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(54) **FORCED ENTRY RESISTANT LOCK**

(57) A forced entry resistant lock (10), comprising
 - a casing (15) with an opening (16) for one or more engagement elements (17, 18),
 - means for moving the one or more engagement elements (17, 18) from an inactive configuration to a configuration for use, and
 - means for fixing to the casing (15) a plate (80) for preventing extraction from the opposite side with respect to the opening (16).

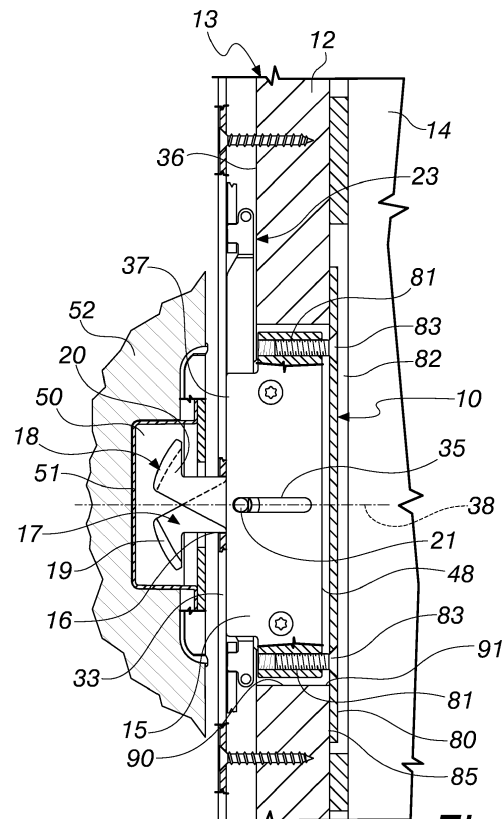


Fig. 1

Description

[0001] The present invention relates to a forced entry resistant lock.

[0002] Currently, the most widespread international certifications for forced entry resistance for door and window assemblies, such as for example the EN1627 standard, entail various tests, including a manual test with burglary tools, which attempt to tear out the locking points of the hardware mounted on the leaf from the corresponding anchoring coupling mounted on the frame.

[0003] Up to now, in door or window assemblies with shutter-like or tilt-and-turn opening with a forced entry resistance function it is known to use single hook and tumbler systems, which however, by using burglary tools such as screwdrivers and crowbars, can be extracted easily from the coupling seat, since they are anchored only on one side.

[0004] Such known technical solutions, therefore, do not allow to attain the forced entry resistance class RC3, i.e., they are not resistant to the use of a screwdriver or crowbar by a burglar, according to the EN1627 standard.

[0005] Currently known locks, moreover, are inserted in a corresponding seat in the leaf of a door or window assembly and are fixed to the edge of the leaf by means of threaded elements that generally are visible.

[0006] This fixing solution allows a burglar to tear the lock out of its seat in the leaf by acting on the heads of the screws or by tearing out said screws by using a screwdriver as a lever between the plate portion of the lock on which a threaded element is inserted and the underlying edge of said leaf.

[0007] The aim of the present invention is to provide a forced entry resistant lock capable of obviating the cited limitations of known locks.

[0008] Within this aim, an object of the invention is to devise a forced entry resistant lock capable of withstanding burglary attempts performed with a screwdriver or crowbar.

[0009] In particular, an object of the invention is to devise a forced entry resistant lock that is much more difficult for a burglar to strip from its seat in the leaf.

[0010] This aim and these and other objects that will become better apparent hereinafter are achieved by a forced entry resistant lock, characterized in that it comprises

- a casing with an opening for one or more engagement elements,
- means for moving said one or more engagement elements from an inactive configuration to a configuration for use, and

means for fixing to said casing a plate for preventing extraction from the opposite side with respect to said opening.

