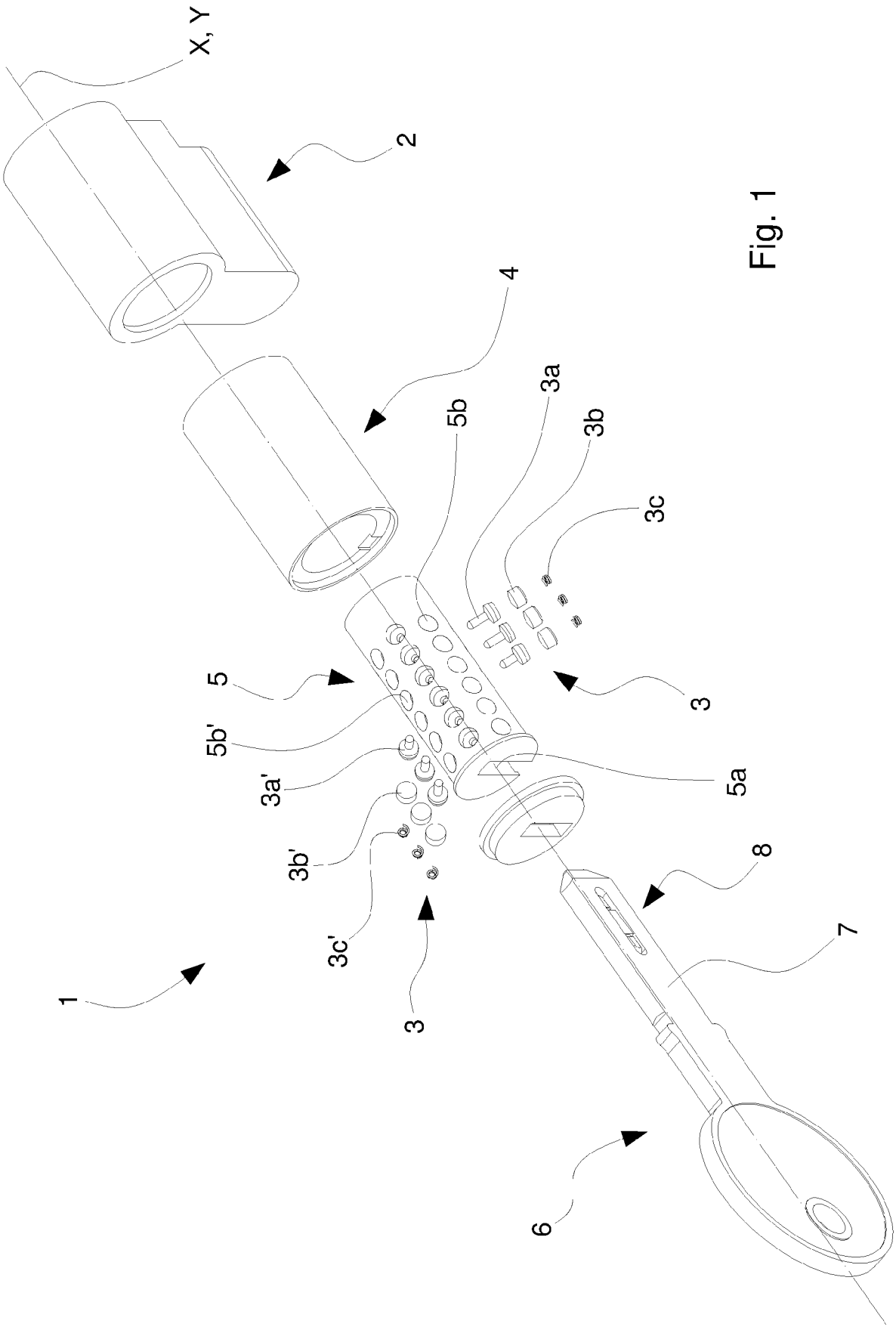

Fig. 1

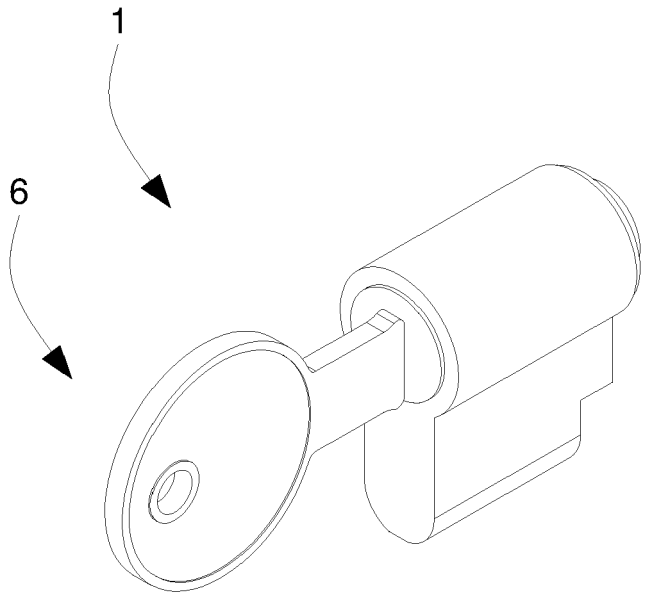

Fig. 2

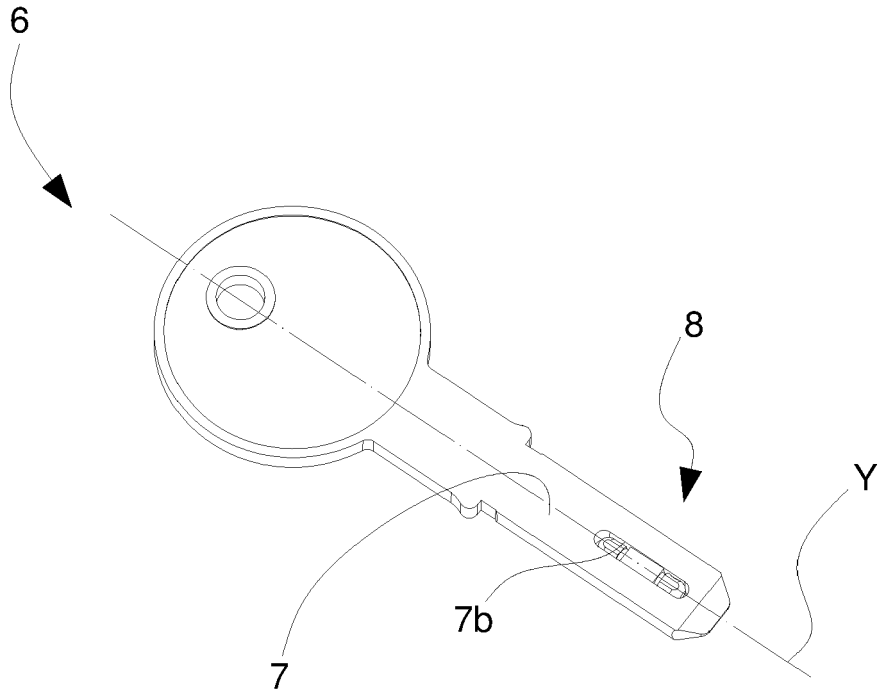

