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(54) COMPRESSION LOCK

(57) A lock, in particular for motor vehicles such as vans, caravans, motorhomes, and the like, is designed to close a door, a tailgate, a hatch, by compression, using a handle rotation of less than 180°. The lock acts to convert the rotation of the handle on a plane parallel to the plane of the door into a roto-translatory motion of the bolt which performs the locking and fastening operations.

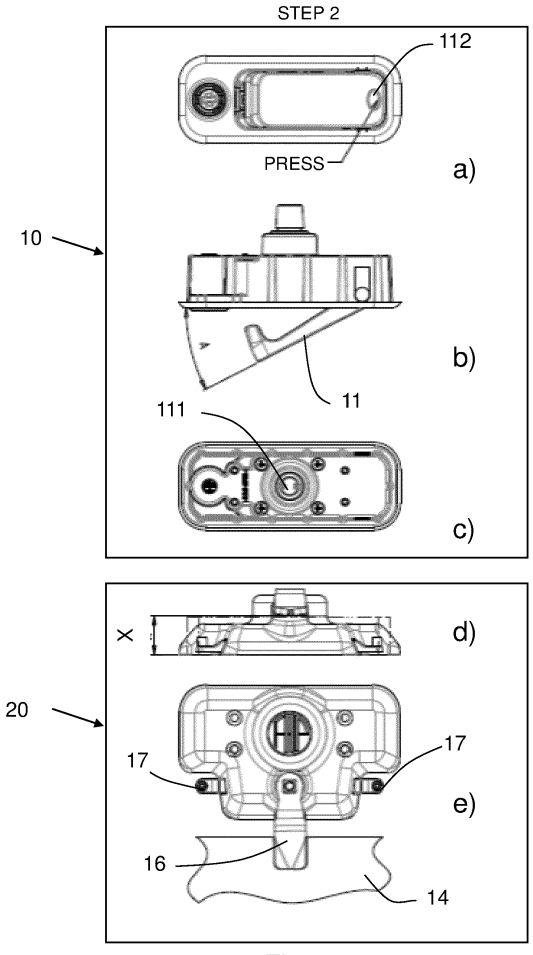

Fig. 2

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of closing devices and safety locks for doors and hatches; in greater detail, the present invention relates to the technical field of locks for doors, tailgates, and hatches, in particular for motor vehicles, such as vans, caravans, motorhomes and the like.

BACKGROUND ART

[0002] In the field of closing devices and safety locks for doors and hatches, devices generally comprising a lock body applied integrally to the concerned door, which houses a shaft, adapted to guide a closing sliding bolt integral with an end of said shaft, are available on the market. A rotational actuating knob is associated with said shaft and is adapted to actuate it by rotating it and then translating it in an axial direction to close the rotational lock of the so-called "screw lock" type to which it belongs.

[0003] Said rotational knob is further generally provided with a cylinder lock, or similar key locking means, which makes locking with a key possible.

[0004] In general, in the closing systems used in the field of closing devices and safety locks for doors and hatches, and in particular for doors of motor vehicles such as vans, caravans, motorhomes, and the like, the closing of the so-called "screw lock" type always contemplates the actuation of the handle, which must be rotated by 180 degrees to close and then fasten.

[0005] It is an object of the present patent application to introduce a snap-closing device for doors and hatches, with particular reference to the doors and hatches of motor vehicles such as vans, caravans, motorhomes, and the like, which makes it possible to introduce a greater simplicity and practicality than the known closing devices of the "screw lock" type and preferably not protruding from the wall profile.

[0006] The invention achieves the purpose with a lock adapted to close, by compression, a door, a tailgate, a hatch, comprising a handle block adapted to be integrally fixed to the outer side of a door, said handle block comprising a handle associated with a rotor and adapted to rotate on an axis parallel to the plane of the door from a first position to a second position, wherein said first position corresponds to a closing position of said lock and said second position corresponds to an opening position of said lock. The handle block is engaged by means of the rotor to a closing block adapted to be integrally fixed onto the inner side of said door and comprises reversible engagement means with the door frame. The reversible engagement means comprise a bolt adapted to rotate to promote the engagement with the frame of said door and to translate in an axial direction to successively fasten the door. The reversible engagement means, actuated by the handle, through a kinematic mechanism, convert the rotary motion of the rotor into a compound motion comprising, in sequence:

- a translatory type motion in the axial distancing direction of the bolt from the frame followed by a rotational type of motion in the circumferential distancing direction of the bolt from the frame when the handle moves from the first to the second position;
- a rotational type of motion in the circumferential approaching direction of the bolt to the frame followed by a translatory type motion in the axial approaching direction of the bolt to the frame when the handle moves from the second to the first position.

[0007] The closing device of the present invention can be applied to the doors of vans, caravans, motorhomes, and the like and is characterized as an improvement of the conventional "screw lock" devices which perform both the closing and fastening by means of a simple continuous rotary movement of the handle which occurs on an axis parallel to the plane of the door.

[0008] It is possible to use the lock according to the invention also with doors, hatches, flaps provided with multiple locking points, because the possibility is envisaged, in an advantageous improvement, to generate additional translatory motions to the roto-translatory motion acting on the main bolt included in the lock body to drive remote locking blocks by means of rods or tie-rods, thus achieving an effective compression closing through the use of a single handle.

