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(54) Title: BREAK-IN RESISTANT LOCK

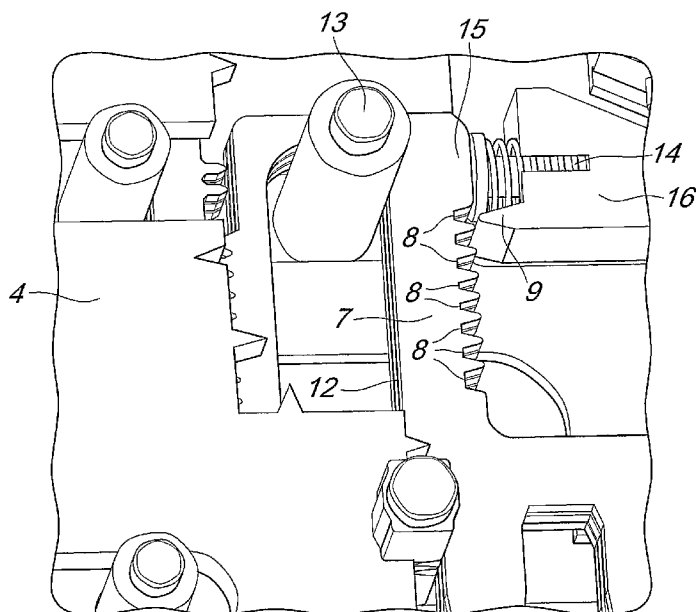


Fig. 2

(57) Abstract: A break-in resistant lock (1), of the type which comprises a box-like body (2) for accommodating a plurality of contoured plates (3) provided with a respective portion which is suitable for detachable engagement on a corresponding area of a rod (4) which can perform a translational motion and supports, at its free end (5), at least one bolt (6) which can retract monolithically with the rod (4). The plates (3) can perform a vertical translational motion by way of the action of the key and release, when they are raised, the translational motion of the rod (4) and the bolts (6) for their retraction and protrusion. At least one of the plates (3) comprises at least one area (7) provided with at least one seat (8) which is aligned and proximate to at least one protrusion (9) which is shaped substantially complementarily with respect to the shape of the seat (8). The at least one plate (3) provided with the at least one seat (8) is able to oscillate, about a guiding pivot (10) rigidly coupled to the box-like body (2), from a first configuration for mutual engagement of the at least one seat (8) with the respective at least one protrusion (9), as a consequence of external break-in actions aimed at retracting the rod (4) and the bolts (6), in which translational motion of the plates (3) is not allowed and therefore the rod

(4) is locked, to a second inactive configuration, in which the seat (8) and the protrusion (9) are spaced and the translational motion of the plates (3) is free and therefore the rod (4) can be extracted and retracted.

BREAK-IN RESISTANT LOCK

Technical field

The present invention relates to a break-in resistant lock particularly of the type which can be operated by means of twin-blade keys.

5 Background art

Locks associated with twin-blade keys are constituted by a main box-like body provided with a seat (which is arranged substantially transversely) suitable for the insertion of the key.

The key, once inserted, is arranged so that its coded portion is aligned
10 with a plurality of coding plates (normally termed tumblers) which can perform a partial translational motion along preset directions.

The rotation of the key in the seat entails a movement of the plates (tumblers), which is matched by the disengagement of a rod (which is normally engaged by interference on the plates); such rod can thus be made
15 to perform a translational motion by the rotary motion of the key in the seat.

The bolts are stably coupled on the front portion of the rod: the translational motion of the rod entails the protrusion of the bolts from the front edge of the lock, with consequent stable engagement of the bolts in the receptacles of the jamb, ensuring the correct closure of the door in which the
20 lock is installed.

This type of lock ensures a good level of protection against break-in actions of the destructive type, since the generous dimensions allow embodiments of the armored type.

However, this type of lock is subject to break-in actions of the type
25 normally known as lock picking.

