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(71) Applicant: **Jasa Company A/S**
8240 Risskov (DK)

(72) Inventor: **MADSEN, Søren**
8530 Hjortshøj (DK)

(74) Representative: **Zacco Denmark A/S**
Arne Jacobsens Allé 15
2300 Copenhagen S (DK)

(54) **KEY PIN AND CYLINDER LOCK**

(57) A key pin (4) for a cylinder lock (1) is disclosed comprising an end part (9) of a tapering shape, suitable to be in abutment with a key when the key is inserted in a cylinder (3) of the cylinder lock (1), wherein the key pin (4) comprises a first pin part (4a, 4b) and a second pin part (4a, 4b), the first pin part (4a, 4b) having a base part (6) and a central protrusion (7) extending from said base part (6), wherein said protrusion (7) has a width (W1) which is smaller than the width (W2) of said base part (6), wherein the second pin part (4a, 4b) has a longitudinal extend (L4) of at least the longitudinal extend (L2) of the central protrusion (7) and comprises a recess (8) arranged to receive said protrusion (7), the second pin part (4a, 4b) having an outer width (W3) of substantially the same magnitude as the width (W2) of said base part (6).

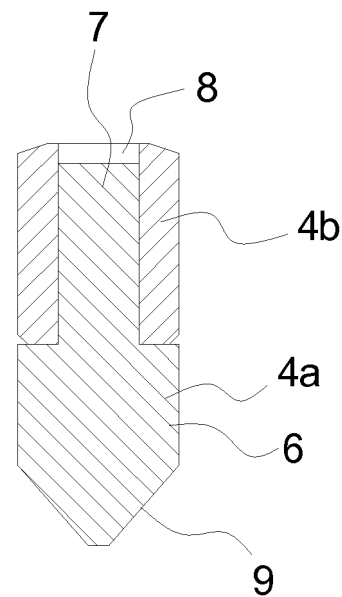


Fig. 3

EP 3 093 417 A1

Description

[0001] The present invention relates to a key pin for a cylinder lock as well as to the cylinder lock provided with at least one such key pin.

Background

[0002] Different types of cylinder locks are known of which the pin tumbler lock is widely used, where pin assemblies comprising a key pin, a driver pin and possibly a spacer pin for master keying, are arranged in channels through the cylinder housing and the cylinder, also known as the plug, which is rotatable in the housing for opening of the lock, provided that division lines between the pins in each pin assembly is situated at the shear line between the cylinder and the housing by means of a particular key for the particular arrangement of pin assemblies.

[0003] The pin tumbler locks are susceptible to unauthorized opening by means of a so-called bump key, which is a key where the notches for engaging the tips of the key pins all are positioned at the lowermost level. When inserted in the lock, a torque is applied to the bump key and the free end of the bump key is given an impact that transfers a momentum to the tips of the key pins, which again transfers the momentum to the driver pins which abuts the key pins. The momentum forces the drive pins upward away from the key pins and the cylinder may be turned when none of the drive pins blocks the shear line between the cylinder and the housing. The use of bump keys for unauthorized opening of locks is fast and does not require much training as compared to picking of the lock and constitutes for that reason a particular problem regarding securing of premises, such as housings by means of locks.

[0004] Other types of lock picking, such as by means of a lock pick gun, also operates with imposing an impact on the key pin in order to transfer momentum to the driver pin.

[0005] Different solutions for providing a bump key safe cylinder lock are known. Among these are EP 2 085 542 A1 which provides a solution where an "anti-bumping pin" is provided, where the anti-bumping pin has a smaller diameter in its upper and lower portions than that in its middle portion so as to prevent the "anti-bumping pin" from getting into contact with a bump key.

[0006] Other known solutions for reducing the possibility of picking a cylinder lock by use of a bumper key includes providing mushroom shaped or spool shaped pins.

[0007] It is an object of the present invention to provide an improved cylinder lock as well as means for retrofitting cylinder locks to be less susceptible to unauthorized opening of the lock, in particular by means of bump keys.

The invention

[0008] The present invention relates to a key pin for a

cylinder lock comprising an end part of a tapering shape, preferably a conically shape such as a frusto-conical shape, or alternatively hemispherical, suitable to be in abutment with a key when the key is inserted in a cylinder of the cylinder lock, wherein the key pin comprises a first pin part and a second pin part, the first pin part having a base part and a central protrusion extending from said base part, wherein said protrusion has a width (W1) which is smaller than the width of said base part, wherein the second pin part has a longitudinal extend of at least the longitudinal extend of the central protrusion and comprises a recess arranged to receive said protrusion, the second pin part having an outer width of substantially the same as the width of said base part.

