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(54) **Title:** LOCK AND RELATED KEY

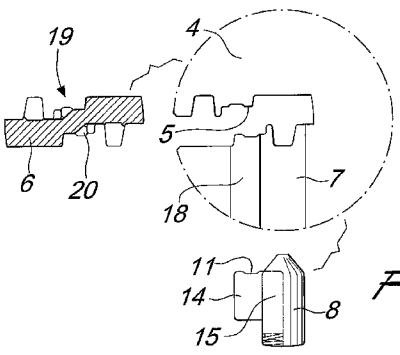


Fig. 9

(57) **Abstract:** A lock (1) with related key of the type comprising a stator (2) provided with a substantially cylindrical longitudinal cavity (3) for accommodating a rotor (4) with a longitudinal recess (5) for the insertion of a coded key (6), the rotor (4) and the stator (2) comprising a plurality of channels (7) which are substantially aligned and face each other when the lock (1) is in the closed configuration, channels (7) for accommodating respective pins (8), complementary pins (9) and any elastic means (7a) meant to prevent the rotation of the rotor (4) within the stator (2) in the absence of the key (6) within the longitudinal recess (5). At least one of the pins (8) has at least one substantially lateral protruding tab (10) which has an upper edge (11) which is suitably contoured and the key (6) has a cross- section which is shaped complementarily to the cross-section of the longitudinal recess (5) when the pins (8), at the regions that are aligned with the tab (10), are in the configuration for disengaging the stator (2) and the rotor (4), accommodating with contact the end of the pins (8) within respective coding recesses (12) and the contoured edge (11) of the corresponding tab (10) on appropriately provided complementarily shaped portions (13). At least one (14) of the lateral tabs (10) which protrude from the pin (8) can move with respect to the pin (8) and has at least one portion (15) which is stably related with the pin (8).

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LOCK AND RELATED KEY

Technical field

The present invention relates to a lock with a related key suitable for installation in doors, main entrance doors, and in all applications requiring closure by means of a key.

Background art

There are various kinds of lock with respective keys which close securely a door by using several different refinements to contrast any break-in attempts.

Among cylinder locks, there is considerable interest for those which have a substantially flat seat for accommodating the key (and therefore also a substantially flat related key) and in which the pins meant to detect the key act substantially transversely with respect to the seat (and therefore act on flat portions of the key).

These locks are normally identified by the type of key related therewith and are termed flat-key locks.

The risk of break-in is avoided by means of the complex coding of the lock and key: particular break-in actions allow to actuate the pins in order to open the lock even in the absence of the original key.

In view of the small size of a lock of the type being considered, it is substantially not possible to increase the number of pins to ensure greater security against break-ins.

Likewise, it is complicated to manage pins with complex shapes, since such shapes may prevent correct access of the key within the lock.

Disclosure of the invention

The aim of the present invention is to provide a lock with related key in which the pins have particular break-in resistant shapes and in which the shape of the pins is perfectly compatible with the access of the key.

Within this aim, an object of the present invention is to provide a lock with a related key which has traditional dimensions and is provided with

portions suitable to increase the difficulty of any break-in attempt.

Another object of the present invention is to provide a lock with a related key which has a low cost, is relatively simple to provide in practice and is safe in application.

This aim and these and other objects which will become better apparent hereinafter are achieved by the present lock with related key of the type comprising a stator provided with a substantially cylindrical longitudinal cavity for accommodating a rotor with a longitudinal recess for the insertion of a coded key, said rotor and said stator comprising a plurality of channels which are substantially aligned and face each other when the cylinder is in the closed configuration, channels for accommodating respective pins, complementary pins and any elastic means meant to prevent the rotation of the rotor within the stator in the absence of the key within said longitudinal recess, at least one of said pins having at least one substantially lateral protruding tab which has an upper edge which is suitably contoured and said key having a cross-section which is shaped complementarily to the cross-section of the longitudinal recess when said pins, at the regions that are aligned with said tab, are in the configuration for disengaging the stator and the rotor, accommodating with contact the end of said pins within respective coding recesses and the contoured edge of the corresponding tab on appropriately provided complementarily shaped portions, characterized in that at least one of said lateral tabs which protrude from said pin can move with respect to said pin and has at least one portion which is stably related with said pin.