These techniques use specific tools to be inserted within the seat adapted to accommodate the key: by means of these tools, by keeping the rod under tension in the direction that corresponds to the retraction of the bolts, the burglar can "lift" the plates individually until the rod is released,
30 the rod retracting as a consequence of the mechanical tension that is applied.

Although these break-in techniques are rather complicated, they have a distinctly high rate of success and therefore make all double-blade key locks substantially insecure.

Disclosure of the invention

5 The aim of the present invention is to provide a break-in resistant lock which is provided with means adapted to contrast any break-in action which falls within the field of lock picking.

 Within this aim, an object of the present invention is to provide a break-in resistant lock for double-blade keys of the type which can be
10 recoded, provided with means adapted to contrast any break-in action which falls within the field of lock picking.

 Another object of the present invention is to provide a break-in resistant lock which has a low cost, is relatively easy to provide in practice, and is safe in application.

15 This aim and these objects, as well as others which will become better apparent hereinafter, are achieved by the present break-in resistant lock, of the type which comprises a box-like body for accommodating a plurality of contoured plates provided with a respective portion which is suitable for detachable engagement on a corresponding area of a rod which can perform
20 a translational motion and supports, at its free end, at least one bolt which can retract monolithically with said rod, said plates being able to perform a vertical translational motion by way of the action of said key and releasing, when they are raised, the translational motion of said rod and said bolts for their retraction and protrusion, characterized in that at least one of said
25 plates comprises at least one area provided with at least one seat which is aligned and proximate to at least one protrusion which is shaped substantially complementarily with respect to the shape of said seat, said at least one plate provided with the at least one seat being able to oscillate, about a guiding pivot rigidly coupled to said box-like body, from a first
30 configuration for mutual engagement of said at least one seat with the

respective said at least one protrusion, as a consequence of external break-in actions aimed at retracting said rod and said bolts, in which translational motion of said plates is not allowed and therefore the rod is locked, to a second inactive configuration, in which said seat and said protrusion are spaced and the translational motion of said plates is free and therefore the rod can be extracted and retracted.

Brief description of the drawings

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

Figure 1 is a partially sectional perspective view of a lock according to the invention in the inactive configuration;

Figure 2 is an enlarged-scale view of a detail of the perspective view of Figure 1;

Figure 3 is a partially sectional perspective view of a lock according to the invention in the break-in resistant locking configuration;

Figure 4 is an enlarged-scale view of a detail of the perspective view of Figure 3.

Ways of carrying out the invention

With reference to the figures, the reference numeral 1 generally designates a break-in resistant lock.

The lock 1 comprises a box-like body 2 for accommodating a plurality of contoured plates 3 provided with a respective portion (not shown in the figure) which is suitable for detachable engagement on a corresponding area of a rod 4, which can perform a translational motion and supports, at its free end 5, at least one bolt 6 which can retract monolithically with the rod 4.

With particular reference to the embodiment shown in the accompanying figures, the rod 4 supports (with its end 5) four mutually

parallel bolts 6.

The plates 3 can perform a vertical translational motion by way of the action of the key (not visible in the figure) and are designed, when they are raised, to release the translational motion of the rod 4 and accordingly of the bolts 6 for their retraction and protrusion.

At least one of the plates 3 comprises at least one area 7 provided with at least one seat 8 which is aligned and proximate to at least one protrusion 9 which is shaped substantially complementarily with respect to the shape of the seat 8.

The at least one plate 3 provided with the at least one seat 8 can oscillate about a guiding pivot 10 rigidly coupled to the box-like body 2.

In practice, the oscillating motion is possible between two extreme positions defined by the geometry of the structure of the lock 1. This movement is in fact possible from a first configuration for the mutual engagement of the at least one seat 8 with the respective at least one protrusion 9, as a consequence of external break-in actions intended to produce the forced retraction of the rod 4 and the retraction of the bolts 6 (a situation shown in Figure 4), to a second inactive configuration, in which the seat 8 and the protrusion 9 are spaced and the translational motion of the plates 3 is free and therefore the rod 4 can be extracted and retracted (situation shown in Figure 2).