[0009] The end part of the key pin is arranged on one of the first and the second pin part, preferably on the first pin part. The end part may be formed integrally in the pin part or alternatively be formed in a wear resistant hard metal.

[0010] By the term outer width of the base part and width of the second pin part is herein understood the width of the widest section of the pin part. The widest sections of the first and second pin parts are substantially of the same width, i.e. within 0.08, such as within 0.05 millimetres so that they fit into standard channels in cylinder locks of constant and uniform inner diameters.

[0011] The length of the protrusion is smaller than the length of second pin part comprising said recess so that the protrusion does not extent beyond the second pin part and comes into contact with the neighbouring pin in the pin assembly, i.e. the drive pin or, in case the lock is used in master keying, a spacer pin. For the function of the key pin according to the present invention, it is important that an impact from e.g. a bump key on the end part of the key pin causes the pin part having the end part to transfer momentum to the other pin part which then transfers momentum to the neighbouring pin. This will cause the two parts of the key pin to slide mutually along the protrusion and at least partly separate with the effect of elongating the key pin for a moment, thus blocking the shear line between the housing and the cylinder of the lock. The key pin according to the present invention will be effective against the use of bump keys as well as other types of unauthorized opening of a lock.

[0012] It is preferred that the key pin which consists of said first pin part and said second pin part only for simplicity of the key pin.

[0013] The protrusion is preferably a rotational symmetrical body, more preferably cylindrical in shape.

[0014] The base part comprises preferably a substantially annular base surface for abutting the second pin part.

[0015] The length of said protrusion represents preferably 20% - 70% such as about 25% - 50%, e.g. around 30-45% of the overall length of the first pin part. The length of the protrusion is preferably at least 50% such as at least 60% e.g. at least 80%, e.g. at least 90% of the length of the second pin part having the recess.

[0016] The length of the protrusion is preferably in the range of 2 to 5 millimetres, such as 2.5 to 4 millimetres. The base part has preferably a length in the range of 2 to 6 millimetres, such as 3 to 5 millimetres. The second pin part comprising the recess has preferably a length in the range of 1.5 to 6 millimetres, such as in the range of 2 to 4 millimetres.

[0017] The recess is preferably a through hole in the second pin part, but may alternatively be a blind hole. It is preferred that the recess is of a cylindrical shape.

[0018] Alternatively, the recess is of an at least partly tapering shape, so that the width of the recess is largest at the end facing towards the first pin part comprising the protrusion.

[0019] The clearance, i.e. the difference, between the width of said recess and the width of said protrusion is preferably in the range of 0.05 to 0.2 millimetres, which provides that the pin parts are allowed to pivot relatively to each other while the protrusion extends into the recess.

[0020] The present invention also relates to a cylinder lock comprising a housing and a cylinder arranged rotatable in said housing so as to allow rotation of the cylinder around a longitudinal axis of the cylinder when a key configured to unlock and lock said cylinder lock is inserted in said cylinder and turned, wherein said cylinder lock comprises a plurality of spring loaded pin assemblies arranged in channels of the cylinder lock, wherein each of said pin assemblies includes at least a key pin and a driver pin, which key pins and driver pins are arranged to be displaced in a channel of the cylinder lock when said key is inserted in the cylinder so as to allow rotation of said cylinder, wherein at least one of said key pins is a key pin according to the invention. It is preferred that at least two of said key pins are key pins according to the present invention, and it is furthermore preferred that at least one, more preferred at least two of the key pins of the cylinder lock that are different from the key pin according to the present invention so as to provide a cylinder lock having key pins and thus pin assemblies of different configuration, which causes the lock to be more difficult to open unauthorized, i.e. without the correct key.

[0021] The width of the channels is preferably substantially constant throughout that part of the channels where the key pin and the driver pin moves during operation of the lock, and it is also preferred that all of said channels of the lock have the same width.

[0022] The width of the base part of the first pin part and the outer width of the second pin part are preferably in the range of 0.05 to 0.2 millimetres smaller than the width of the channel in which they are arranged so as to allow for the pins to slide inside the channels.

[0023] The present invention furthermore relates to a set of key pins, in particular for retrofitting of cylinder locks, comprising at least seven, such as eight and preferably at least nine groups of key pins according to the present invention, wherein the key pins of each group have the same longitudinal extent and the key pins of different groups have different longitudinal extents.

