



(11)

EP 4 826 201 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.10.2026 Bulletin 2026/43

(51) International Patent Classification (IPC):
E05C 7/04 (2006.01) E05C 9/18 (2006.01)

(21) Application number: **26162821.8**

(52) Cooperative Patent Classification (CPC):
E05C 9/185; E05C 7/045; E05C 9/002

(22) Date of filing: **06.03.2026**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
GE KH LA MA MD TN

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(30) Priority: **15.04.2025 IT 202500008349**

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(54) ROD LOCKING DEVICE

(57) The locking device (1) for the upper bolt (13) of a vertical rod (12) vertically slidable along a upright (11) of a swing leaf (6) for engagement of the end (13a) of the upper bolt (13) with a strike plate (14) in a fixed frame (2, 3, 4) of a door or window frame comprises: a guide profile (15) applicable externally to the upright (11) of the leaf (6) and configured to define, together with the upright (11) of the leaf (6), a channel (16) for guided sliding of the upper bolt (13) in the vertical direction; a mechanical sensor (17) slidable in the vertical direction within the sliding channel (16) and adapted to interact with the strike plate (14) or with the upper crosspiece (4) of the frame (2, 3, 4) of the door or window frame in order to retract towards the inside of said sliding channel (16) against the action of an elastic element (18); and a friction locking element (19) for the upper bolt (13), vertically slidable together with the mechanical sensor (17) and actuated by a cam (20) in a direction transverse to the vertical direction between a locking position of the upper bolt (13) and an unlocking position of the upper bolt (13); the mechanical sensor (17) comprising a main body (21) slidable in the vertical direction within the sliding channel (16) and a sensitive tip (22) operatively connected to the main body (21) in order to synchronize unlocking of the upper bolt (13) with achievement of vertical alignment of the upper bolt (13) with the strike plate (14) in the crosspiece (4) of the frame (2, 3, 4).

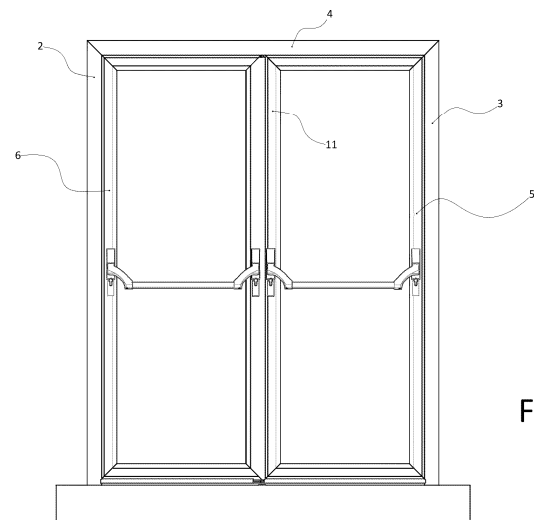


Fig. 1

Description

[0001] The present invention relates to a locking device, in particular a locking device for the upper bolt of a vertically sliding rod that slides vertically along an upright of a swing leaf of a door or window frame.

[0002] In particular, in the field of aluminum frames, it is possible to manufacture doors composed of two swing leaves, wherein the main leaf is fitted with a lock provided with at least one latch and/or bolt engageable in a corresponding strike plate installed on the upright of the secondary leaf, while in the upright of the secondary leaf there is mounted a rod provided with an upper locking bolt and a rod provided with a lower locking bolt which, in a synchronized manner, engage corresponding strike plates installed respectively on the upper crosspiece of the frame and on the floor.

[0003] For safety reasons, the double-leaf door must be able to close sequentially and automatically: first, the upper and lower bolts of the secondary leaf engage the respective strike plates, and subsequently each latch/bolt of the main leaf engages the corresponding strike plate.

[0004] In the secondary leaf, the bolts are return-controlled by specific actuating devices provided with a spring which, when the door is open, remains compressed and retains the rod and the related bolts inside the secondary leaf by means of a specific locking device.

[0005] This makes it possible to avoid dragging of the lower bolt on the floor and impact of the upper bolt against the upper crosspiece of the frame during the closing of the secondary leaf.

[0006] At the moment of closing the secondary leaf, the locking device detects the alignment of the secondary leaf with the upper crosspiece of the frame and releases the travel of the bolts by discharging the energy of the spring.

[0007] There are various types of doors which, depending on the extruded profile adopted to manufacture the leaves, require the secondary leaf to have two different arrangements of the rods supporting the bolts, one inside the secondary leaf and one outside the secondary leaf.

[0008] The field of application of the present invention relates to types of doors that provide for the arrangement of the rods outside the secondary leaf.

[0009] In this context, the locking devices must be extremely compact and, above all, reliable in operation. One drawback that may be encountered consists in the premature unlocking of the rod, before complete vertical alignment with the frame, with the result not only that the secondary leaf does not close, but also that the upper bolt, following impact against the upper crosspiece of the frame, may be damaged.

[0010] The technical task proposed by the present invention is therefore to provide a locking device of the type indicated above that makes it possible to eliminate

the technical drawbacks complained of in the prior art.

[0011] Within this technical task, one object of the invention is to provide a locking device of the type indicated above that is extremely compact and reliable in operation.

[0012] The technical task, as well as these and other objects, according to the present invention are achieved by providing a locking device for the upper bolt of a vertically sliding rod sliding vertically along a upright of a swing leaf for engagement of the end of the upper bolt with a strike plate in a frame of a door or window, characterized in that it comprises: a guide profile applicable externally to the upright of the leaf and configured to define, together with the upright of the leaf, a guided sliding channel for the upper bolt in the vertical direction, wherein the sliding channel has an open upper end for the passage of the end of the bolt; a mechanical sensor slidable in the vertical direction within the sliding channel and adapted to project out of said open end of the sliding channel and interact with the strike plate or with the upper crosspiece of the frame in order to retract towards the inside of said sliding channel against the action of an elastic element; and a friction locking element for the upper bolt, vertically slidable together with the mechanical sensor and actuated by a cam in a direction transverse to the vertical direction between a locking position of the upper bolt and an unlocking position of the upper bolt; said sensor having a main body slidable vertically within said sliding channel and a sensitive tip operatively connected to said main body to synchronize the unlocking of the upper bolt with the achievement of vertical alignment of the upper bolt with the strike plate of the frame crosspiece.

[0013] In a preferred embodiment of the invention, said sensitive tip is hinged to said main body.

[0014] In a preferred embodiment of the invention, said sensitive tip has two opposing inclined planes for interaction with the upper crosspiece of the frame.

[0015] In a preferred embodiment of the invention, said main body has two opposing shoulders for limiting the end-of-stroke rotation of said sensitive tip.