[0011] Further characteristics and advantages of the invention will become better apparent from the descrip-

tion of a preferred but not exclusive embodiment of the forced entry resistant lock according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a sectional side view of a forced entry resistant lock according to the invention;

Figure 2 is a sectional top view of the lock of Figure 1; Figures 3 and 4 are each a side view of a lock according to the invention in a corresponding step of operation,

Figure 5 is a view of a detail of an engagement element.

[0012] With reference to the figures, a forced entry resistant lock according to the invention is generally designated by the reference numeral 10.

[0013] The lock 10 comprises:

- a casing 15 with an opening 16, for example, for the passage of two engagement elements 17 and 18,
- means for moving the engagement elements 17 and 18 from an inactive configuration to a configuration for use, described better hereinafter by way of example.

[0014] The particularity of the forced entry resistant lock 10 resides in that it comprises means for fixing to the casing 15 a plate 80 for preventing extraction from the opposite side with respect to the opening 16.

[0015] The forced entry resistant lock 10 is shown in Figures 1 and 2 inserted in the frame 12 of a leaf 13 provided with a glass pane, particularly with a double-glazing unit, 14.

[0016] The casing 15 is inserted in a corresponding seat 90 defined in the frame 12.

[0017] The extraction-preventing plate 80 has greater dimensions at least in one direction with respect to the opening 91 of the seat 90, so as to abut and be pressed against the edges of the opening 91.

[0018] The casing 15 then has threaded holes 81 for corresponding screws 83; the screws 83 are arranged so as to pass through the extraction-preventing plate 80.

[0019] The extraction-preventing plate 80 in particular is adapted to be mounted in an interspace 82 between the glazing 14 and the frame 12 of the leaf 13.

[0020] The extraction-preventing plate 80 prevents a burglar from extracting the casing 15 from its seat 90, since the dimensions of the extraction-preventing plate 80 prevent its passage through the opening 91 of the seat 90.

[0021] The casing 15 is supported by an outer cover 33 and the extraction-preventing plate 80 is fixed only to the casing 15 by means of the screws 83, which pull it, or push it if there is contact, toward the casing 15.

[0022] The extraction-preventing plate 80 is made of metallic material, but it is to be understood that it can also be made of other similar and equivalent materials.

[0023] Therefore it is to be understood that the invention also relates to a leaf 13 for a door or window assembly of the shutter-like or tilt-and-turn type, of the kind comprising a frame 12 that is arranged so as to surround a glass pane 14 and defines with it an interspace 82, characterized in that it comprises, within a corresponding flush mounting seat 90, a forced entry resistant lock 10 comprising

- a casing 15 with an opening 16 for one or more engagement elements 17 and 18,
- means for moving the one or more engagement elements 17 and 18 from an inactive configuration to a configuration for use,
- and means for fixing to the casing 15 an extraction-preventing plate 80 on the opposite side with respect to the opening 16, the extraction-preventing 80 plate being arranged in the interspace 82.

[0024] By way of non-limiting example of the invention, the forced entry resistant lock 10 comprises:

- a casing 15 with an opening 16 for the passage of two engagement elements, respectively 17 and 18,
- two engagement elements 17 and 18, arranged with respective engagement teeth 19 and 20 that have opposite directions in the configuration for use with the lock in operation, as in Figures 1 and 3;
- a movable pivot 21, to which both of said engagement elements are pivoted.

[0025] The movement means for the engagement elements 17 and 18 comprise:

- means 23 for the translation of the movable pivot 21 in a direction for the exit of the engagement elements 17 and 18 from inside the casing 15, in an inactive configuration, toward the outside of the casing 15, in an intermediate configuration for translation and in a subsequent configuration for use,
- means 24 for the rotation in opposite directions of each engagement element 17 and 18 from an intermediate configuration for translation to a configuration for use,
- elastic means 25 for contrasting the rotation of the engagement elements 17 and 18 from said intermediate configuration for translation to said configuration for use.

[0026] The engagement elements 17 and 18 are plate-like.