Fig. 3

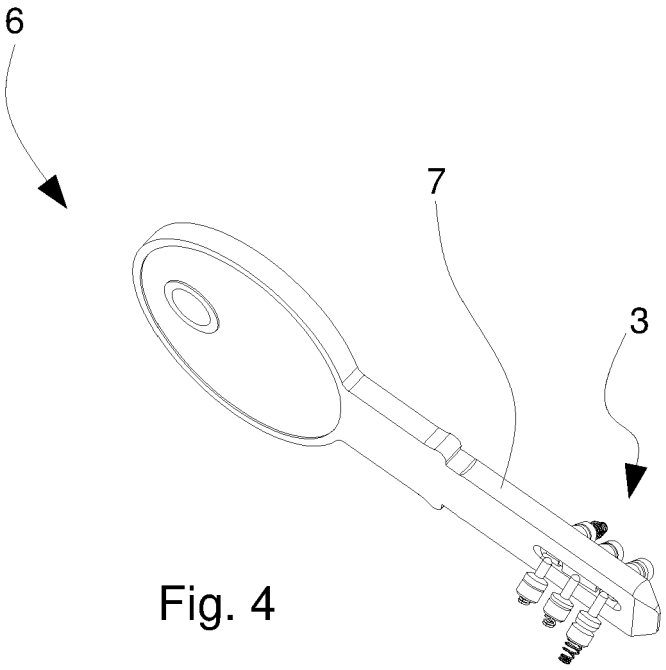

Fig. 4

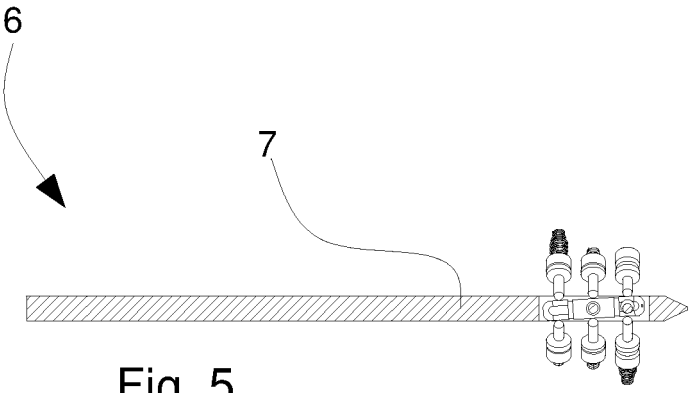

Fig. 5