[0016] In a preferred embodiment of the invention, said locking element includes a rolling element.

[0017] In a preferred embodiment of the invention, said cam is formed in a block fixed to the guide profile. In a preferred embodiment of the invention, said locking element is slidable in a track formed on said mechanical sensor and having a first open end facing a first support surface of the locking element provided by the upper bolt and a second open end facing a second support surface of the locking element provided by the block.

[0018] In a preferred embodiment of the invention, said first support surface is vertical and said second support surface comprises a lower vertical portion and an upper inclined portion defining said cam. In a preferred embodiment of the invention, said elastic ele-

ment includes a vertical helical spring interposed between the mechanical sensor and the block.

[0019] The present invention also relates to a door or window frame comprising a frame, a main swing leaf on which a lock provided with at least one bolt and/or latch is mounted, and a secondary swing leaf having an upright on which a strike plate for engagement with said at least one bolt and/or latch is mounted, a vertically sliding vertical rod provided with an upper bolt for engagement with an upper crosspiece of the frame, and a locking device for the upper bolt of said rod.

[0020] Further features and advantages of the invention will become more apparent from the description of a preferred but not exclusive embodiment of the locking device according to the invention, illustrated by way of non-limiting example in the accompanying drawings, in which:

- Figure 1 shows a view of the closed door or window frame;
- Figure 2 shows the same view as Figure 1, but with the central portion of the frame vertically sectioned, and with an enlarged detail of the frame in the area of the upper bolt;
- Figure 3 shows a detail of the frame of Figure 1 in a partially open condition;
- Figure 4 shows an exploded axonometric view of the locking device;
- Figure 5 shows a view of the locking device from the inner side;
- Figure 6 shows the locking device sectioned along the horizontal plane A-A of Figure 5;
- Figure 7 shows a view of the locking device from the outer side;
- Figure 8 shows the locking device sectioned along the horizontal plane A-A of Figure 7;
- Figures 9 and 9a show a view of the locking device from the inner side, and an enlarged detail thereof, in a configuration of engagement between the locking element and the cam;
- Figures 10 and 10a show a view of the locking device from the inner side, and an enlarged detail thereof, in a configuration of disengagement between the locking element and the cam;
- Figures 11a, 11b, 11c show an axonometric view of the locking device in the sequence of configurations assumed during closing of the leaf;
- Figures 12a, 12b, 12c show a view from the inner side of the locking device in the sequence of configurations assumed during closing of the leaf, in which interaction with the strike plate is highlighted; and
- Figure 13 shows a view from the outer side of the locking device, in which interaction with the strike plate is highlighted.

[0021] With reference to the cited figures, a locking device is shown, indicated overall by reference numeral

1.

[0022] The locking device 1 is provided in the context of a door or window frame having a fixed frame 2, 3, 4 and a double-leaf door 5, 6 hinged to the fixed frame 2, 3, 4.

[0023] In particular, the fixed frame 2, 3, 4 comprises, in a known manner, a first upright 2 and a second upright 3 connected by an upper horizontal crosspiece 4.

[0024] Also in a known manner, of the two leaves 5, 6 of the door, a primary leaf 5 hinged to the first upright 2 is provided with one or more latches 7 and/or bolts 8, and a secondary leaf 6 hinged to the second upright 3 is provided, for each latch 7 and bolt 8, with a corresponding engagement strike plate 9, 10 arranged more precisely in an upright 11 of the secondary leaf 6.

[0025] By upright 11 of the secondary leaf 6 is meant the external flat perimeter wall of the secondary leaf 6 oriented in the direction of the thickness of the secondary leaf 6; the upright 11 therefore connects the external perimeter wall of the secondary leaf 6 facing the interior of the environment separated by the door to the external perimeter wall of the secondary leaf 6 facing the exterior of the environment separated by the door.

[0026] A vertical rod 12 provided with an upper bolt 13 is slidably guided in the vertical direction along the upright 11 for the releasable engagement of the end 13a of the upper bolt 13 with the upper crosspiece 4 of the fixed frame 2, 3, 4.

[0027] In particular, the end 13a of the upper bolt 13 of the vertical rod 12 is engageable with a strike plate 14 integrated in the upper crosspiece 4 of the fixed frame 2, 3, 4.

[0028] The strike plate 14 includes a cup 14a into which the end 13a of the upper bolt 13 of the vertical rod 12 can be inserted, and a collar 14b external to the cup 14a which defines the mouth of the cup 14a.

[0029] The locking device 1 is intended in particular for locking the upper bolt 13 of the vertical rod 12 and comprises a guide profile 15 applied externally to the upright 11 of the secondary leaf 6 and configured to define, together with the upright 11 of the secondary leaf 6, a channel 16 for guided sliding of the upper bolt 13 in the vertical direction.

[0030] The guide profile 15 extends longitudinally in the vertical direction and is located in the upper portion of the upright 11.

[0031] The sliding channel 16 has an open upper end for the passage of the end 13a of the upper bolt 13 of the vertical rod 12.

[0032] The guide profile 15 has a "U"-shaped cross-section and is formed by two parallel side walls 15a, 15a resting against the upright 11 of the secondary leaf 6, and by a bottom wall 15b which orthogonally connects the two parallel side walls 15a, 15a and is therefore arranged parallel to and at a distance from the upright 11 of the secondary leaf 6.

[0033] The vertical rod 12 and the upper bolt 13 are

formed by longitudinal plates having a main plane of extension oriented parallel to the flat upright 11.

[0034] The guide profile 15 is preferably fixed to the upright 11 of the secondary leaf 6 by means of screws or rivets.

[0035] The locking device 1 further includes a mechanical sensor 17 slidable in the vertical direction within the sliding channel 16 and adapted to project out of the open upper end of the sliding channel 16 and interact with the upper crosspiece 4 of the fixed frame 2, 3, 4 of the door or window frame, in order to retract towards the inside of the sliding channel 16 against the action of an elastic element 18.

[0036] Finally, the locking device 1 includes a friction locking element 19 for the vertical rod 12.

[0037] The locking element 19 is preferably a rolling element, for example a ball or a roller.

[0038] The locking element 19 is vertically slidable together with the mechanical sensor 17 and is actuated by a cam 20 in a direction transverse to the vertical direction between a locking position of the upper bolt 13 and an unlocking position of the upper bolt 13.

[0039] The cam 20 is formed in a block 30 fixed to the guide profile 15.

[0040] In particular, the block 30 is fixed to the bottom wall 15b of the guide profile 15, but it may alternatively be formed integrally with the guide profile.