In the first configuration (situation shown in Figure 4), it should be noted that the translational motion of the plates 3 is rendered impossible and that therefore the rod 4 is locked: this situation is indeed what ensures protection against break-in actions such as lock picking.

By means of a suitable tool, the burglar in fact keeps the rod 4 forced so as to force its retraction and by means of a second tool lifts one by one the superimposed plates 3 until the rod 4 is released completely and is thus free to perform a backward translational motion, causing the retraction of the bolts 6.

The locking of the at least one plate 3 produced by the stable engagement of the seat 8 of the portion 7 with the fixed protrusion 9 (which occurs indeed in case of forcing actions from the outside which correspond to tractions of the rod 4 in the direction for its retraction) makes it impossible for the plates 3 to perform a translational motion by way of the action of the second break-in tool. In practice, therefore, no translational motion of the plates 3 is possible whenever the retraction of the bolts 6 (and therefore of the rod 4) is forced, because this action entails the engagement of the protrusion 9 in the respective seat 8.

10 The plates 3 comprise at least one respective guiding slot 11, which accommodates a pivot 10 which is rigidly coupled to the box-like body 2: in practice, the pivot 10 constitutes the center of rotation of each plate 3 upon every break-in action matched by an attempt at forced retraction of the rod 4 and of the bolts 6.

15 According to an embodiment of assured practical and application-related interest, there are two slots (the slot 11, which has already been mentioned, and a second upper slot 12), each designed to accommodate a respective fixed pivot (the first pivot 10, already mentioned, and a second pivot 13) and oriented so as to allow the translational motion of the plates 3 along a substantially vertical direction, releasing the rod 4.

The slot 12 is wider than the pivot 13 that it accommodates.

The slot 11 instead has shapes and dimensions which are complementary to those of the respective pivot 10.

25 A retraction of the rod 4 (caused for example by a break-in attempt by lock picking) is matched by a rotation of the plate 3 (or plates 3) about the pivot 10 snugly accommodated in the slot 11 and a consequent movement of the wider slot 12 until interference with the respective pivot 13 occurs.

The rotation of the plate 3 (or plates 3) until the edge of the wider slot 12 rests on the respective pivot 13 corresponds to the first configuration for mutual engagement of the at least one seat 8 with the respective protrusion

30

9.

It is appropriate to note that, in order to ensure the optimum arrangement of all the components that constitute it, the lock 1 comprises elastic means 14 which are interposed between a fixed abutment and a region 15 which is proximate to the seat 8 for the elastic forcing of the at least one plate 3 in the second configuration for mutual separation and lack of interference between the seat 8 and the protrusion 9 and for stably maintaining said configuration unless external mechanical interference occurs.

10 According to the particular embodiment shown in the accompanying figures, the elastic means 14 are constituted by an axially acting spring, which is accommodated within an element 16 which is rigidly coupled to the box-like body 2.

15 The free end of the spring rests on the region 15 which lies proximate to the seat 8 of the at least one plate 3.

In the case shown in the accompanying figures, the seats 8 are a plurality and are mutually successive so as to constitute a sort of set of teeth.

In order to facilitate the construction and assembly of the lock 1 according to the invention, the element 16 rigidly coupled to the box-like body 2 and designed to accommodate the axially acting spring (the elastic means 14) also comprises the protrusion 9: this is merely a wedge-shaped protrusion which extends from its lower end toward the portion 7 of the plate 3 which faces it.

25 Positively, each plate 3 is constituted by a main lamina, which is provided with the at least one seat 8 for accommodating the protrusion 9, and by a strip.

The main lamina and the strip face each other and are provided with teeth for mutual meshing according to a plurality of configurations in order to allow recoding of the lock 1.