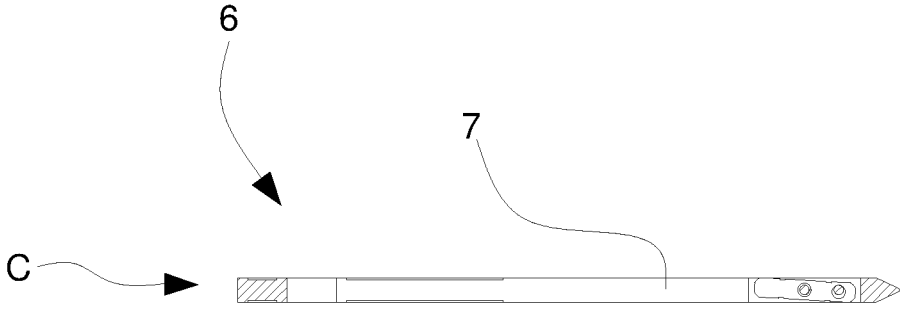

Fig. 6

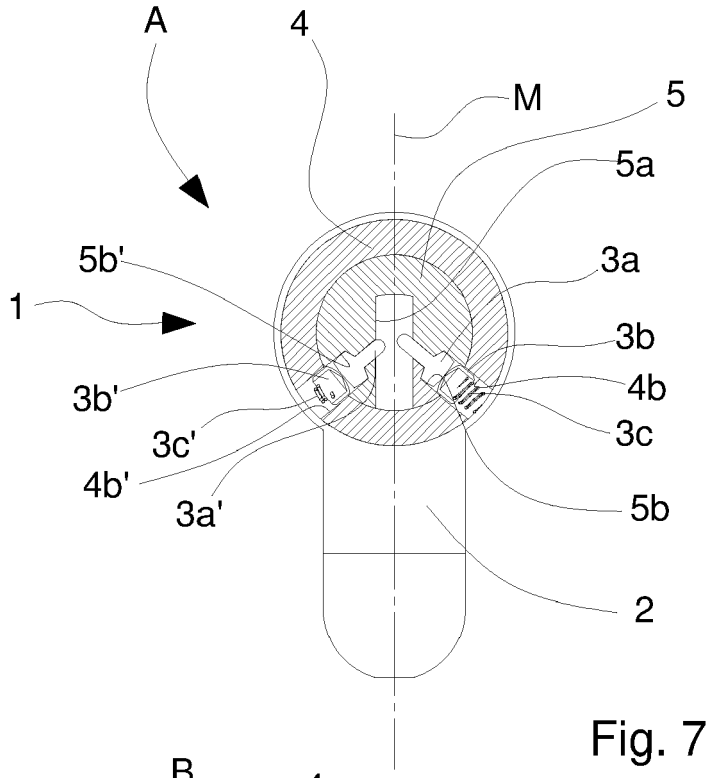
A
4
M
5
5a
5b'
1
3a
3b
3b'
4b
3c'
3c
4b'
3a'
5b
2