[0041] Advantageously, the mechanical sensor 17 comprises a main body 21 slidable in the vertical direction within the sliding channel 16 and a sensitive tip 22 operatively connected to the main body 21 in order to synchronize, in a manner that will be clarified in greater detail below, the unlocking of the upper bolt 13 with the achievement of vertical alignment of the upper bolt 13 with the strike plate 14 of the crosspiece 4 of the fixed frame 2, 3, 4 of the door or window frame. The sensitive tip 22 is specifically hinged to the main body 21 of the mechanical sensor 17.

[0042] The axis of rotation of the sensitive tip 22 is horizontal.

[0043] In particular, the horizontal axis of rotation of the sensitive tip 22 is orthogonal to the flat upright 11 of the secondary leaf 6.

[0044] The sensitive tip 22 of the mechanical sensor 17 has two opposing inclined planes 23, 24 for interaction with the upper crosspiece 4 of the fixed frame 2, 3, 4.

[0045] The main body 21 of the mechanical sensor 17 has two opposing shoulders 25, 26 for limiting the end-of-stroke rotation of the sensitive tip 22.

[0046] The opposing shoulders 25, 26 are formed at the upper edge of the main body 21 of the mechanical sensor 17.

[0047] In particular, the sensitive tip 22 of the mechanical sensor 17 has an isosceles triangular shape, wherein the two equal sides define the two opposing inclined planes 23, 24, and the base side centrally has, for hinging to the main body 21 of the mechanical sen-

sor 17, a protrusion 27 having a rounded end 28 engaged in a correspondingly shaped seat 29 provided in the main body 21 of the mechanical sensor 17.

[0048] Each of the two portions of the base side of the sensitive tip 22 separated by the protrusion 27 is configured to abut against a corresponding abutment 25, 26 for limiting the end-of-stroke rotation of the sensitive tip 22.

[0049] The block 30 finally has guide fins 39 which slidably engage corresponding fins 40 of the mechanical sensor 17 in order to ensure guided vertical sliding of the latter.

[0050] The locking element 19 is slidable in a track 31 formed on the mechanical sensor 17.

[0051] The track 31 has a first open end facing a first support surface 32 of the locking element 19 provided by the upper bolt 13, and a second open end facing a second support surface 33 of the locking element 19 provided by the block 30.

[0052] The first support surface 32 is vertical and the second support surface 33 comprises a lower vertical portion 34 and an upper inclined portion defining the cam 20.

[0053] The upper bolt 13 has a vertical through-slot 36 in which the block 30 is housed.

[0054] The first vertical support surface 32 is defined by a wall of the vertical through-slot 36, and the second support surface 33 is defined by a surface of the block 30 facing said wall of the vertical through-slot 36.

[0055] The track 31 is formed by two flat horizontal teeth arranged parallel to one another and positioned one above the other, which extend orthogonally from the side of the mechanical sensor 17 facing the bottom wall 15b of the guide profile 15.

[0056] The upper bolt 13 is interposed between the mechanical sensor 17 and the bottom wall 15b of the guide profile 15.

[0057] The mechanical sensor 17 therefore faces the upright 11 of the secondary leaf 6.

[0058] The mechanical sensor 17 is also a flat element having a main plane of extension oriented parallel to the flat upright 11.

[0059] In practice, the guide profile 15 guides the vertical sliding of the upper bolt 13, while the upper bolt 13, by means of dedicated vertical guide flanges 37, guides the vertical sliding of the mechanical sensor 17.

[0060] The elastic element 18 includes a vertical helical spring interposed between the mechanical sensor 17 and the block 30.

[0061] In detail, the vertical helical spring has a lower end engaged against a shoulder 35 of the block 30 positioned below the second support surface 33, and an upper end engaged against the lower side of the lower tooth of the track 31.

[0062] The operation of the locking device according to the invention is apparent from what has been described and illustrated and, in particular, is essentially as follows.

[0063] Hereinafter, as shown in the drawings, opening of the secondary leaf 6 from left to right and consequently closing of the secondary leaf 6 from right to left is assumed; analogous concepts obviously apply to opening and closing in the opposite direction.

[0064] The upper bolt 13 is normally held in a protruding upward position by the action of an elastic element not shown.

[0065] When the secondary leaf 6 is closed, the upper bolt 13 of the rod 12 is engaged in the cup 14a of the strike plate 14 and the mechanical sensor 17 is completely retracted downward since the tip of the sensitive tip 22 engages the surface of the collar 14b.

[0066] In particular, the tip of the sensitive tip 22 has a protrusion 22a which prevents the penetration of the tip of the sensitive tip 22 into the cup 14a of the strike plate 14.

[0067] In this configuration of the locking device 1, the upper bolt 13 is free to slide vertically since the locking element 19 is positioned between the vertical surface 32 and the lower vertical portion 34 of the support surface 33, which is parallel to the vertical surface 32.

[0068] To open the secondary leaf 6, a manual control causes downward retraction of the upper bolt 13, overcoming the elastic force generated by the elastic element acting on the upper bolt 13. During opening of the secondary leaf 6, the sensitive tip 22, resting with its base side against one of the shoulders 25, 26, disengages from the upper horizontal strike plate 14 and consequently, due to the action of the elastic element 18, the mechanical sensor 17 protrudes upward.

[0069] The upward movement of the mechanical sensor 17 causes wedging of the locking element 19 between the vertical surface 32 and the cam 20 defined by the upper inclined portion of the support surface 33.

[0070] The cam 20 pushes the locking element 19 along the track 31, causing it to tighten against the vertical surface 32 until the upper bolt 13 is locked.

[0071] The locking element 19 thus locks the upper bolt 13 in the downwardly retracted position. During closing of the secondary leaf 6, the locking device 1 operates as follows.

[0072] The sensitive tip 22, resting against one of the shoulders 25, 26, shoulder 25 in the illustrated case, is intercepted by the strike plate 14.

[0073] Advantageously, at this point the thrust force exerted by the strike plate 14 brings the sensitive tip 22 to rest against the shoulder 25, 26 opposite the intercepted inclined plane, and only subsequently does it retract downward.

[0074] This delay in the downward retraction of the mechanical sensor 17 prevents premature unlocking of the upper bolt 13 which, pushed upward by the elastic element acting thereon, could rise before proper alignment of the upper bolt 13 with the strike plate 14 has been achieved.

[0075] Correct closing of the secondary leaf 6 is in-

stead ensured by this feature even in the worst condition in which the clearance between the guide profile 15 and the strike plate 14 is minimal.

[0076] In fact, only after completion of the rotation of the sensitive tip 22 does the thrust force exerted by the strike plate 14 on the intercepted inclined side 23 of the sensitive tip 22 cause the latter and the main body 21 to retract downward together.