30 This constructive choice allows to obtain even locks for twin-blade

keys of the type which can be recoded and provided with means for hindering lock picking actions.

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

5 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 further be replaced with other technically equivalent ones.

10 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
15 of a disclaimer.

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

CLAIMS

1. A break-in resistant lock, of the type which comprises a box-like body (2) for accommodating a plurality of contoured plates (3) provided with a respective portion which is suitable for detachable engagement on a corresponding area of a rod (4) which can perform a translational motion and supports, at its free end (5), at least one bolt (6) which can retract monolithically with said rod (4), said plates (3) being able to perform a vertical translational motion by way of the action of the key and releasing, when they are raised, the translational motion of said rod (4) and said bolts (6) for their retraction and protrusion, characterized in that at least one of said plates (3) comprises at least one area (7) provided with at least one seat (8) which is aligned and proximate to at least one protrusion (9) which is shaped substantially complementarily with respect to the shape of said seat (8), said at least one plate (3) provided with the at least one seat (8) being able to oscillate, about a guiding pivot (10) rigidly coupled to said box-like body (2), from a first configuration for mutual engagement of said at least one seat (8) with the respective said at least one protrusion (9), as a consequence of external break-in actions aimed at retracting said rod (4) and said bolts (6), in which translational motion of said plates (3) is not allowed and therefore the rod (4) is locked, to a second inactive configuration, in which said seat (8) and said protrusion (9) are spaced and the translational motion of said plates (3) is free and therefore the rod (4) can be extracted and retracted.

2. The lock according to claim 1, characterized in that said plates (3) comprise at least one respective guiding slot (11) within which said pivot (10) rigidly coupled to said box-like body (3) is accommodated.

3. The lock according to claim 2, characterized in that said slots (11, 12) are two, each designed to accommodate a respective fixed pivot (10, 13) and oriented so as to allow the translational motion of said plates (3) along a substantially vertical direction, releasing said rod (4).

4. The lock according to claim 3, characterized in that one of said slots (12) is wider than the width of the pivot (13) which it accommodates, while the other slot (11) has a shape and dimensions which are complementary to those of the respective pivot (10), a retraction of said rod
5 (4) being matched by a rotation of said plate (3) about the pivot (10) snugly accommodated in the slot (11) and a consequent movement of the wider slot (12) until interference with the respective pivot (13) occurs, said rotation of the plate (3) until the rim of the wider slot (12) rests against the respective pivot (13) corresponding to said first configuration for mutual engagement
10 of said at least one seat (8) with the respective said at least one protrusion (9).

5. The lock according to claim 1, characterized in that it comprises elastic means (14), which are interposed between a fixed abutment and a region (15) which lies proximate to said seat (8) for the elastic forcing of
15 said at least one plate (3) into said second configuration for mutual separation and lack of interference between said seat (8) and said protrusion (9).

6. The lock according to claim 5, characterized in that said elastic means (14) are constituted by an axially acting spring which is
20 accommodated within an element (16) which is rigidly coupled to said box-like body (2), the end of said spring that rests against said area (7) being proximate to said seat (8) of said at least one plate (3).

7. The lock according to one or more of the preceding claims, characterized in that said element (16) rigidly coupled to said box-like body
25 (2) designed to accommodate said axially acting spring also comprises said protrusion (9).

8. The lock according to one or more of the preceding claims, characterized in that each one of said plates (3) is constituted by a main lamina, which is provided with said at least one seat (8) for said protrusion
30 (9) and by a strip, said lamina and said strip facing each other and being

provided with teeth for mutual meshing according to a plurality of configurations in order to allow recoding of said lock (1).