Brief description of the drawings

Further characteristics and advantages of the present invention will become better apparent from the following detailed description that follows of a preferred but not exclusive embodiment of a lock with related key, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a side view of the cylinder of a lock with corresponding key according to the invention;

Figure 2 is a front view of a lock according to the invention;

Figure 3 is a front view of a lock according to the invention in the closed configuration;

Figure 4 is a front view of a lock according to the invention with the corresponding key inserted;

Figure 5 is a partially sectional side view of a lock according to the invention in which the corresponding key is inserted;

Figure 6 is a front view of an embodiment of a particular pin of a lock according to the invention with the corresponding key arranged laterally adjacent;

Figure 7 is a front view of an embodiment of a particular pin of a lock according to the invention with the corresponding key arranged laterally adjacent;

Figure 8 is a side view of a second possible embodiment of a pin of a lock according to the invention;

Figure 9 is an exploded front view of a lock according to the invention with a corresponding key;

Figure 10 is a partial front view of a lock according to the invention;

Figure 11 is a partially sectional side view of a lock according to the invention in which the corresponding key is inserted.

Ways of carrying out the invention

With reference to the figures, the reference numeral 1 generally designates a lock with a corresponding key.

The lock 1 comprises a stator 2 which is provided with a substantially cylindrical longitudinal cavity 3 for accommodating a rotor 4 with a longitudinal recess 5 for the insertion of a coded key 6.

The rotor 4 and the stator 2 comprise a plurality of channels 7 which are substantially aligned and face each other when the cylinder 1 is in the

closed configuration.

The containment channels 7 are designed to accommodate respective pins, complementary pins 9 and optional elastic means 7a: the purpose of the pins 8 and of the complementary pins 9 is to prevent the rotation of the rotor 4 within the stator 2 in the absence of the key 6 within the longitudinal recess 5.

At least one of the pins 8 has at least one substantially lateral tab 10 which protrudes and has an appropriately contoured upper edge 11.

The key 6 has a cross-section which is complementary with respect to the cross-section of the longitudinal recess 5, particularly when the pins 8 are in the configuration for uncoupling the stator 2 and the rotor 4: i.e., when the shear line between the pin 8 and the complementary pin 9 is aligned with the shear line between the stator 2 and the rotor 4. The key 6 therefore accommodates by contact the end of pins 8 in respective coding recesses 12 and the contoured edge 11 of the corresponding tab 10 on appropriately provided complementary shaped portions 13.

At least one of the lateral tabs 10 which protrude from the pin 8 can move with respect to said pin 8 and has at least one portion 15 which is stably related with the pin 8.

According to particular constructive embodiment of assured practical interest in application, a movable lateral tab 14, which protrudes from the pin 8, can perform a translational motion with respect to said pin 8, having at least one portion 15 which is guided within a respective passage 16 of said pin 8.

In particular, the pin 8, seen in cross-section, must be C-shaped, with an axial longitudinal cavity which constitutes the passage 16 to accommodate the portion 15 which is shaped complementarily with respect to it; in the figure, the portion 15 and the passage 16 both have a substantially cylindrical shape.

In order to ensure optimum operation of the lock 1 according to the

invention, the elastic means 7a comprise respective elastic means 16a which have an axial action and are substantially related with the portion 15 of the tab 14 to elastically force it toward the top of the pin 8, while the remaining part of the means 7a is related with the pin 8.

In particular, with reference to Figure 5, it can be seen that the complementary pin 9 also is substantially tubular (with dimensions which are similar to those of the pin 8) and accommodates a rod 21: axially acting elastic means are interposed above the head 22 of the rod 21 and are designed to move the entire pin 8 and the parts that are rigidly coupled thereto, while the means 16a are accommodated below the head 22, to the bottom of the channel 7, and their elastic contribution is also transferred to the tab 14.