Figures

[0024] Aspects of the present invention will be described in the following with reference to the figures in which:

- Fig. 1 is a side view of an assembled key pin according to the present invention,
- Fig. 2 shows the separated first and second pin part of the key pin of Fig. 1,
- Fig. 3 is a longitudinal section of the assembled key pin of Fig. 1,
- Fig. 4 is a longitudinal section of the partly separated first and second pin parts of the key pin of Fig. 1,
- Fig. 5 is a longitudinal section of the partly separated first and second pin parts of an alternative key pin according to the invention,
- Fig. 6 is a cross-section of a cylinder lock according to the present invention,
- Fig. 7 is a side view of a second embodiment of an assembled key pin according to the present invention,
- Fig. 8 shows a longitudinal section through a second pin part according to one embodiment of the invention,
- Fig. 9 shows a longitudinal section through a second pin part according to another embodiment of the invention, and
- Fig. 10 is a longitudinal section of a cylinder lock according to the present invention.

Detailed description

[0025] The key pin 4 shown in Figs. 1 to 4 is one embodiment of a key pin 4 according to the present invention. It consists of two parts, a first part 4a having a base part 6 and an end part 9 which is of a frusto-conical shape to fit with the notches of the key. The first part 4a of the key pin 4 also has a central protrusion 7 extending from one end of the body part 6 opposite the end part 9. The central protrusion 7 is formed as a cylinder and fits with the recess 8 of the second part 4b of the key pin 4 so that the two parts 4a, 4b are slidably connected in the longitudinal direction as shown in Fig. 4. When closely assembled as shown in Figs. 1 and 3, the end of the second part 4b rests on an annular surface 6a of the base part 6. This is the mutual position, i.e. closely assembled, that the two parts 4a, 4b of the key pin 4 are in when the key pin 4 is in use inside the cylinder lock 1. The force from the partly compressed spring 13a-13b will push the drive pin 5 towards the key pin 4 and thus ensure that the two key pin parts 4a, 4b are abutting. The protrusion 7 of the first pin part 4a has a longitudinal extent L2 that is shorter than the longitudinal extent of the second pin part 4b to ensure that uppermost part of the key pin 4 that is in abutment with the drive pin 5 is the second pin part 4b in the embodiment of Figs. 1 to 4, the alternative embod-

iment of Fig. 5 will be discussed below.

[0026] The cylinder lock 1 shown in Fig. 10 has a housing 2 in which a cylinder 3 is rotatable arranged. Six channels 11a-11f are formed in the housing 2 and the cylinder 3 of identical and constant diameters of 3 millimetres except for the lowermost part of the channels 11 a-11f in the cylinder 3 as seen in Fig. 6, where the channel 11a-11b is formed to accommodate the frustro-conical end part 9 of the key pin 4. Pin assemblies 10a-10b comprising a key pin 4 according to the invention are arranged in two of the channels 11 a-11 b, whereas pin assemblies 10c-10f comprising key pins 4 formed in one piece are arranged in the remaining four channels 11c-11f. The pin assemblies 10a-10f furthermore comprise each a drive pin 5 between the key pin 4 and the spring 13a-13f and each key pin 4 is selected from a series of nine different longitudinal extent L5 of the key pin 4 so that only a key with the correct height of the key notches will elevate the six key pins 4 to the level where the upper end of each key pin 4 is flush with the shear line between the housing 2 and the cylinder 3 and thus allow the cylinder 3 to be rotated freely in the housing 2.

[0027] When the key pin 4 of Figs. 1 to 4 is in use in a cylinder lock 1 as shown in Figs. 6 and 10, a sudden impact on the end part 9 of the key pin 9 from e.g. a bump key or from picking of the lock 1 will result in a transfer of momentum from the first pin part 4a to the second pin part 4b via the annular surface 6a on which the second pin part 4b rests and a further transfer of momentum from the second pin part 4b to the driver pin 5 of the same pin assembly 10a-10b as shown in Fig. 6, whereby the second pin part 4b will separate from the first pin part 4a and the longitudinal extent of the key pin 4 according to the invention will be elongated and the shear line between the housing 2 and the cylinder 3 will remain blocked by the key pin 4. The remaining pin assemblies 10c-10f will react differently from the two first assemblies 10a-10b and it will be most difficult to provide a simultaneous impact to all six pin assemblies 10a-10f of the cylinder lock 1 by means of a bump key that will allow the cylinder 3 to be free to rotate in the housing 2.