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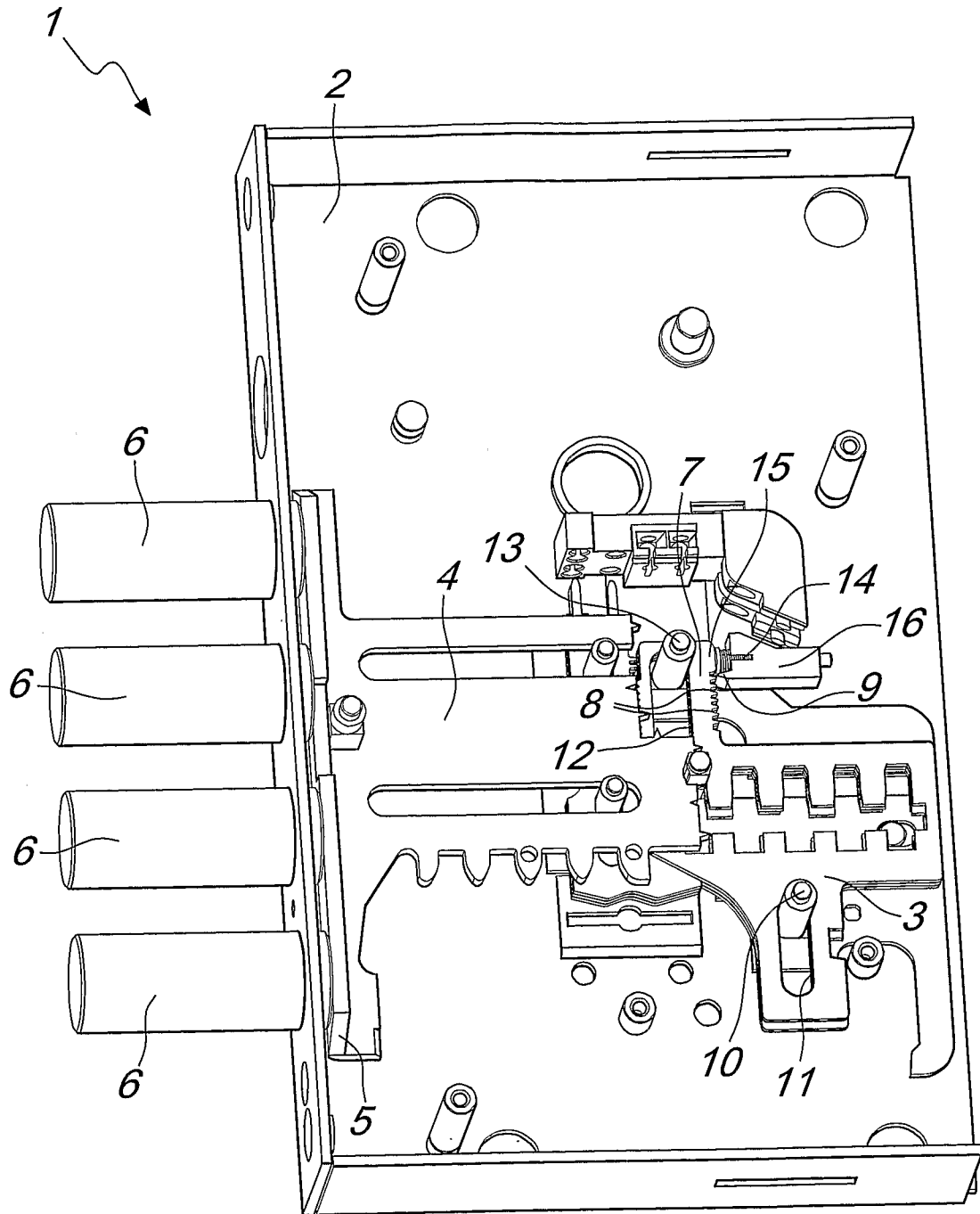