[0027] Each engagement element 17 and 18, for example the engagement element 17, clearly shown in Figure 5, comprises a pivoting portion 26, with a through hole 27 for the movable pivot 21, and an engagement portion 28, from which the corresponding engagement tooth 19 protrudes.

[0028] A coupling and rotation tab 30, which extends

on the same side as the engagement tooth 19, and an abutment and stroke limiting tab 31 extend radially, in substantially opposite directions, from the pivoting portion 26.

[0029] The coupling and rotation tab 30 has a curved or cam-shaped edge 32 designed to abut against an outer cover 33 of the casing 15 proximate to the opening 16; such coupling determines the beginning of the rotation of the engagement element 17 during the translation movement of the mobile pivot 21, as better described hereinafter.

[0030] The abutment and stroke limiting tab 31 has a linear edge 34 that is adapted to couple to the outer cover 33 on the opposite side proximate to the opening 16 but on the opposite side with respect to the coupling and rotation tab 30, so as to stop the rotation of the engagement element that began with the contact of the coupling and rotation tab 30 with the outer cover 33.

[0031] The tabs 30 and 31 are thus shaped so that, with respect to the translation movement that the engagement element 17 and 18 performs carried by the movable pivot 21, the coupling and rotation tab 30 couples to the outer cover 33 before the abutment and stroke limiting tab 31.

[0032] The engagement element 18 is to be understood as equal to the described engagement element 17 and mounted in a mirror-symmetrical manner on the same movable pivot 21.

[0033] The movable pivot 21, to which both of said engagement elements 17 and 18 are pivoted, is arranged so as to slide with the ends inserted in corresponding slots 35, which have a linear extension and are defined on the casing 15 along a direction that is at right angles to the outer edge 36 of the frame 12 of the leaf 13 in which the lock 10 is inserted, i.e., a direction 38 from the inside toward the outside of the casing 15, which is substantially at right angles to the outer edge 37 of the casing 15.

[0034] The means 23 for the translation of the movable pivot 21 in the direction 38, for the exit of the engagement elements 17 and 18 from inside the casing 15, are constituted by a moving body 40, designed to be coupled to corresponding actuation shafts 41 and 42 that are part of the hardware of which also the forced entry resistant lock 10 is a part.

[0035] The moving body 40 is adapted to be translated in a direction that is perpendicular to the direction 38 of translation of the movable pivot 21, therefore parallel to the outer edge 36 of the frame 12 of the leaf 13.

[0036] The moving body 40 is provided centrally with a cam-shaped slot 43 in which the movable pivot 21 is arranged so that it can slide.

[0037] The cam-shaped slot 43 comprises two linear portions 45 and 46 and a diagonal intermediate portion 47.

[0038] A first linear portion 45 is extended proximate to the outer cover 33 of the casing 15.

[0039] The second linear portion 46 is extended prox-

imate to the inner cover 48 of the casing 15.

[0040] The diagonal intermediate portion 47 is extended between the two linear portions 45 and 46.

[0041] The translation of the moving body 40 causes a thrust, by means of the edges of the diagonal portion 47 of the cam-shaped slot 43, on the movable pivot 21, such as to induce the translation of the movable pivot 21 in the linear slots 35 of the casing 15, with consequent translation either toward the outside of the casing 15 or toward the inside of the casing 15 of the two engagement elements 17 and 18, as in Figures 3 and 4.

[0042] The moving body 40, in the present non-limiting example of embodiment of the invention, comprises two rod-like elements 40a and 40b, which are shown schematically in Figure 2 and diverge in order to surround the engagement elements 17 and 18 inside the casing 15, each one of which has a cam-shaped slot 43 as described above.

[0043] The means 24 for the rotation of each engagement element 17 and 18 from an intermediate configuration for translation to a configuration for use are constituted by the coupling and rotation tab 30 and the abutment and stroke limiting tab 31, and by the outer cover 33 with which the coupling and rotation tab 30 cooperates to rotate the engagement element, 17 or 18, to which it belongs, while the abutment and stroke limiting tab 31, by abutting against the outer cover 33, stops the rotation of the engagement element 17 or 18 to which it belongs.