Fig. 7

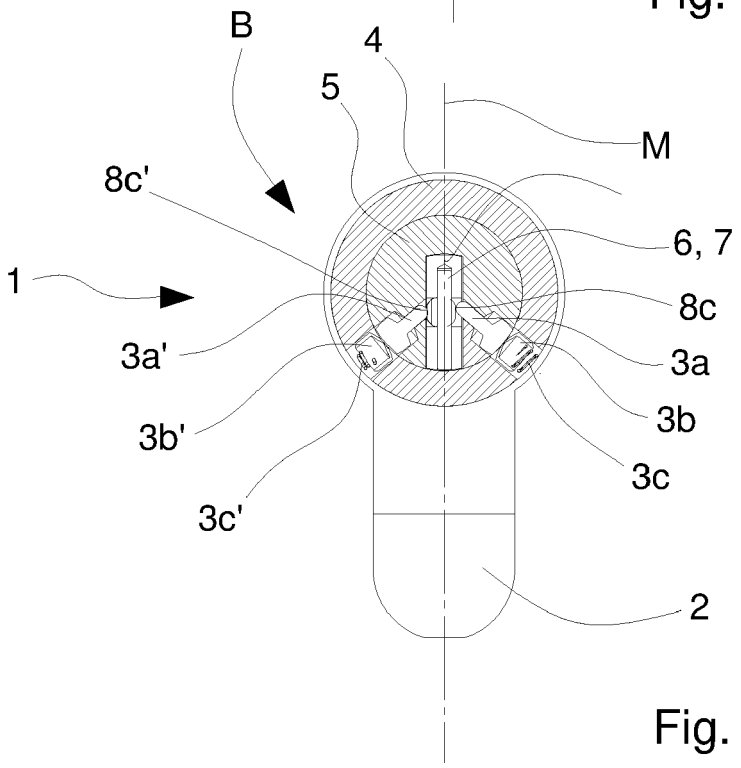
B
4
5
M
8c'
6, 7
1
8c
3a'
3a
3b
3b'
3c
3c'
2

Fig. 8

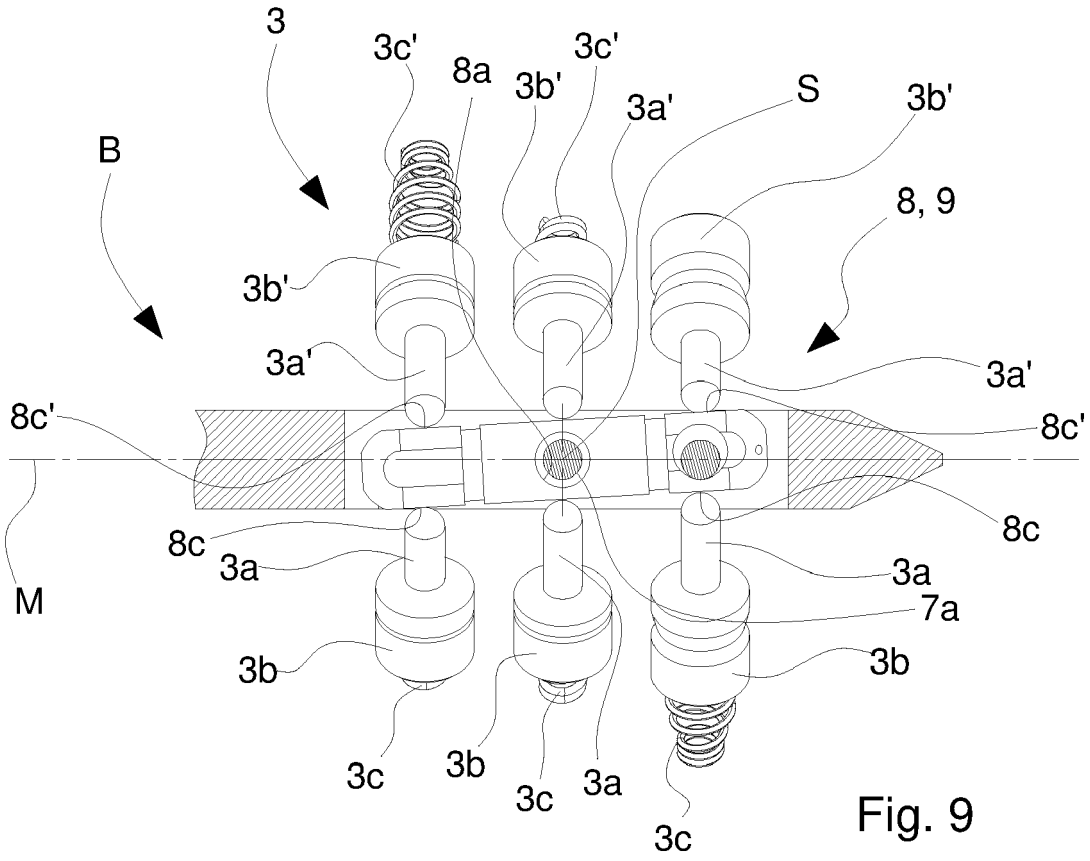
3
3c'
8a
3b'
3c'
3a'
S
3b'
B
8, 9
3b'
3a'
3a'
8c'
8c'
8c
M
8c
3a
3a
7a
3b
3b
3c
3b
3c
3a
3c