[0077] As a result of the downward retracting vertical sliding of the mechanical sensor 17, the locking element 19 returns between the vertical surface 32 and the lower vertical portion 34 of the support surface 33, which is parallel to the vertical surface 32, and the locking element 19 unlocks the upper bolt 13, which can thus correctly engage in the cup 14a of the strike plate 14.

[0078] Optionally, a chamfer 38 of the collar 14b of the strike plate 14 may be provided to guide the upper bolt 13 of the vertical rod 12 into the correct position and reduce impact.

[0079] Obviously, in the case where the opening and closing direction of the secondary leaf 6 is reversed with respect to that shown above, the sensitive tip 22, with the secondary leaf 6 open and closed, will be positioned at rotation end stops reversed with respect to those shown above. Advantageously, the proposed solution simplifies warehouse logistics, since a single product code can be provided for both opening directions of the leaf.

[0080] In a solution not shown, the strike plate 14 may be flush with the upper crosspiece 4 of the fixed frame 2, 3, 4 rather than projecting as shown. In this case, the sensitive tip 22 can interact directly with the upper crosspiece 4 of the fixed frame 2, 3, 4.

[0081] The locking device thus conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept; moreover, all details may be replaced with technically equivalent elements.

[0082] For example, the guide profile 15 may have an internal lining made of a material having a reduced coefficient of friction.

[0083] In practice, the materials used, as well as the dimensions, may be any according to requirements and the state of the art.

Claims

1. A door or window assembly comprising a fixed frame (2, 3, 4), a primary hinged leaf (5) provided with a lock equipped with at least one latch and/or bolt (7, 8), and a secondary hinged leaf (6) with an upright (11) where a strike plate (9, 10) is mounted for engaging said at least one latch and/or bolt (7, 8); a vertical rod (12) vertically slidable and provided with an upper bolt (13) for engagement with an upper horizontal crosspiece (4) of the frame (2,

3, 4); a vertically slidable rod (12) with an upper bolt (13) for engagement with an upper horizontal crosspiece (4) of the frame (2, 3, 4); and a locking device (1) for the upper bolt (13) of said vertical rod (12), said vertical rod (12) being vertically slidable along said upright (11) for engagement of the end (13a) of the upper bolt (13) with a strike plate (14) in the upper crosspiece (4); **characterized in that** said locking device (1) comprises:

a guide profile (15) applicable externally to the upright (11) of the leaf (6) and configured to define, together with the upright (11) of the leaf (6), a channel (16) for guided vertical sliding of the upper bolt (13), wherein the sliding channel (16) has an open upper end for the passage of the end (13a) of the bolt (13);

a mechanical sensor (17) slidable in the vertical direction within the sliding channel (16) and adapted to protrude from said open end of the sliding channel (16) and interact with the strike plate (14) or with the upper crosspiece (4) of the frame (2, 3, 4) of the window or door assembly to retract into the interior of said sliding channel (16) against the action of an elastic element (18); and

a friction-type locking element (19) of the upper bolt (13), vertically movable with the mechanical sensor (17) and actuated by a cam (20) in a direction transverse to the vertical direction, between a locking position and an unlocking position of the upper bolt (13); wherein the mechanical sensor (17) has a main body (21) vertically slidable within said sliding channel (16), and a sensing terminal (22) operatively connected to said main body (21) for synchronizing the unlocking of the upper bolt (13) with the vertical alignment of the upper bolt (13) with the strike plate (14) in the crosspiece (4) of the frame (2, 3, 4); **in that** said sensing terminal (22) is hinged to said main body (21) and said main body (21) has two opposing abutments (25, 26) for limiting the rotation travel of said sensing terminal (22); **in that** said cam (20) is formed in a block (30) fixed to the guide profile (15); **in that** said locking element (19) is slidable in a track (31) formed on said mechanical sensor (17) and having a first open end facing a first support surface (32) of the locking element (19) provided by the upper bolt (13) and a second open end facing a second support surface (33) of the locking element (19) provided by the block (30); and **in that** said first support surface (32) is vertical and said second support surface (33) comprises a lower vertical portion (34) and an upper inclined portion defining said cam (20).

2. Locking device (1) according to claim 1, **characterized in that** said sensitive tip (22) has two opposing inclined planes (23, 24) for interaction with the upper crosspiece (4) of the frame (2, 3, 4).

3. Locking device (1) according to any one of the preceding claims, **characterized in that** said locking element (19) includes a rolling element.

4. Locking device (1) according to any one of the preceding claims, **characterized in that** said elastic element (18) includes a vertical helical spring interposed between the mechanical sensor (17) and the block (30).