[0028] The key pin 4 shown in Fig. 5 is a first alternative embodiment of a key pin 4 according to the present invention. Here the end part 9 of the key pin 4 for engaging the notch of the key is formed on the second pin part 4b, whereas the first pin part 4a is arranged to be in abutting contact with the drive pin 5 of the pin assembly 10a-10f. Although this embodiment of the key pin 4 according to the present invention in principle operates similar to the first embodiment shown in Figs. 1 to 4, the key pin 4 of Fig. 5 would have a different reaction to an impact from a bump key due to the different distribution of mass between the first and second pin parts 4a, 4b, and a particular embodiment of the lock 1 according to the present invention is equipped with at least one key pin 4 of the embodiment of Figs. 1 to 4 and at least one key pin 4 of the embodiment of Fig. 5, so as to further prevent an unauthorized opening of the lock 1 by means of a bump

key.

[0029] The present invention may be combined with other known measures to hinder unauthorized opening of the lock 1. In the embodiment of the key pin 4 shown in Fig. 7, the second pin part 4b is formed as a so-call spool pin with a reduction of the outer diameter W3 in the central region, so that only the parts near the upper and lower end of the second pin part 4b has the outer diameter W3 matching the inner diameter of the channel 10a-10f with a clearance of about 0.1 millimetre. This will allow the second pin part 4b to be caught at the shear line between the housing 2 and the cylinder 3 if a torque is applied to the cylinder and the key pin 4 is impacted with a bump key or a lock pick inserted into the lock 1 and thus block the turning of the cylinder 3. A spool pin is also shown in Fig. 6 as the drive pin 5 of the pin assembly 10a-10f with a similar effect. Other known forms of safety lock pins, such as mushroom pins and serrated pins may also be used together with the key pin 4 of the present invention or as part of the design of the first or the second pin part 4a, 4b.

[0030] In particular embodiments, the second pin part 4b according to the present invention may be provided with a recess 8 with a shape deviating from the cylindrical shape as shown in Fig. 8, where the upper part 20 of the inner wall of the recess 8 in the second pin part 4b is formed with a cylindrical shape with an inner diameter W6 being about 0.1 millimetre larger than the outer diameter W1 of the cylindrical protrusion 7 of the corresponding first pin part 4a, and the lower part of the inner wall 21 of the recess 8 is formed with a conical shape with the same centre line LA1 as the part of the recess 8 of a cylindrical shape, so that the diameter W5 of the opening of the recess 8 towards the first pin part 4a is larger than the diameter W6 of the cylindrical part of the recess 8. This will allow the two pin parts 4a, 4b to tilt slightly when they are in the partly separated state as shown in Figs. 4 and 6 and to temporarily lock in that mutually tilted position if the key pin crosses the shear line between the housing 2 and the cylinder 3 when torque is applied to the cylinder 3 during an attempted unauthorized opening of the lock 1. The blocking of the shear line between the housing 2 and the cylinder 3 will remain until the torque on the cylinder 3 is released and the key pin 4 together with the other key pins 4 of the lock 1 will return to the basic position.

[0031] The ability of the first and second pin part 4a, 4b to tilt mutually when partly separated may be enhanced if the second pin part 4b as shown in Fig. 9 furthermore is provided with a reduction of the outer diameter W3 at the opposite end of the second pin part 4b of the enlarged opening W5 of the recess 8. Thus, the outer shape of the second pin part 4b of Fig. 9 consist of a cylindrical part with an outer diameter W3 and a frustro-conical part which end diameter W3_1 is less than the outer diameter W3 of the cylindrical part.

List**[0032]**

1. Cylinder lock
2. Housing
3. Cylinder
4. Key pin
- 4a. First part of key pin
- 4b. Second part of key pin
5. Drive pin
6. Base part of first key pin part
- 6a. Annular base surface
7. Protrusion
8. Recess
9. End part of key pin
- 10, 10a-10f. Pin assemblies
- 11, 11a-11f. Channels
- 12a-12f. Cover pins
- 13a-13f. Springs

- L1 Longitudinal extent of first key pin part
- L2 Longitudinal extent of protrusion
- L3 Longitudinal extent of base part
- L4 Longitudinal extent of second key pin part
- L5 Longitudinal extent of key pin
- LA1 Centre line of second key pin part

- W1 Width of protrusion
- W2 Width of base part
- W3 Width of second key pin part
- W3_1 Reduced width of second key pin part
- W5 Width of opening of recess
- W6 Width of recess

Claims

1. A key pin (4) for a cylinder lock (1) comprising an end part (9) of a tapering shape, preferably a conically shape such as a frusto-conical shape, suitable to be in abutment with a key when the key is inserted in a cylinder (3) of the cylinder lock (1),
characterized in that
the key pin (4) comprises a first pin part (4a, 4b) and a second pin part (4a, 4b), the first pin part (4a, 4b) having a base part (6) and a central protrusion (7) extending from said base part (6), wherein said protrusion (7) has a width (W1) which is smaller than the width (W2) of said base part (6),
wherein the second pin part (4a, 4b) has a longitudinal extend (L4) of at least the longitudinal extend (L2) of the central protrusion (7) and comprises a recess (8) arranged to receive said protrusion (7), the second pin part (4a, 4b) having an outer width (W3) of substantially the same magnitude as the width (W2) of said base part (6).