According to a further constructive embodiment of assured interest in practice and in application, the movable lateral tab 14, which protrudes from the pin 8, can rotate with respect to said pin 8, having at least one portion 15 which is pivoted about a fixed axis 17 which is rigidly coupled to the pin 8.

In this case, said tab 14 can comprise a respective elastic element (not shown in the figure) for forcing the rotation of said tab 14 with respect to the axis 17.

The channels 7 of the rotor 4 have a lateral slot 18 for slidingly accommodating the tab 10 of the pins 8.

One of the tabs 10, and particularly the tab 14, can have on its upper surface a multiple of laterally adjacent abutments 19 which constitutes the contoured portion 11; the abutments 19 are complementary with respect to respective thickness variations which constitute abutment portions 16, which constitute the complementarily shaped portions 13 of the cross-section of the key 6, and are related therewith when the key 6 is inserted in the longitudinal recess 5.

The part of the key 6 that is provided with the complementarily shaped abutment portions 13 is substantially the part along the longitudinal

axis: this occurs because the pins 8 act against the substantially central surface of the flat face toward which they are pushed by the elastic action of the means 7a.

Depending on the embodiment to be adopted, even all the pins 8 (or only some, depending on the observed constructive requirements) can be provided with a fixed lateral tab 10 or movable lateral tab 14, and the key 6 can thus have a succession of parts which are provided with complementarily shaped portions 13 distributed in a substantially longitudinal direction.

From a manufacturing standpoint, it is appropriate to note that the fixed tabs 10 and/or movable tabs 14 can also be two (one for each type or both fixed 10 or both movable 14), provided, on the respective upper rim, with specific contoured abutment edges 11.

In this case, the key 6 must have a profile which comprises, on each of the mutually opposite coded faces, two complementarily shaped portions 13 which are shaped complementarily with respect to the respective contoured edges 11 for the abutment of the pairs of fixed tabs 10 and/or movable tabs 14 which are rigidly coupled to the pin 8.

According to embodiments which are complex and difficult to provide in practice (but have excellent levels of security against break-ins and tampering), the fixed tabs 10 and/or movable tabs 14 can be a plurality, even only partly provided with the respective contoured edge 11.

In this case, the key 6 must have a profile which comprises, on each of the mutually opposite coded faces, a plurality of complementarily shaped portions 13 which are shaped complementarily with respect to the respective contoured abutment edges 11.

The part of the key 6 provided with the complementarily shaped abutment portions 11, i.e., the one arranged substantially along the longitudinal axis of said key 6, can comprise at least one movable element.

Said mobility can also be only partial, for example if the movable

element is constituted by a small plate which is pivoted within a through opening provided in said key 6.

It is necessary to associate with the movable element a respective pin 8 which is meant to move it (therefore a pin 8 whose shape and dimensions are dedicated for this purpose) in the configuration in which protrudes from the contour of the key 6 by way of the action of the elastic means 7a.

It is appropriate to note that according to an embodiment of assured practical interest, shown in Figure 11, it is possible to use a pin 8 and the respective lateral tab 14 provided in two separate parts which are mutually detached and both of which side within a same channel 7 and are forced elastically toward the longitudinal recess 5 by way of the action of respective elastic means 7a, which is aligned with the pin 8, and 7b, which is aligned with the lateral tab 14.

It has thus been shown that the invention achieves the intended aim and objects.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

All the details may furthermore be replaced with other technically equivalent ones.

In the exemplary embodiments shown, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

In practice, the materials used, as well as the shapes and the dimensions, may be any according to the requirements without thereby abandoning the scope of the protection of the appended claims.