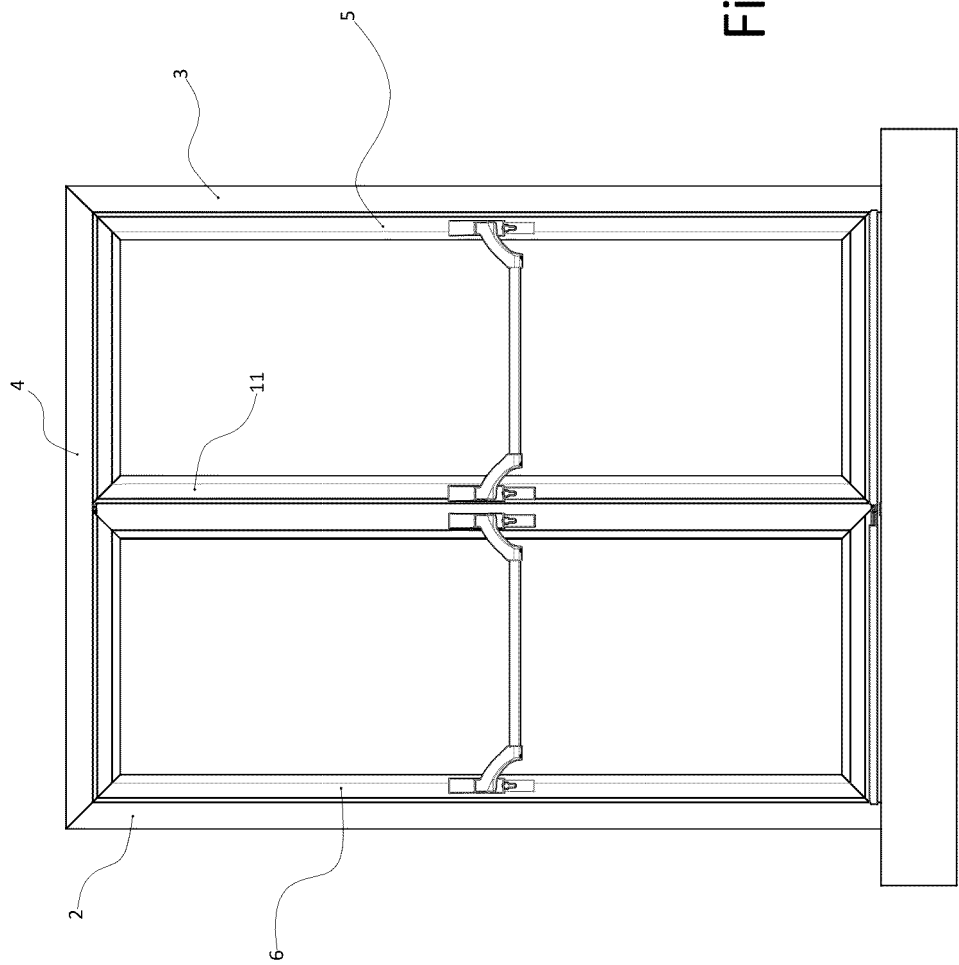


Fig. 1

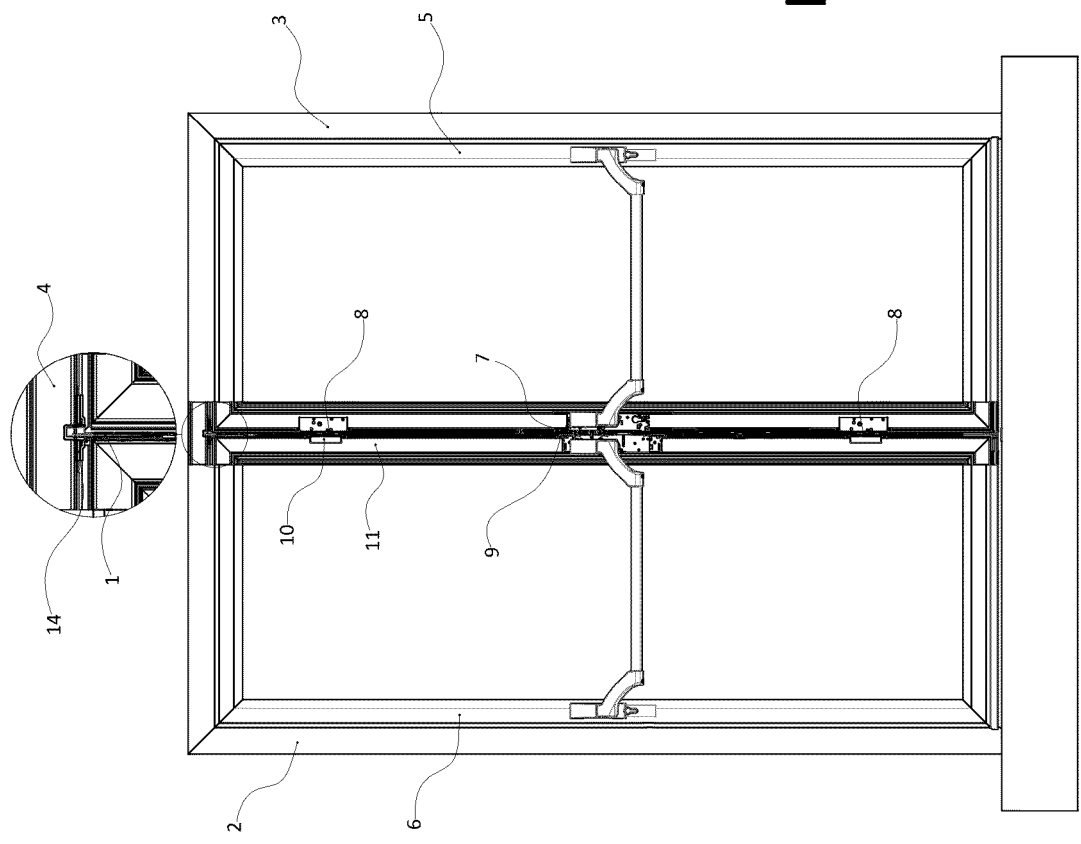


Fig.2

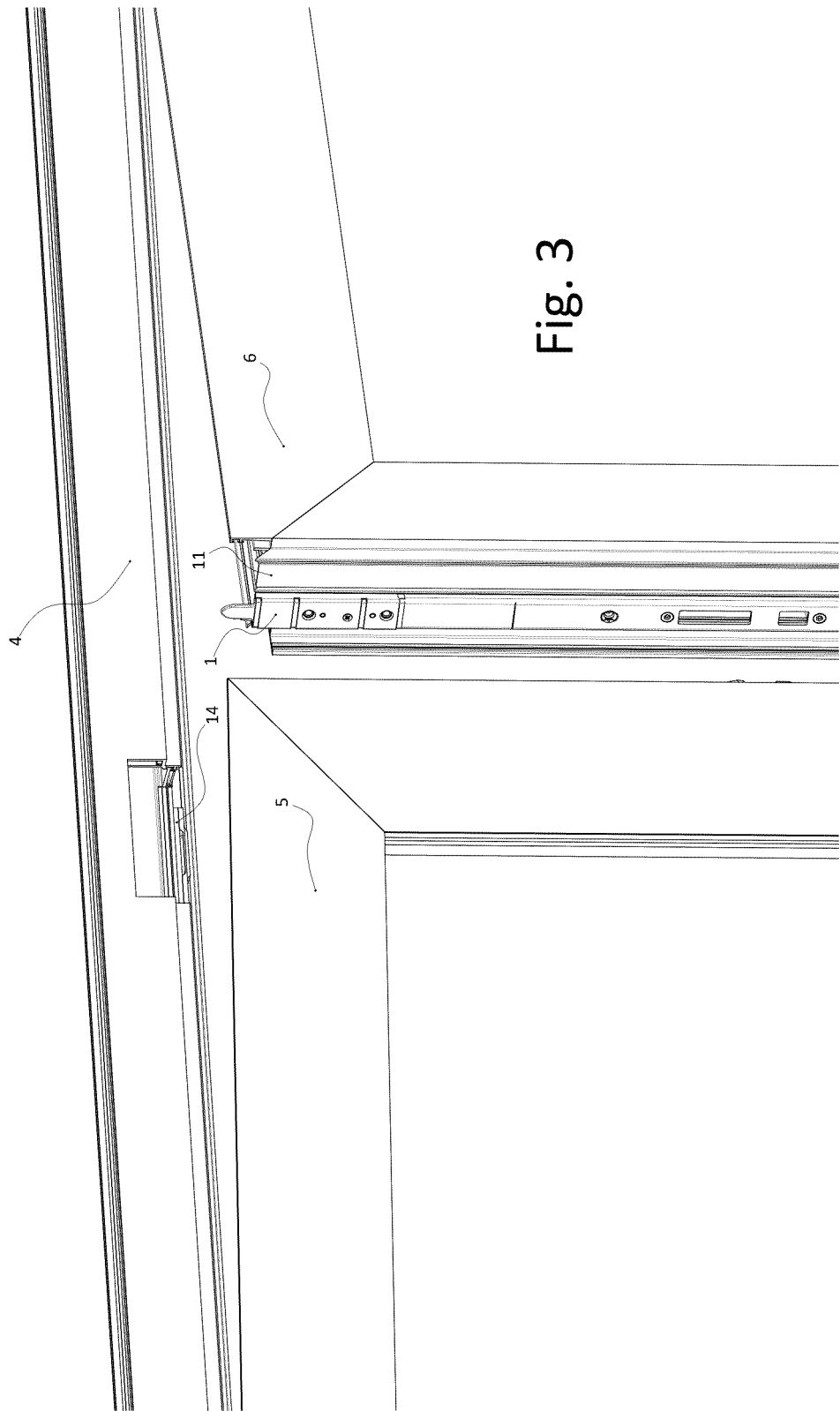


Fig. 3