[0044] Contact of the coupling and rotation tab 30 with the outer cover 33 occurs when the engagement teeth 19 and 20 are extracted from the casing 15 and are within a corresponding engagement seat 50 in an engagement coupling 51, which is fixed to the frame 52 of a door or window assembly.

[0045] The elastic means 25 for contrasting the rotation of the engagement elements 17 and 18 from the intermediate translation configuration to the configuration for use, are constituted, for each engagement element 17 and 18, by a pusher lever 55 and 56 respectively.

[0046] Each pusher lever 55 and 56 is coupled by one end 60 to the casing 15, while the opposite end 61 is pushed by an elastic element 62, for example a helical spring; the intermediate region of the pusher lever 55 and 56 acts on the coupling and rotation tab 30 of the corresponding engagement element 17 and 18, causing a rotation thereof that is equal and opposite to the rotation that occurs during the exit of the engagement element 17 and 18 from the casing 15, during the translation for retraction of the engagement element 17 and 18 inside the casing 15.

[0047] Moreover, the pusher lever 55 and 56 causes the corresponding engagement element 17 and 18 to remain in its inactive and minimum-bulk configuration inside the casing 15.

[0048] Each pusher lever 55 and 56 extends from a corresponding supporting block 65 and 66 by means of a bridge for pivoting thereto; the supporting block 65 and 66 is locked within the casing 15.

[0049] The elastic pusher element 62 is interposed between the free end of the corresponding pusher lever and an insertion groove 67 defined within the casing 15.

[0050] The forced entry resistant lock 10 according to the invention relies therefore on two engagement elements 17 and 18, which by acting in opposite directions inside the coupling 51 cooperate to prevent mutual extraction from the coupling 51, in practice rendering the closure compliant with the RC3 standard category, i.e., resistant to burglary attempts using a screwdriver and a crowbar; in fact, the attempt to disengage an engagement element from the coupling produces a greater engagement of the other engagement element.

[0051] The flat shape of the engagement elements and the rotation around a single movable pivot instead of around two spaced pivots allow the lock 10 to have very small dimensions in height, depth and thickness, and this is very important especially in the application to door or window assemblies having a "minimalist" structure, i.e., with compact leaf and frame profiles that support glazings.

[0052] In particular, the extraction-preventing plate 80, arranged in the interspace 82 that exists between the frame 12 of the leaf 13 and the glass pane 14, ensures that the casing 15 cannot be extracted from the outside of the leaf.

[0053] In practice it has been found that the invention achieves the intended aim and objects.

[0054] In particular, the invention provides a forced entry resistant lock that is capable of withstanding burglary attempts with a screwdriver or a crowbar.

[0055] Moreover, the invention provides a forced entry resistant lock the extraction of which from its seat in the leaf is made much more difficult for a burglar by way of the fixing by means of an inner fixing plate.

[0056] Moreover, the invention provides a forced entry resistant lock that is easy to install like forced entry resistant locks of the known type.

[0057] 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 elements.

[0058] In practice, the components used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements and to the state of the art.

[0059] The disclosures in Italian Patent Application No. PD2014A000073 from which this application claims priority are incorporated herein by reference.