CLAIMS

1. A lock with related key of the type comprising a stator (2) provided with a substantially cylindrical longitudinal cavity (3) for accommodating a rotor (4) with a longitudinal recess (5) for the insertion of a coded key (6), said rotor (4) and said stator (2) comprising a plurality of channels (7) which are substantially aligned and face each other when the lock (1) is in the closed configuration, channels (7) for accommodating respective pins (8), complementary pins (9) and any elastic means (7a) meant to prevent the rotation of the rotor (4) within the stator (2) in the absence of the key (6) within said longitudinal recess (5), at least one of said pins (8) having at least one substantially lateral protruding tab (10) which has an upper edge (11) which is suitably contoured and said key (6) having a cross-section which is shaped complementarily to the cross-section of the longitudinal recess (5) when said pins (8), at the regions that are aligned with said tab (10), are in the configuration for disengaging the stator (2) and the rotor (4), accommodating with contact the end of said pins (8) within respective coding recesses (12) and the contoured edge (11) of the corresponding tab (10) on appropriately provided complementarily shaped portions (13), characterized in that at least one (14) of said lateral tabs (10) which protrude from said pin (8) can move with respect to said pin (8) and has at least one portion (15) which is stably related with said pin (8).

2. The lock according to claim 1, characterized in that at least one of said lateral tabs (14) which protrude from said pin (8) can perform a translational motion with respect to said pin (8), having at least one portion (15) which is guided within a respective passage (16) of said pin (8).

3. The lock according to claim 2, characterized in that said pin (8), seen in cross-section, is C-shaped and has an axial longitudinal cavity, which constitutes said passage (16) for accommodating the portion (15) which is shaped complementarily with respect thereto.

4. The lock according to claim 3, characterized in that said elastic

means (7a) comprise respective elastic means (16a) which have an axial action and are substantially related with said portion (15) of the tab (14) in order to force it elastically toward the top of the pin (8), while the remaining part of the means (7a) is related with the pin (8).

5. The lock according to claim 1, characterized in that at least one of said lateral tabs (14) which protrude from said pin (8) can rotate with respect to said pin (8) and has at least one portion (15) which is pivoted about a fixed axis (17) which is rigidly coupled to said pin (8).

6. The lock according to claim 5, characterized in that it comprises an elastic element for forcing the rotation of said tab (14) with respect to said axis (17).

7. The lock according to claim 1, characterized in that at least the rotor (4) has a lateral slot (18) for slidingly accommodating said tab (14) of said pins (8).

8. The lock according to one or more of the preceding claims, characterized in that the part of said key (6) that lies substantially along the longitudinal axis is provided with complementarily shaped abutment portions (13).

9. The lock according to one or more of the preceding claims, characterized in that all the pins (8) are provided with a lateral tab (10), at least one tab being movable (14), and said key (6) has a succession of parts provided with complementarily shaped portions (13) which are distributed in a substantially longitudinal direction.

10. The lock according to one or more of the preceding claims, characterized in that each pin (8) and the respective lateral tab (14) are provided in two separate and mutually spaced parts, both of which can slide within a same channel (7) and are forced elastically toward the longitudinal recess (5) by way of the action of respective elastic means, of which the means (7a) are aligned with the pin (8) and the means (7b) are aligned with the lateral tab (14).