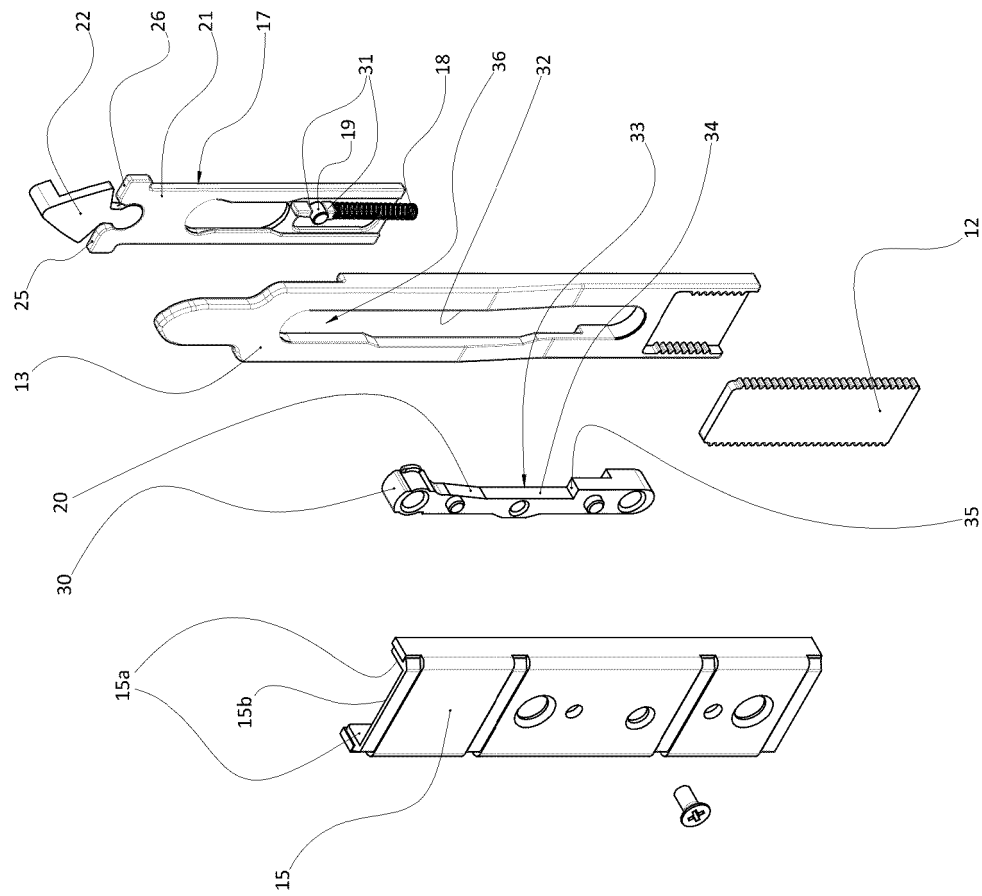


Fig. 4

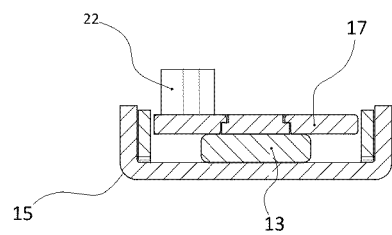


Fig. 6

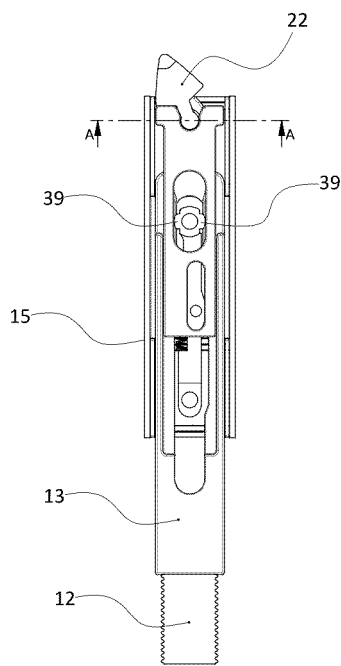


Fig. 5