2. A key pin (4) according to claim 1, which consists of said first pin part (4a, 4b) and said second pin part (4a, 4b).

3. A key pin (4) according to claim 1 or 2, wherein said protrusion (7) is a rotational symmetrical body, preferably cylindrical in shape.

4. A key pin (4) according to any of the preceding claims, wherein the base part (6) comprises a substantially annular base surface (6a) for abutting the second pin part (4a, 4b).

5. A key pin (4) according to any of the preceding claims, wherein said recess (8) is a through hole in the second pin part (4a, 4b).

6. A key pin (4) according to any of the preceding claims, wherein said recess (8) is cylindrical in shape.

7. A key pin (4) according to any of the preceding claims, wherein said recess (8) is of an at least partly tapering shape, so that the width (W5) of the recess (8) is largest at the end facing towards the first pin part (4a, 4b) comprising the protrusion (7).

8. A key pin (4) according to any of the preceding claims, wherein the clearance between the widths (W5) of said recess (8) and the width (W1) of said protrusion (7) is in the range of 0.05 to 0.2 millimetres.

9. A cylinder lock (1) comprising a housing (2) and a cylinder (3) arranged rotatable in said housing (2) so as to allow rotation of the cylinder around a longitudinal axis of the cylinder (3) when a key configured to unlock and lock said cylinder lock (1) is inserted in said cylinder (3) and turned,
wherein said cylinder lock (1) comprises a plurality of spring loaded pin assemblies (10, 10a-10f) arranged in channels (11, 11 a-11f) of the cylinder lock (1), wherein each of said pin assemblies (10, 10a-10f) includes at least a key pin (4) and a driver pin (5), which key and driver pins (4, 5) are arranged to be displaced in a channel (11, 11 a-11f) of the cylinder lock (1) when said key is inserted in the cylinder so as to allow rotation of said cylinder (3),
characterized in that
at least one of said key pins (4) is a key pin according to any of claims 1 to 8.

10. A cylinder lock (1) according to claim 9, wherein the width of the channels (11, 11a-11f) is substantially constant throughout that part of the channels (11, 11a-11f) where the key pin (4) and the driver pin (5) moves during operation of the lock (1).

11. A cylinder lock (1) according to claim 10, wherein all of said channels (11, 11a-11f) of the lock (1) have the same width.
12. A cylinder lock (1) according to any of claims 9 to 11, wherein the width (W3) of the base part (6) of the first pin part (4a) and the outer width (W3) of the second pin part (4b) are in the range of 0.05 to 0.2 millimetres smaller than the width of the channel (11, 11a-11f) in which they are arranged.
13. A set of key pins (4) comprising at least seven groups of key pins (4) according to any of claims 1-8, wherein the key pins (4) of each group have the same longitudinal extent (L5) and the key pins (4) of different groups have different longitudinal extents.

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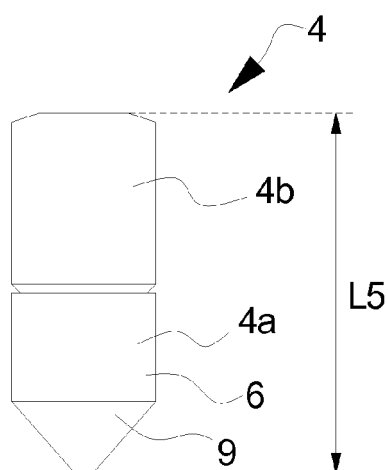


Fig. 1

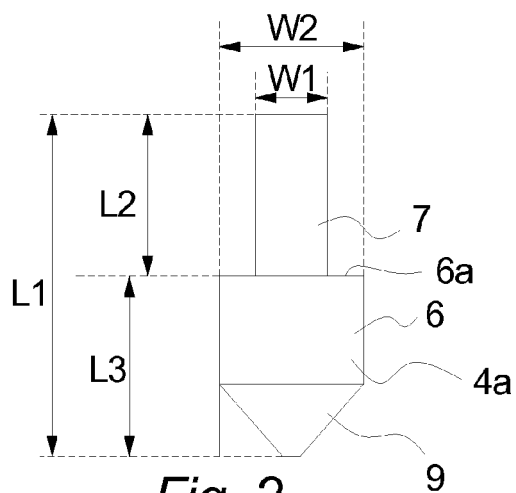
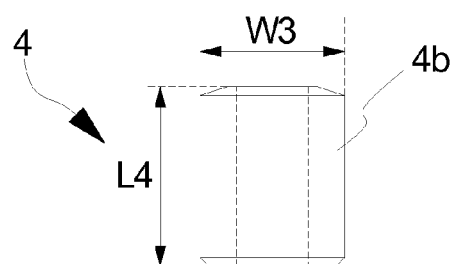