[0060] Where characteristics and technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A forced entry resistant lock (10), **characterized in that** it comprises
- a casing (15) with an opening (16) for one or more engagement elements (17, 18),
 - means for moving said one or more engagement elements (17, 18) from an inactive configuration to a configuration for use, and
 - means for fixing to said casing (15) a plate (80) for preventing extraction from the opposite side with respect to said opening (16).
2. The forced entry resistant lock according to claim 1, **characterized in that** said extraction-preventing plate (80) has larger dimensions at least in one direction with respect to the opening (91) of a seat (90) for said casing (15) defined on a frame of a leaf.
3. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** said means for fixing the extraction-preventing plate (80) to said casing (15) are constituted by threaded holes (81) for corresponding screws (83), said screws (83) being arranged so as to pass through the extraction-preventing plate (80).
4. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** it comprises
- a casing (15) with an opening (16) for the passage of two engagement elements (17, 18),
 - two engagement elements (17, 18) arranged with respective engagement teeth (19, 20) that have opposite directions in the configuration for use with the lock in operation,
 - a movable pivot (21), to which both of said engagement elements (17, 18) are pivoted,
- said movement means for said engagement elements (17, 18) comprising:
- means (23) for the translation of said movable pivot (21) in a direction for the exit of said engagement elements (17, 18) from inside said casing (15), in an inactive configuration, toward the outside of said casing, in an intermediate configuration for translation and in a subsequent configuration for use,
 - means (24) for the rotation in opposite directions of each engagement element (17, 18) from an intermediate configuration for translation to a configuration for use,
 - elastic means (25) for contrasting the rotation of said engagement elements (17, 18) from said intermediate configuration to said configuration
- for use.
5. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** said engagement elements (17, 18) are flat.
6. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** each engagement element (17, 18) comprises a pivoting portion (26), with a through hole (27) for the movable pivot (21), and an engagement portion (28), from which the corresponding engagement tooth (19, 20) protrudes.
7. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** a coupling and rotation tab (30) that protrudes on the same side as the engagement tooth (19) and an abutment and stroke limiting tab (31) extend radially, in substantially opposite directions, from the pivoting portion (26) of each engagement element (17, 18).
8. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** said movable pivot (21), to which both of said engagement elements (17, 18) are pivoted, is arranged so as to slide with the ends inserted in corresponding slots (35) that have a linear extension and are defined on the casing (15) along a direction (38) from the inside toward the outside of said casing (15), said direction being substantially perpendicular to the outer edge (37) of said casing (15).
9. The forced entry resistant lock according to one or more of the preceding claims, **characterized in that** said means (23) for the translation of the movable pivot (21) in the direction (38) for exit and retraction for said engagement elements (17, 18) with respect to said casing (15) are constituted by a moving body (40), said moving body (40) being provided centrally with a cam-shaped slot (43) in which said movable pivot (21) is arranged so as to slide.
10. A leaf (13) for a door or window of the shutter-like or tilt-and-turn type, of the kind comprising a frame (12) that is arranged so as to surround a glass pane (14) and defines with it an interspace (82), **characterized in that** it comprises, within a corresponding flush mounting seat (90), a forced entry resistant lock (10) comprising
- a casing (15) with an opening (16) for one or more engagement elements (17, 18),
 - means for moving said one or more engagement elements (17, 18) from an inactive configuration to a configuration for use,
 - and means for fixing to said casing (15) an extraction-preventing plate (80) on the opposite

side with respect to said opening (16), said extraction-preventing plate being arranged in said interspace (82).