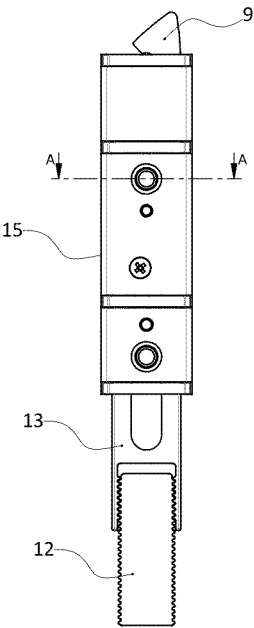


Fig. 7

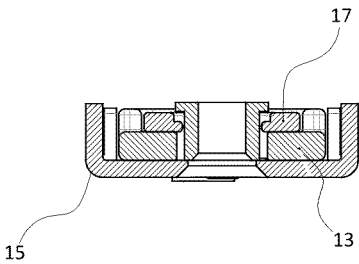
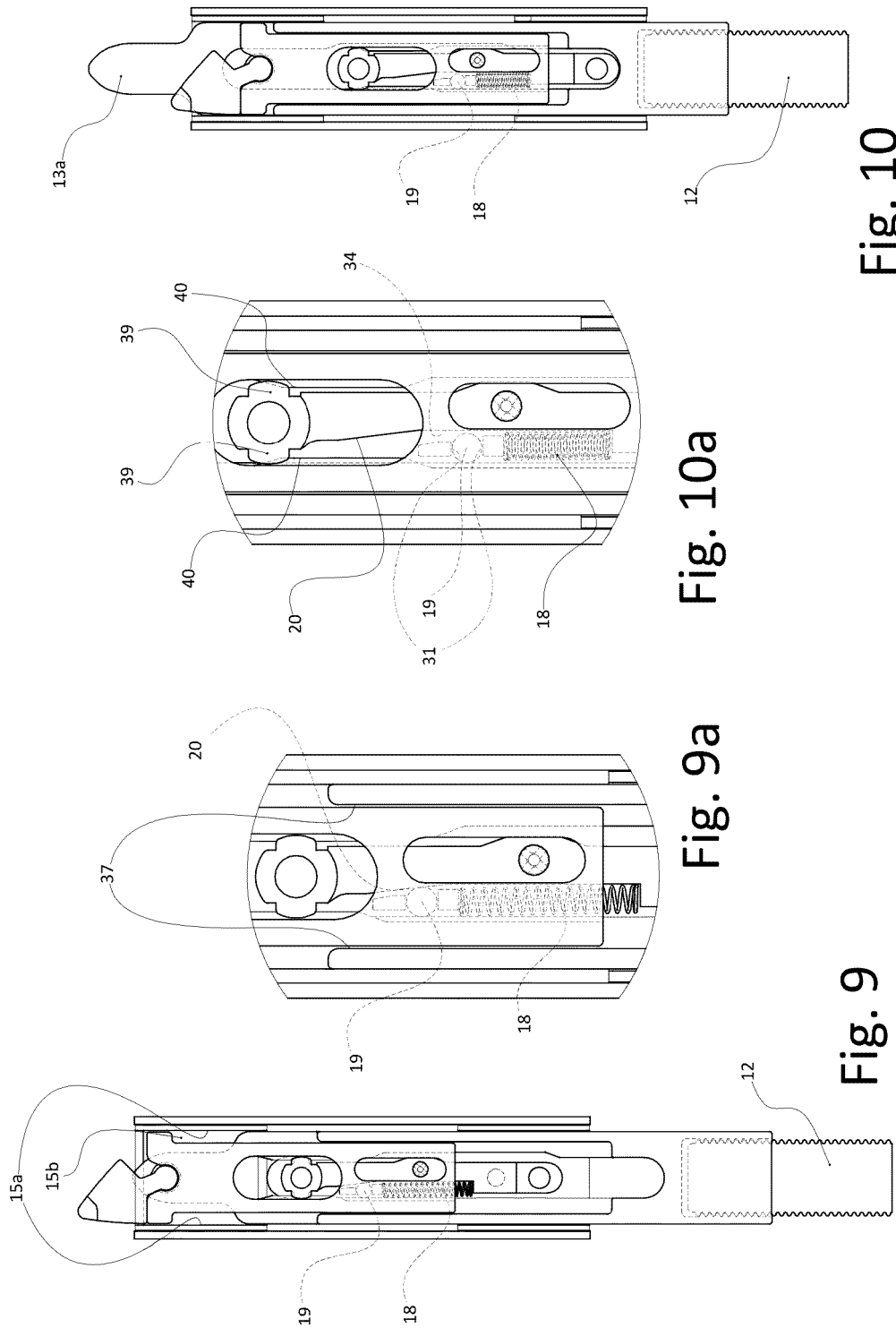
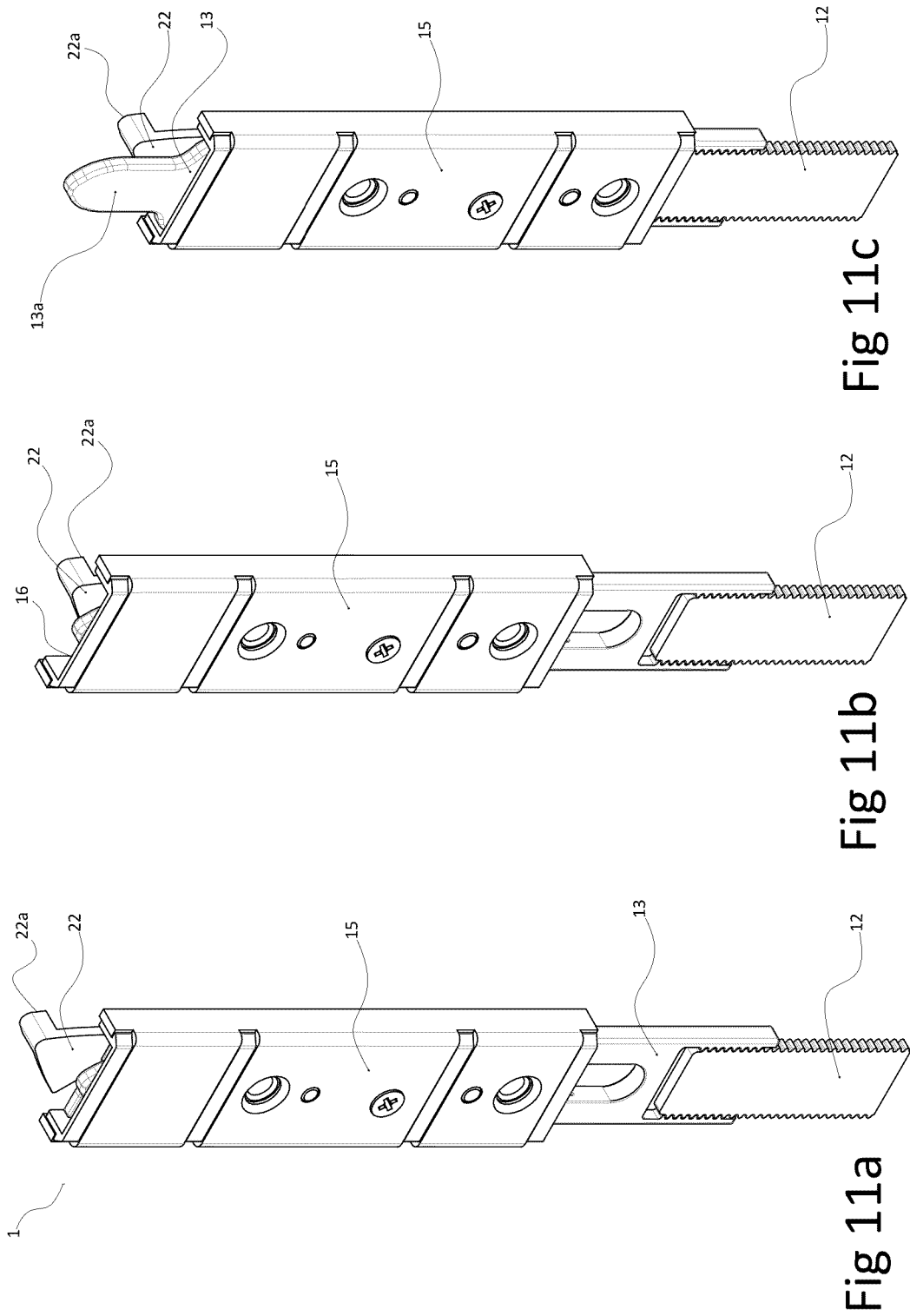