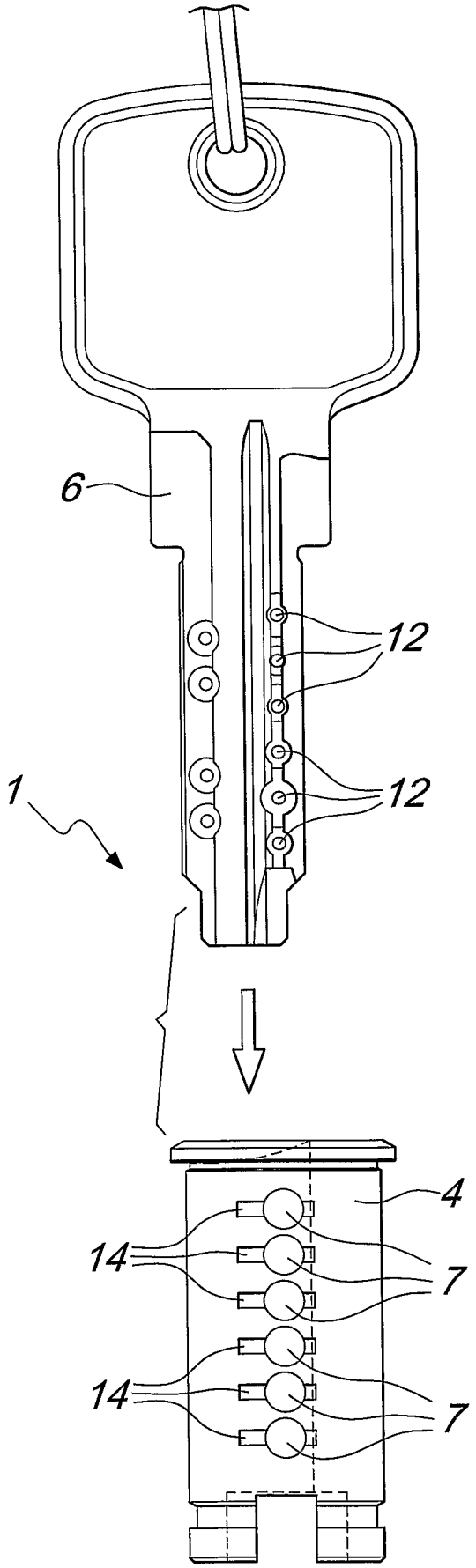


Fig. 1

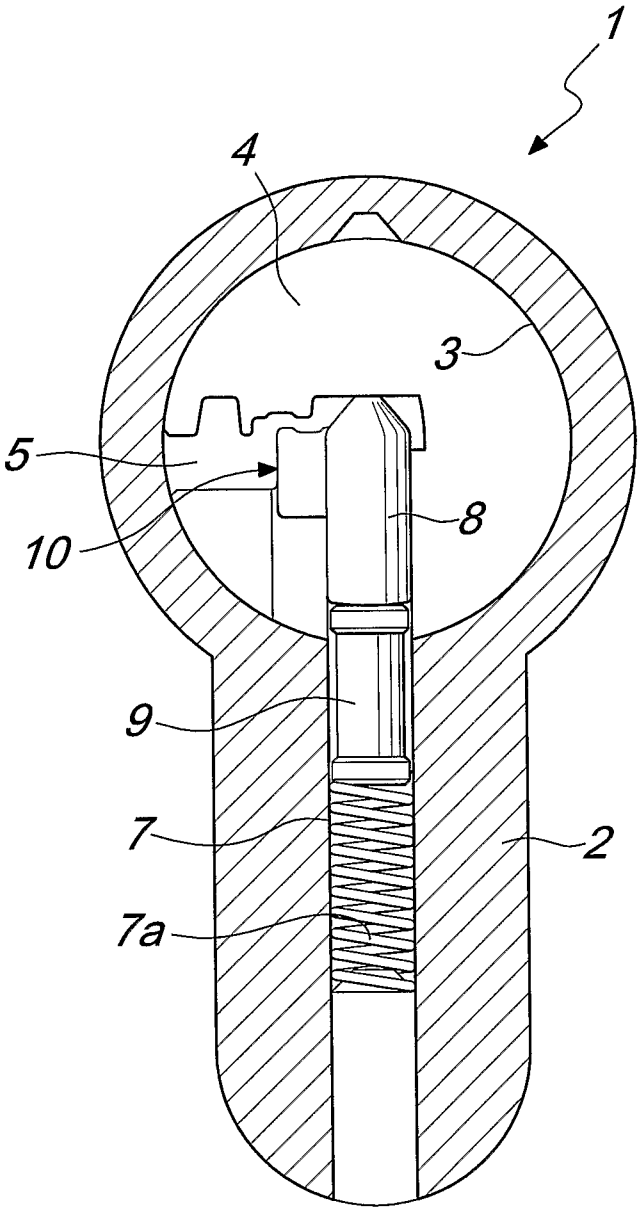


Fig. 2

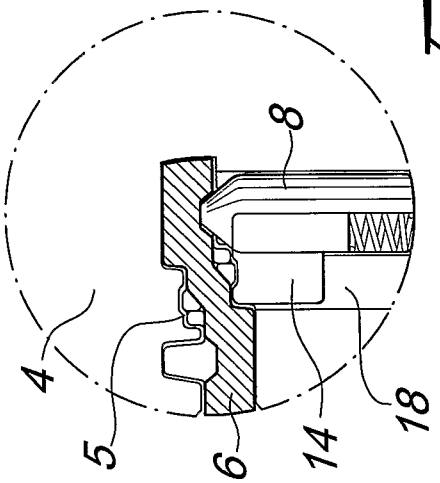


Fig. 4

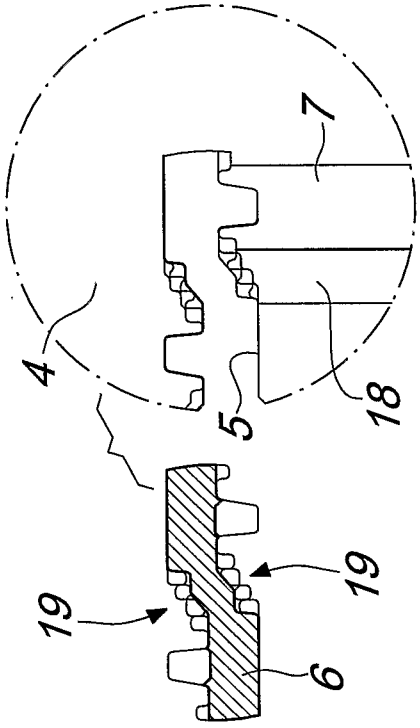


Fig. 10

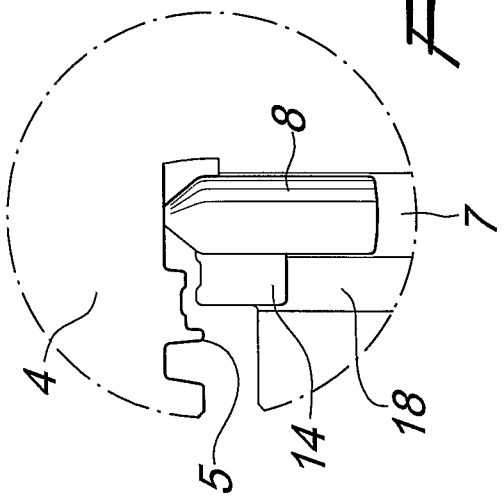


Fig. 3

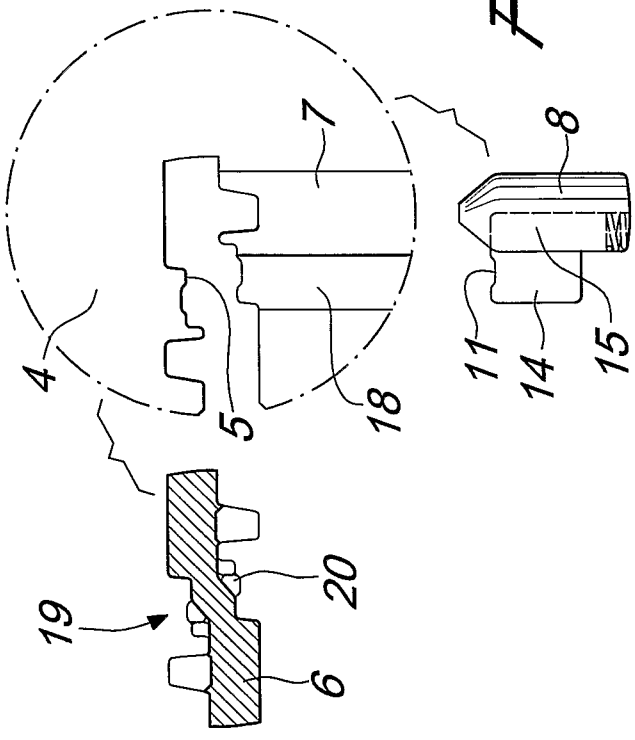


Fig. 9

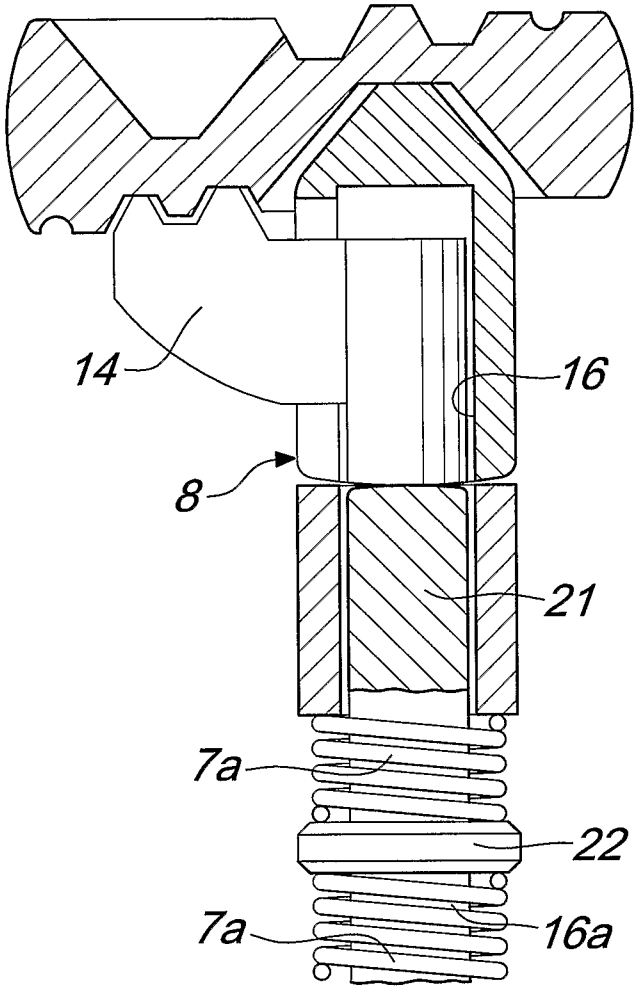