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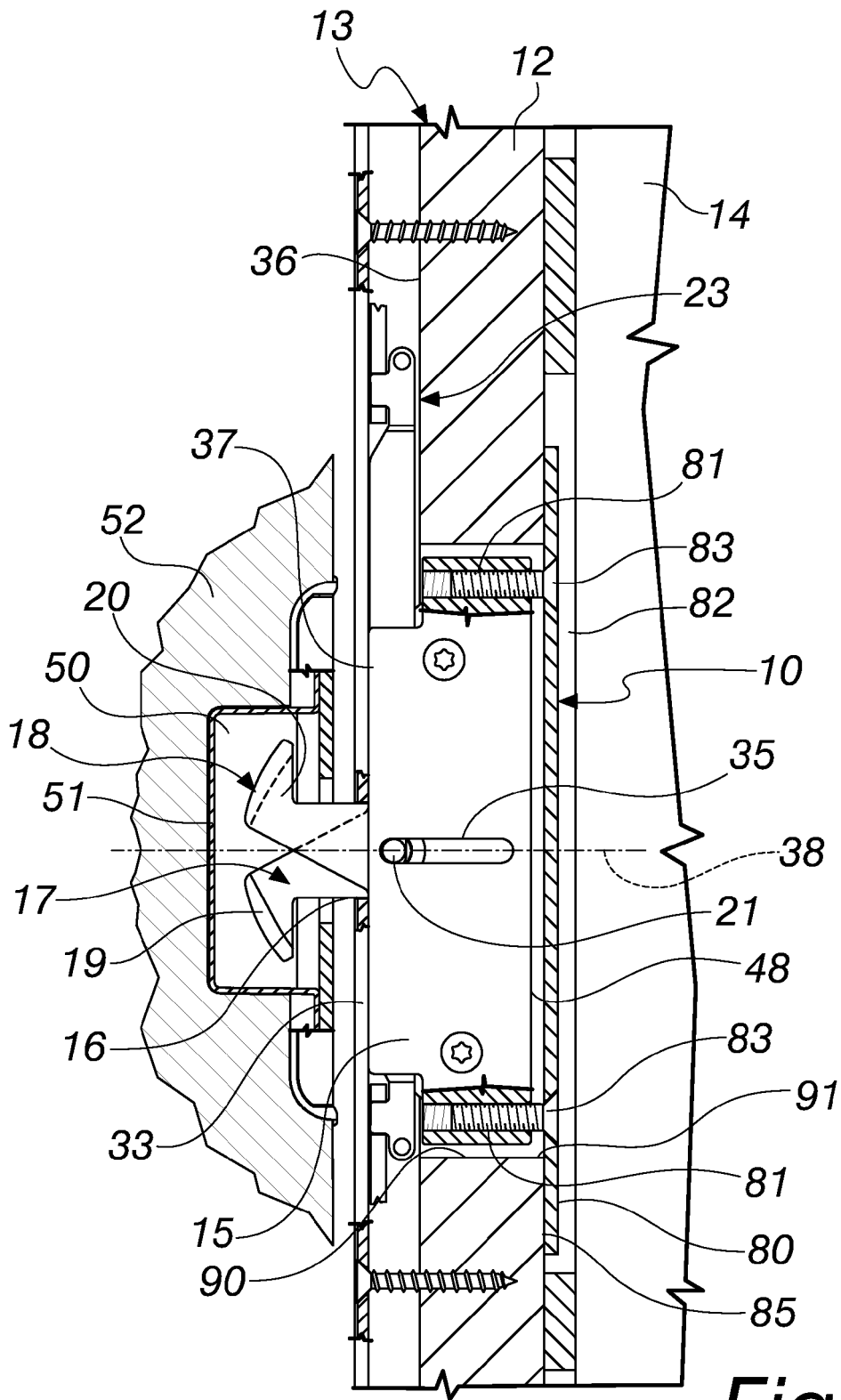