Fig. 8





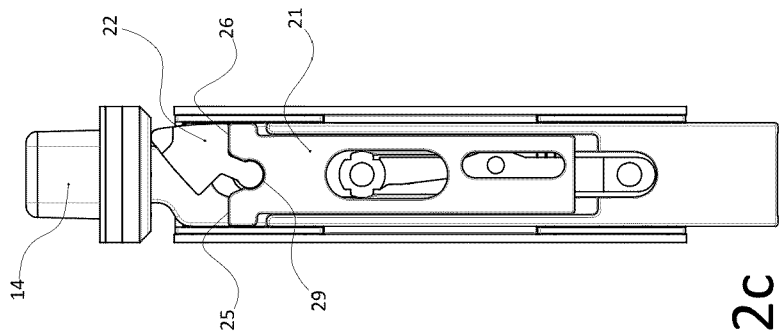


Fig 12c

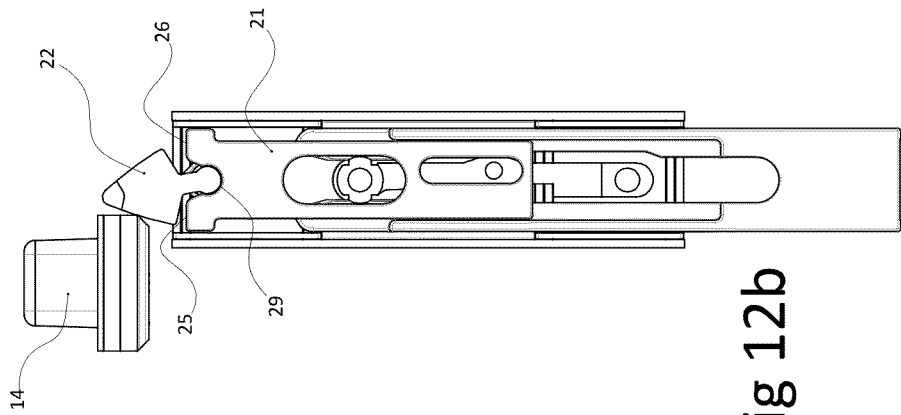


Fig 12b

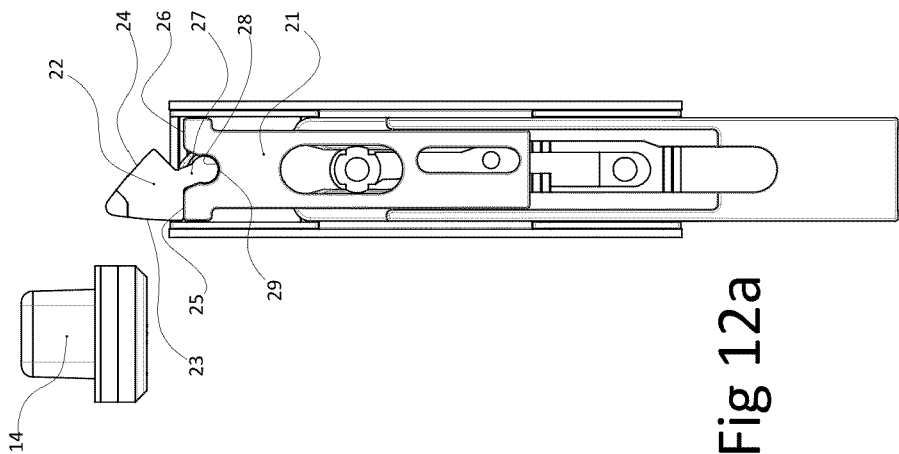


Fig 12a

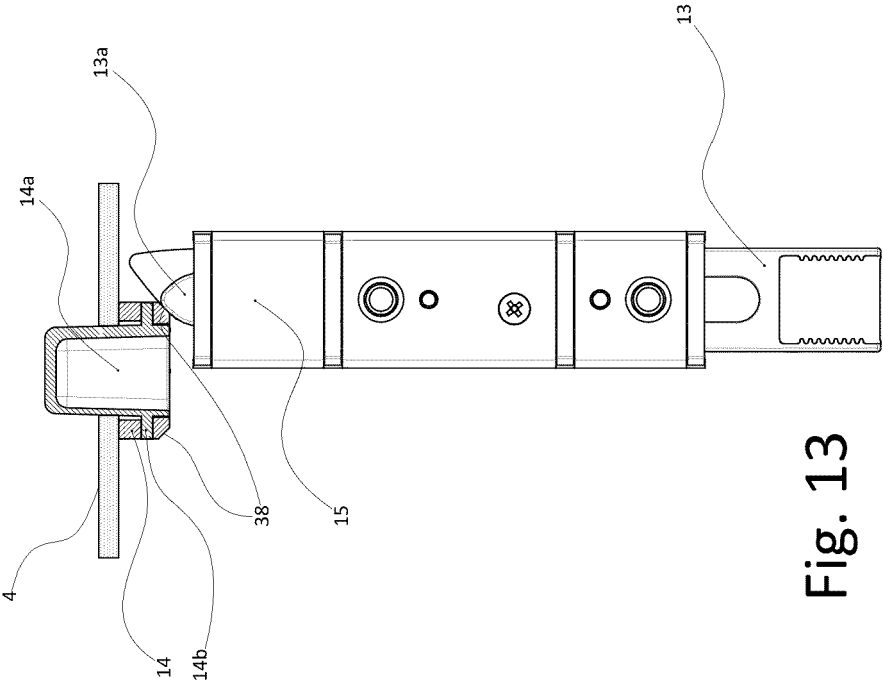


Fig. 13



EUROPEAN SEARCH REPORT

Application Number

EP 26 16 2821

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2021/152641 A1 (CISA SPA [IT]) 5 August 2021 (2021-08-05) * page 4, line 27 - page 9, line 30; figures 1-11 *	1-4	INV. E05C7/04 E05C9/18
A	EP 2 725 173 B1 (WILH SCHLECHTENDAHL & SOEHNE GMBH & CO KG [DE]) 7 September 2016 (2016-09-07) * the whole document *	1-4	
A	EP 0 635 611 A1 (ITALIANA SERRATURE AFFINI [IT]) 25 January 1995 (1995-01-25) * paragraph [0020] - paragraph [0036]; figures 1-19 *	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05C E05B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		30 June 2026	Goddar, Claudia
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L : document cited for other reasons			
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