Fig. 2

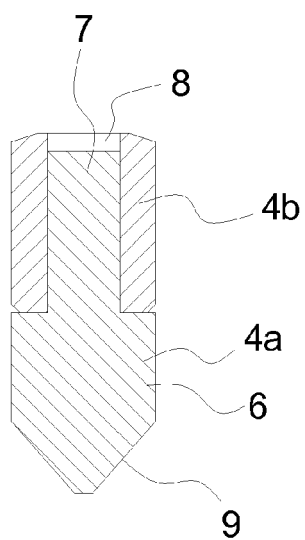


Fig. 3

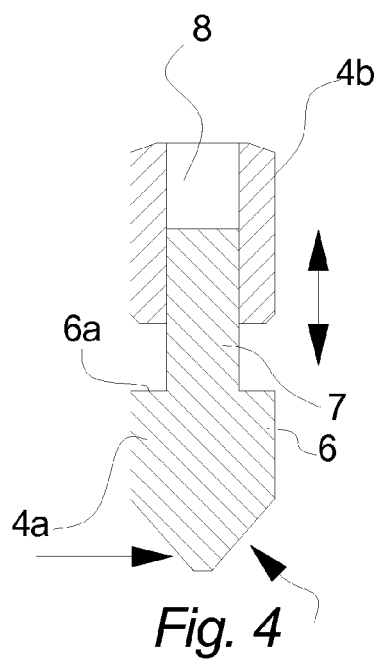


Fig. 4

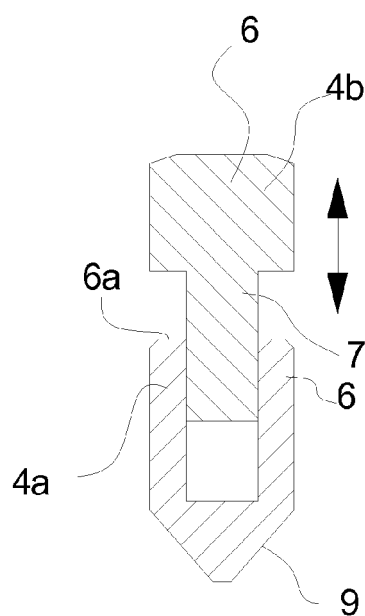


Fig. 5