Fig. 5

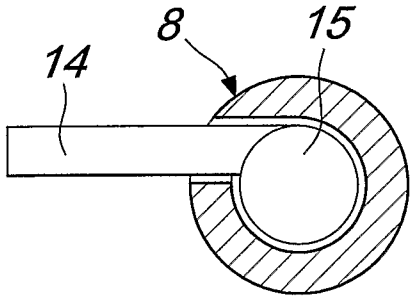


Fig. 7

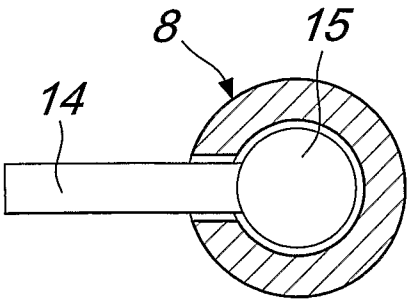


Fig. 6

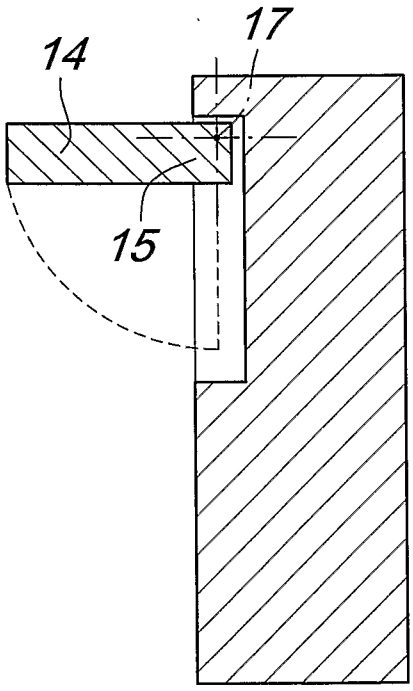


Fig. 8

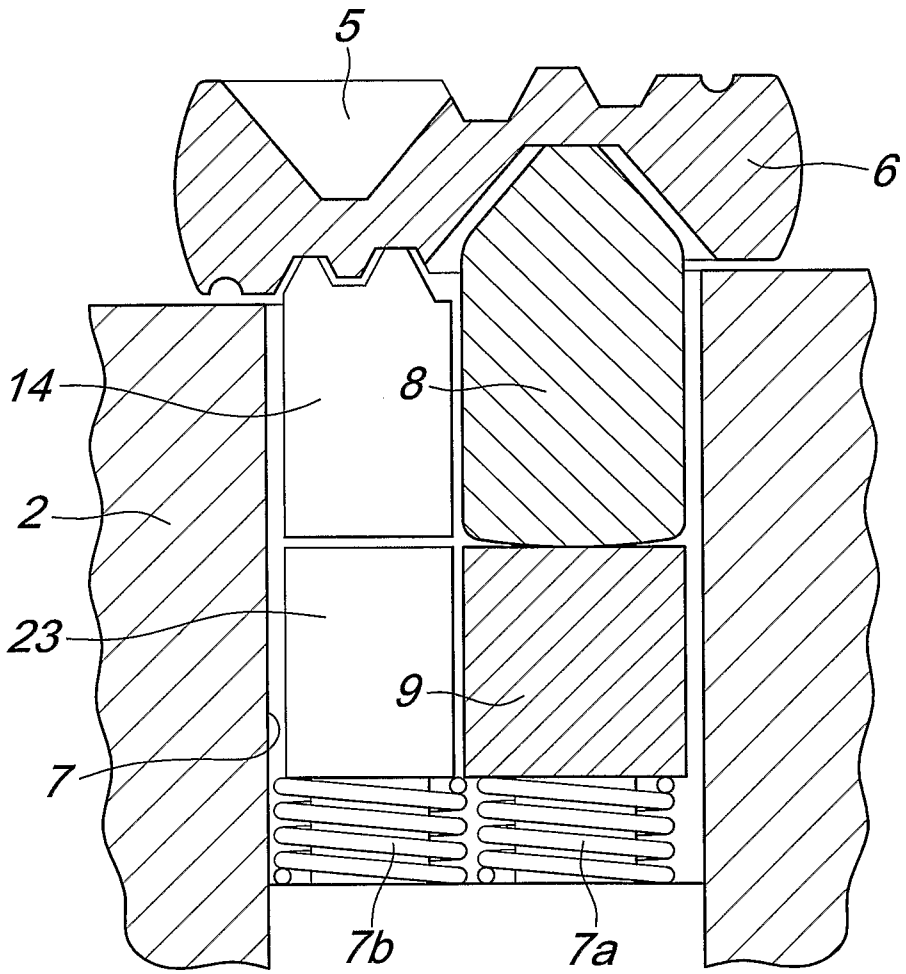


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2007/000572

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05B27/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2004/048724 A (MUL T LOCK TECHNOLOGIES LTD) 10 June 2004 (2004-06-10) abstract	1
A	CA 2 298 152 A1 (LAM) 9 August 2001 (2001-08-09) the whole document	1
A	US 5 067 335 A (WIDEN) 26 November 1991 (1991-11-26) figures	1
A	US 3 818 732 A (TRIA L ET AL) 25 June 1974 (1974-06-25) figures	1

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☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
27 May 2008	05/06/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Van Beurden, Jason

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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