Fig. 1

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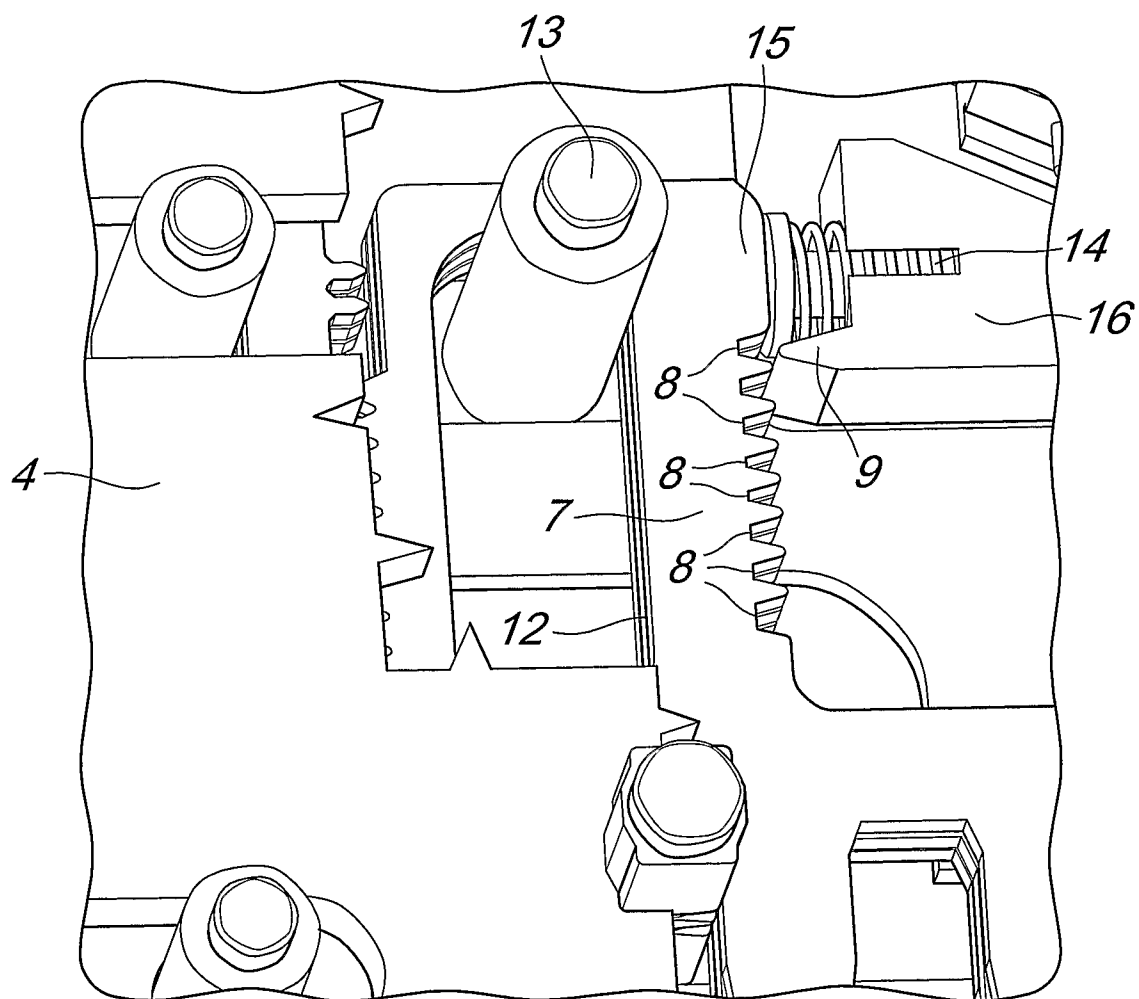