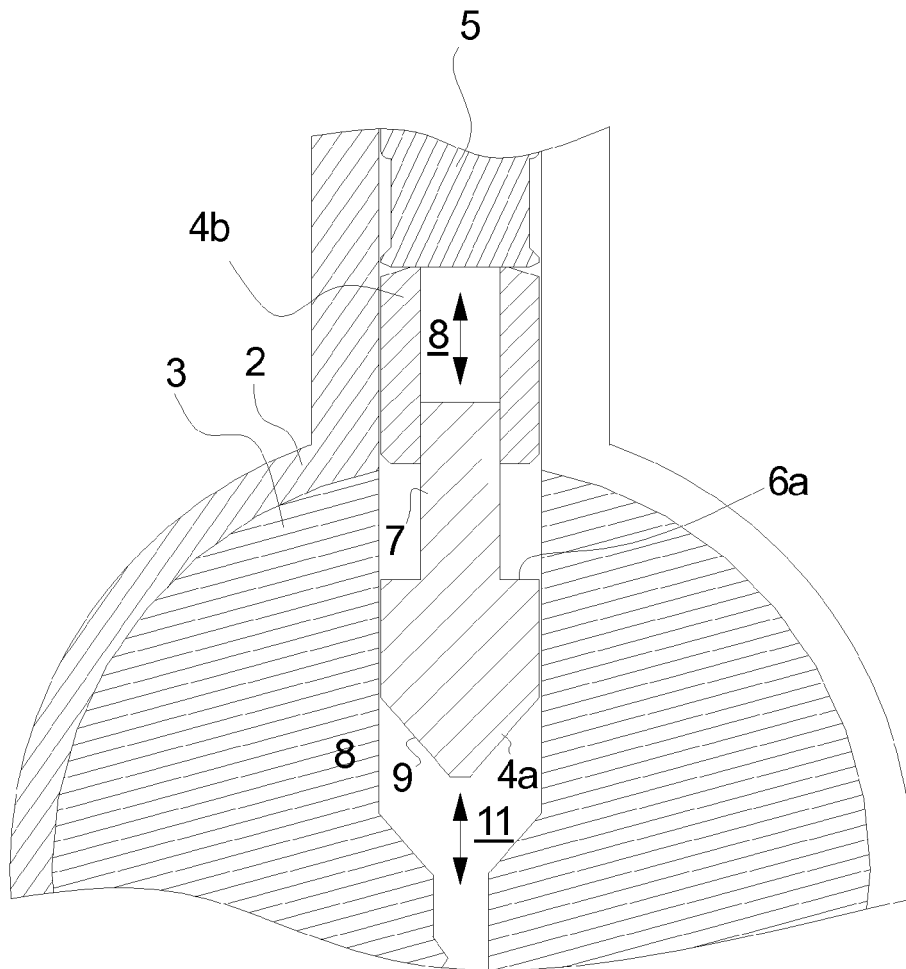


Fig. 6

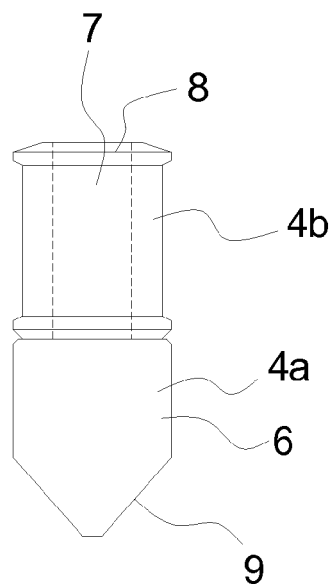
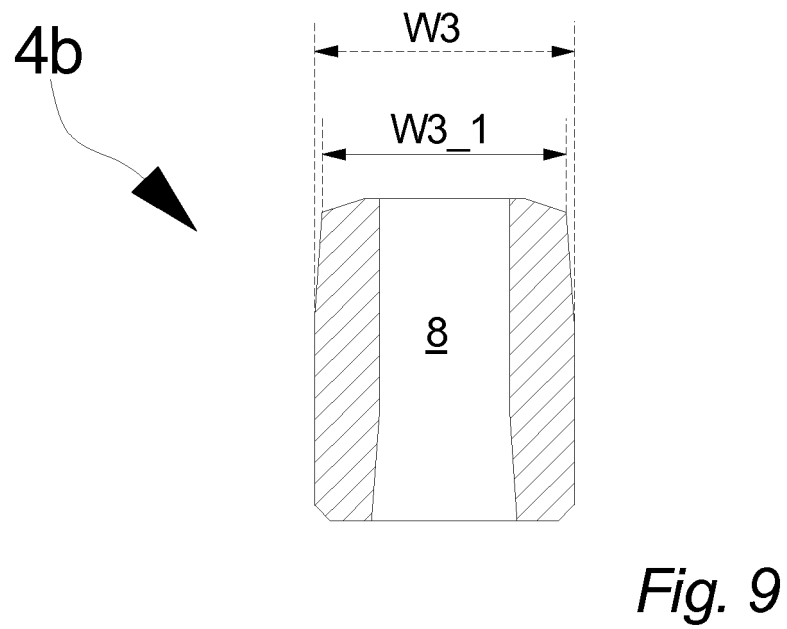
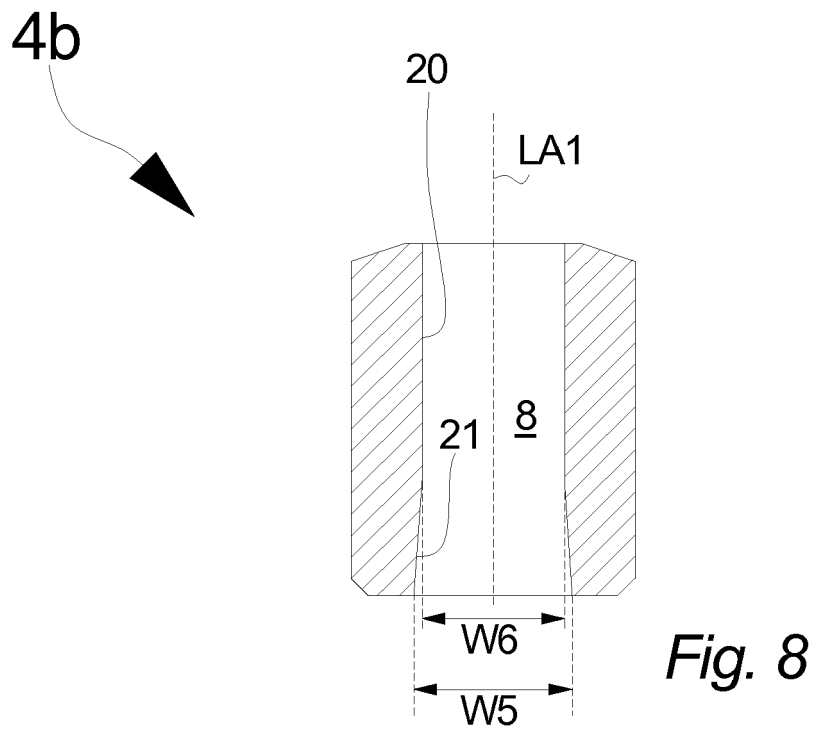