Fig. 1

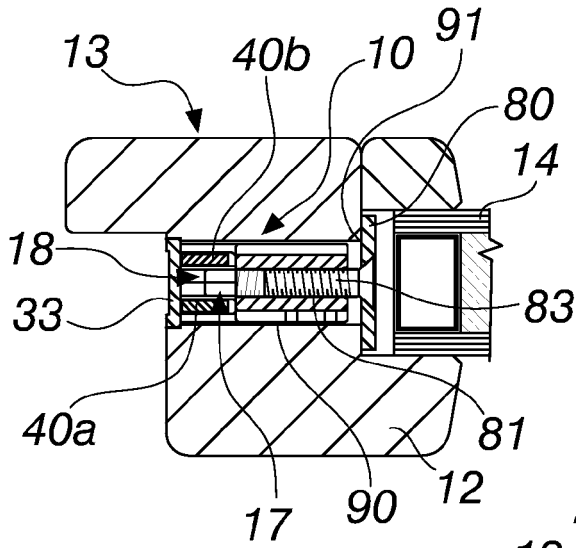


Fig. 2

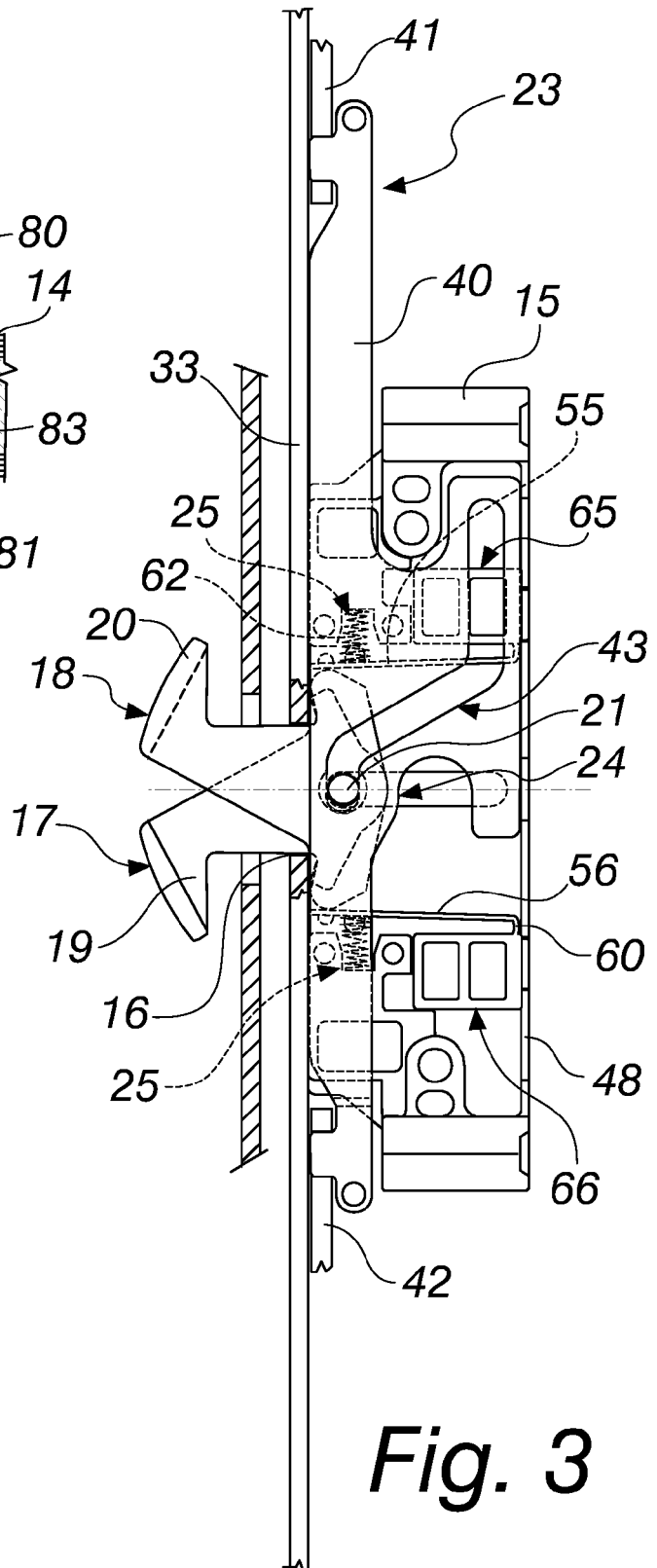
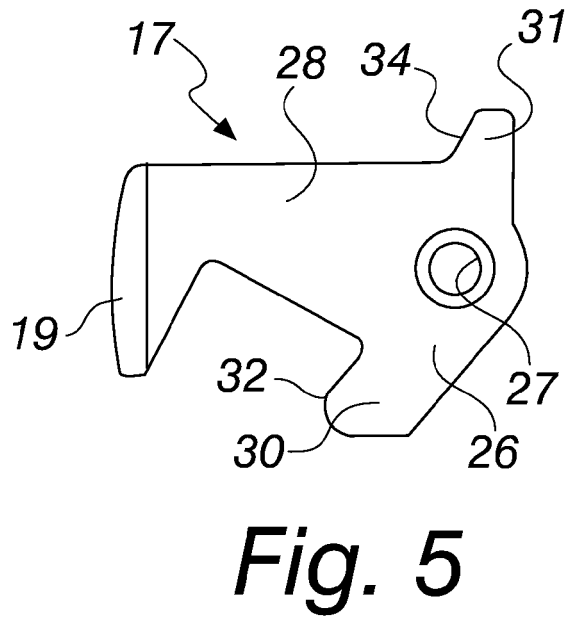
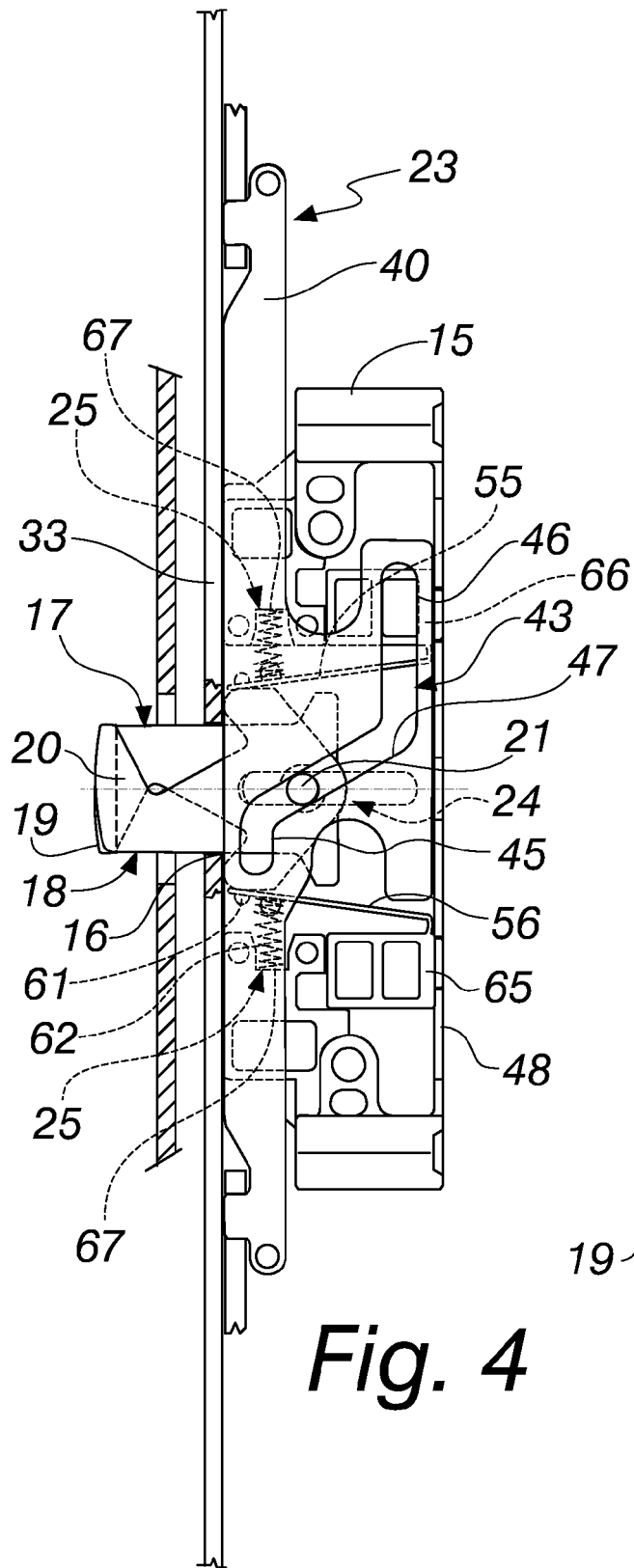


Fig. 3





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Application Number
EP 15 15 9950

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 August 2015	Examiner Philipp, Tobias
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