Fig. 2

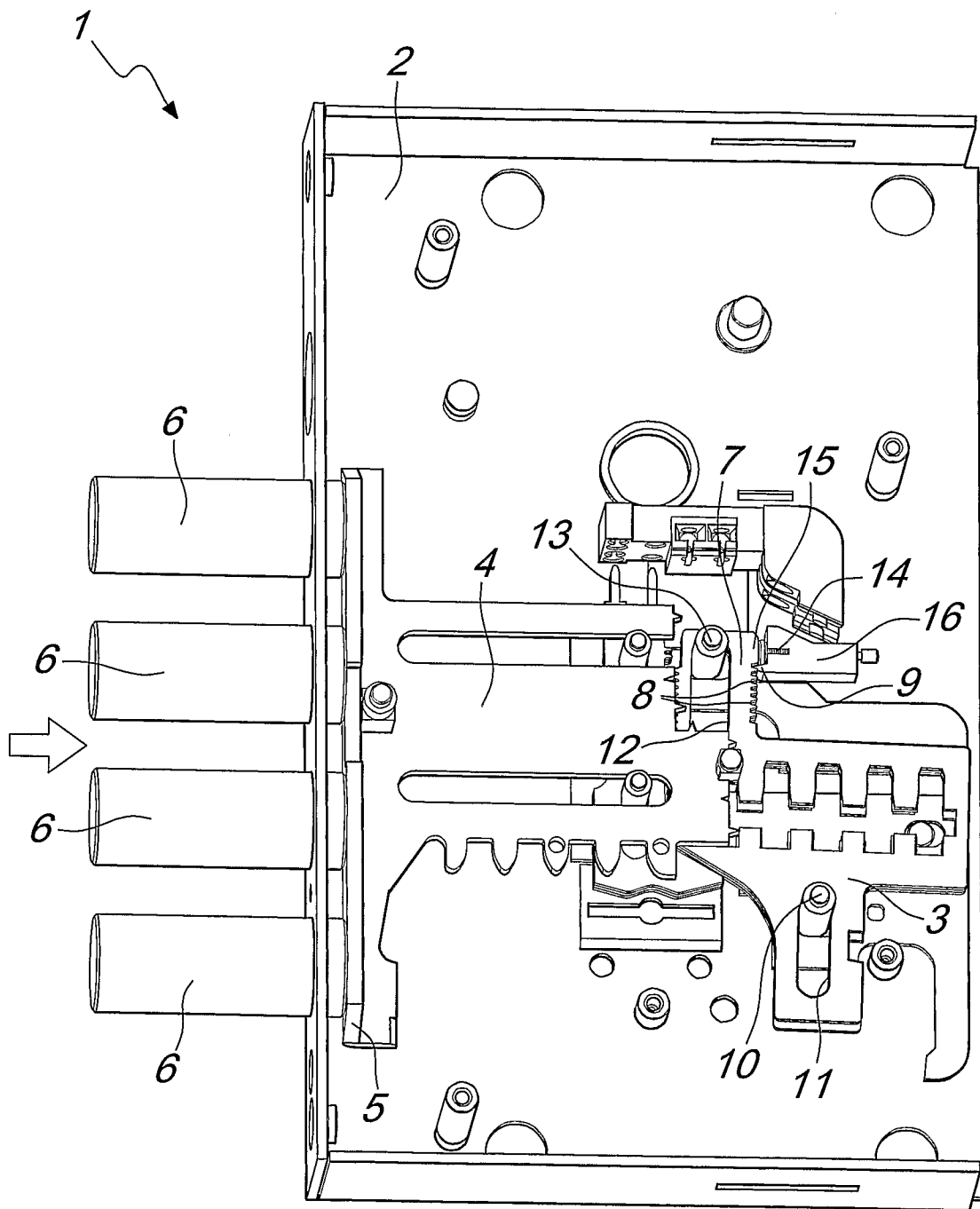


Fig. 3

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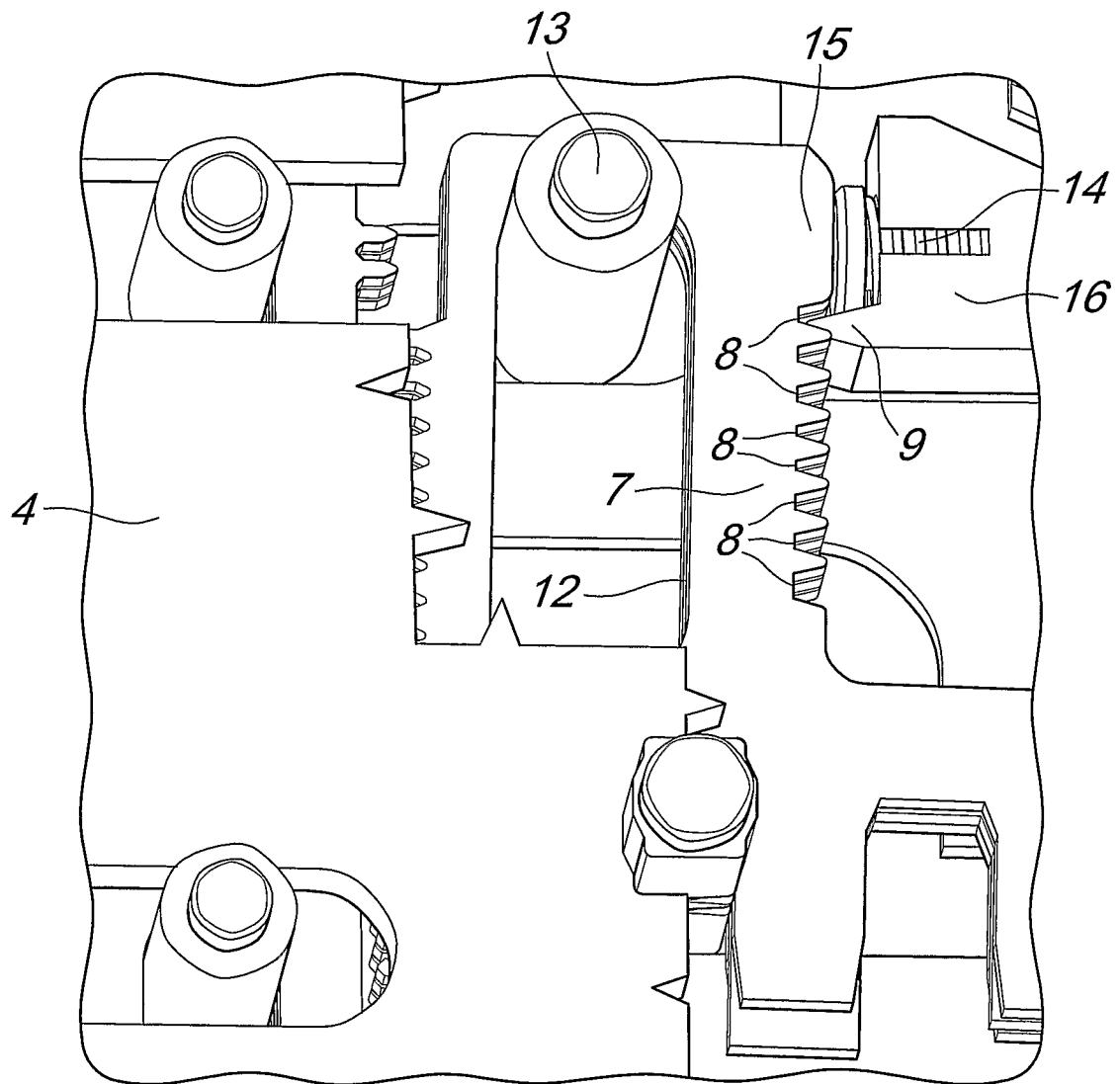


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2007/000764

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05B21/00 E05B63/00

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.
X	EP 0 903 455 A (CISA SPA) 24 March 1999 (1999-03-24) the whole document	1-8
A	WO 03/080969 A (BJÖRKBODA LÅS OY AB) 2 October 2003 (2003-10-02) the whole document	1
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A	EP 1 375 790 A (MOTTURA SERRATURE DI SICUREZZA) 2 January 2004 (2004-01-02) abstract	8



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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