Fig. 7



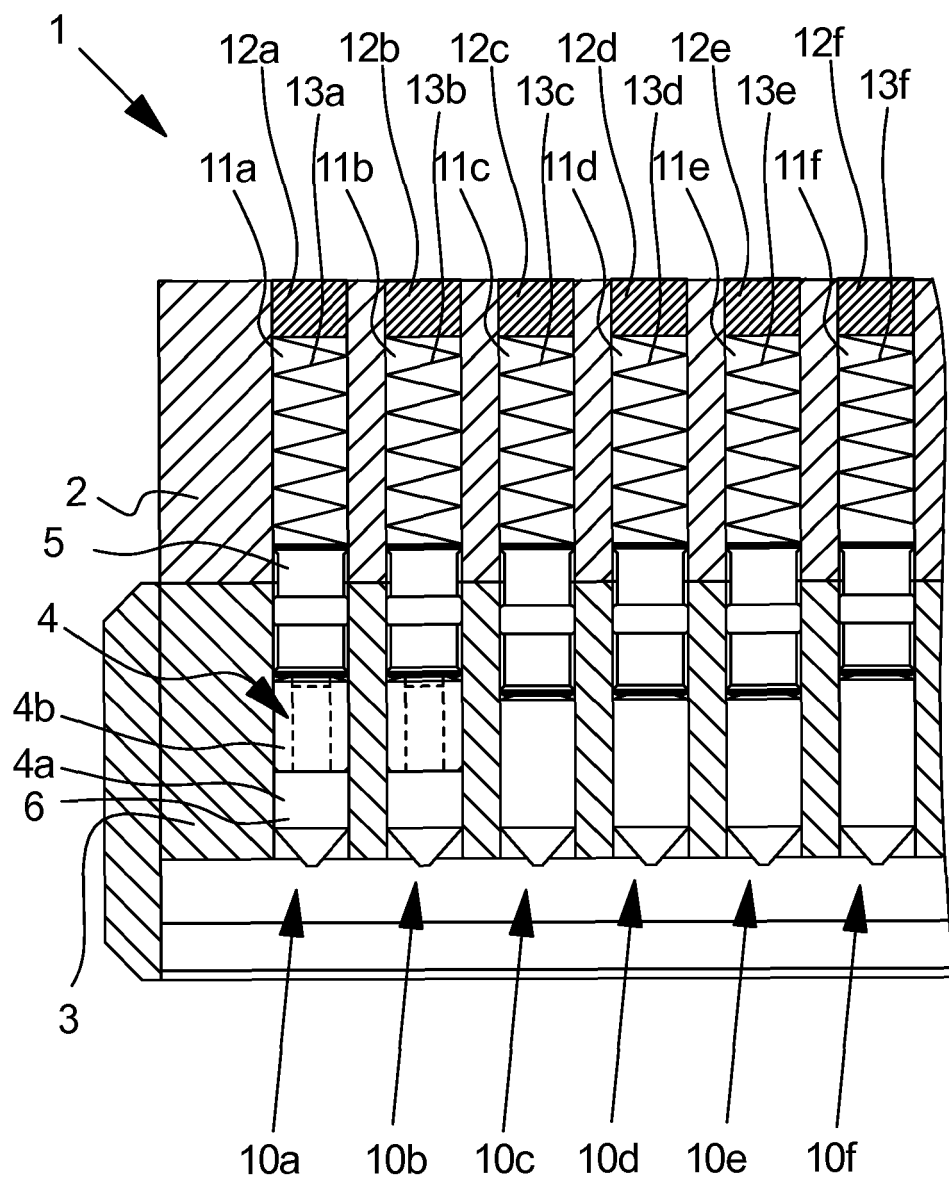


Fig. 10



EUROPEAN SEARCH REPORT

Application Number
EP 15 16 7548

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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		19 October 2015	Westin, Kenneth
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REFERENCES CITED IN THE DESCRIPTION

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