Fig. 9

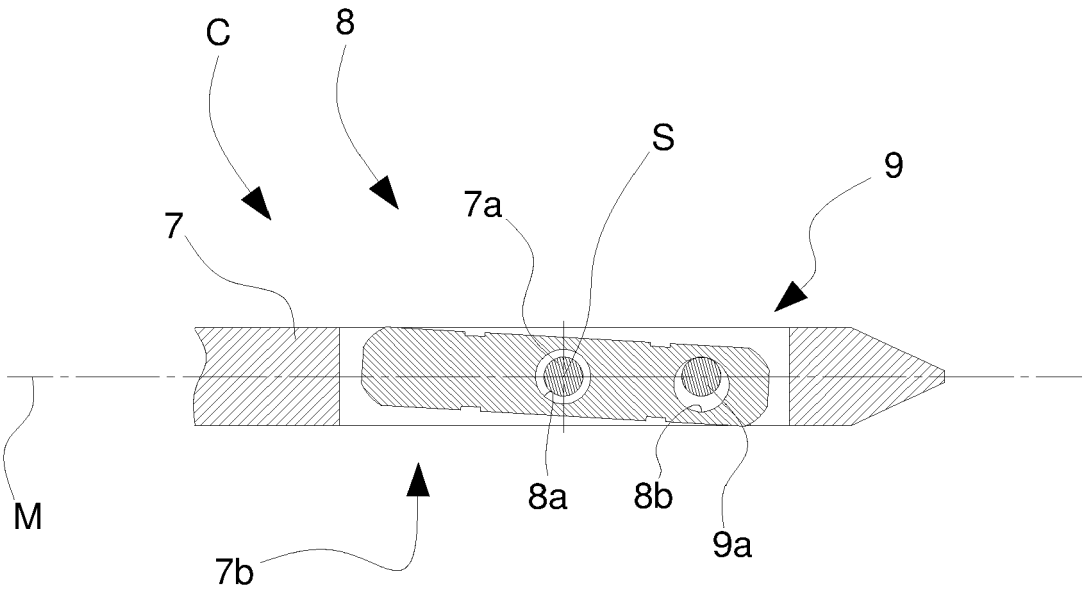

Fig. 10

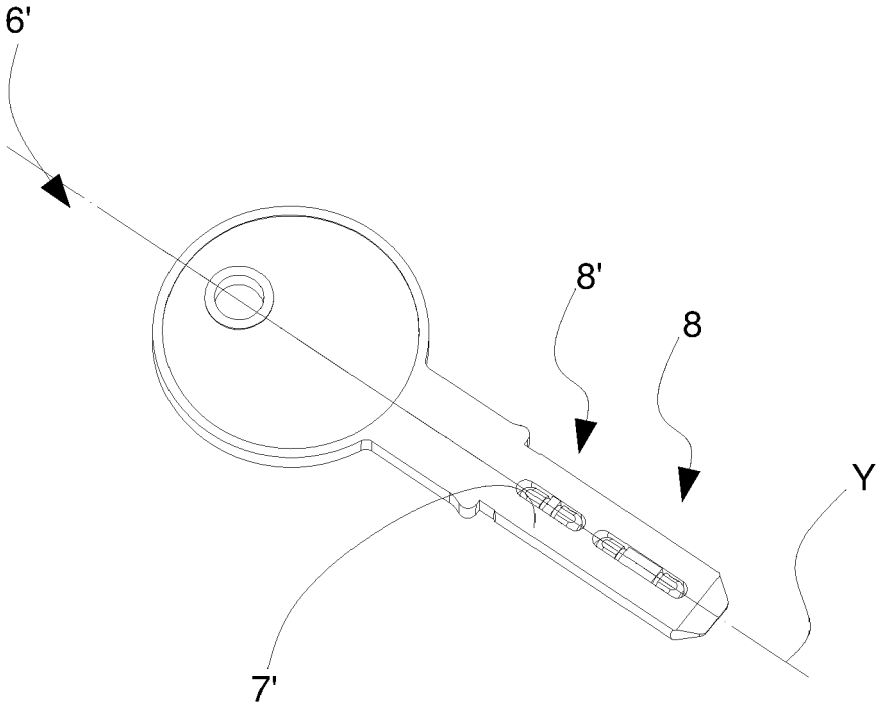

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 24 16 5591

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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	14 August 2024	Boufidou, Maria

CATEGORY OF CITED DOCUMENTS

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