DESCRIPTION OF THE DRAWINGS

[0009] Further objects, features, and advantages of the present invention will be more apparent from the following detailed description provided by way of nonlimiting example and illustrated in the accompanying figures, in which:

- Fig. 1 shows some views of the outer side (front: Fig. 1a, from above: Fig. 1b, rear: Fig. 1c) and the inner side (from above: Fig. 1d, from below: Fig. 1e) of a lock according to a preferred embodiment of the present invention in a first operating position;
- Fig. 2 shows the same views as the previous figure with the lock in a second operating position;
- Fig. 3 shows the same views as the previous figures with the lock in a third operating position;
- Fig. 4 shows the same views as the previous figures with the lock in a fourth operating position;
- Fig. 5 shows a perspective view of a rotatable scope device capable of converting a rotational motion into a roto-translatory mode for driving a bolt of the lock according to the invention;
- Fig. 6 shows an example of a closing block which can be driven by a lock according to the invention;
- Fig. 7 shows an example of a closing block which

can be driven by a lock according to the invention, and

Fig. 8 shows the same views as Figs. 3a and 3b with highlighted an example of a mechanism which can be employed to transform the rotational motion of the handle into the rotational motion of the rotor which drives the bolt of the lock according to the invention.

[0010] The following description of exemplary embodiments relates to the accompanying drawings. The same reference numbers in the various drawings identify the same elements or similar elements. The following detailed description does not limit the invention. The scope of the invention is defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

[0011] With reference to the accompanying figures, a preferred embodiment of the present invention comprises a handle block 10, adapted to be integrally fixed to the outer side of a door, comprising a handle 11 associated with a rotor 111, engaged with a closing block 20 adapted to be integrally fixed to the inner side of the door at the handle block 10 and comprising a shaft 19 and a bolt 16.

[0012] The handle block 10 may be provided with a limit stop device and may comprise a cylinder lock adapted to control a stop bolt adapted to engage, in the closing position, with an appropriate housing on the handle 11, said handle 11 being preferably of the retractable type.

[0013] Fig. 1b shows the handle 11 in a first position flush with the door while Fig. 4b shows the handle 11 in a second position substantially at 90° to the first position. The first position corresponds to a closing position of the lock while the second position corresponds to an opening position of the lock. By rotating the handle from the first to the second position and vice versa, the door can be opened/closed without the need for further movements as described in more detail below.

[0014] The handle block 10 comprises reversible means adapted to transform the rotational motion of the handle 11, which occurs on an axis parallel to the plane of the door, into a rotational motion of the rotor 111, which occurs on an axis perpendicular to the plane of the door. For example, such reversible means may comprise a connecting rod/crank coupling 113 as shown in Fig. 8.

[0015] The rotor 111 moves the closing block 20. The handle block 10 and the closing block 20 are typically two separate devices, but can also be advantageously integrated into the same lock component.

[0016] The closing block 20 comprises reversible engagement means with the door frame that advantageously comprise an element 16, named a bolt, adapted to rotate by means of a shaft 19 fixed at one end to facilitate engagement with the door frame 14 of the door. During the rotation, the bolt 16 moves from an opening position, in which it is substantially parallel to the perimeter edge of the door frame 14 as shown in Figs. 4d and 4e to a closing position in which the bolt 16 is rotated substantially 90° to a position substantially perpendicular to the perimeter edge of the door frame 14 as shown in Fig. 3e.

[0017] The shaft 19 can translate in the axial direction. When the bolt 16 is in the closing position, the door is fastened by moving the shaft 19 axially in the approaching direction of the bolt 16 to the lock body 10.

[0018] In other words, during the step of closing, the bolt 16 rotates firstly to promote the engagement with the frame 14 of said door and then translates axially to press the door onto its frame 14 and fasten the door itself.

[0019] Then, after a first initial rotation which makes the bolt 16 rotate to circumferentially approach the peripheral edge of the frame 14 of the door, a further rotation of the handle 11 to the limit stop does not apply further rotations to the bolt 16, instead, it applies an axial translation, orthogonal to the plane of the door, such to reduce the distance between the bolt 16 itself and the plane of the door on which the closing block 20 is fixed. This axial translation is adapted to progressively compress the door onto its frame 14, guaranteeing the right squeezing of the seals possibly placed on the edge of the door or of the frame 14 and achieving the fastening of the door.

[0020] The door is opened by performing the same steps in reverse. The initial rotation of the handle 11 in the opposite direction causes the axial translation of the bolt 16 so that the distance between the bolt and the door is increased. The successive rotation in the same direction induces rotation of the bolt 16, which thus disengages from the frame 14.

[0021] With reference to Fig. 1-4, the working steps required to open the door can be summarized as follows:

STEP 1

[0022]

- The handle 11 is flush with the handle block 10;
- The rotor 111 is positioned to keep the bolt 16 of the inner portion compressed on the frame of the tailgate 14 at position X as shown in Fig. 1d;
- The hatch is closed; the seals are compressed.

STEP 2

[0023]

- By applying light pressure to the point on the handle shown in Fig. 2a, the handle rotates by the clearance angle A. Releasing this pressure, the handle returns flush with the lock body. For this purpose, the handle block advantageously comprises a pressure zone 112, the pressure of which causes the handle 11 to rotate from its rest position to its maximum angular extension defined by the release angle A. Spring-return means then return the handle to its home position when the pressure is released.

- By maintaining the pressure, it is possible to grasp the handle 11 and apply the force needed to proceed to STEP 3;
- With handle 11 rotated by angle A, the rotor remains in the same position as in STEP 1;
- In this step, the rotation of the handle 11 does not generate any rotation of the rotor 111;
- The hatch remains closed, the seals still compressed.

STEP 3

[0024]

- By applying the right force, the handle 11 rotates by an angle B as shown in Fig. 3b;
- The movement of the handle 11 rotates the rotor 111 which is engaged with the closing block 20 and drives the bolt 16 which is distanced from the frame 14 by a quantity Y, decompressing the seals as shown in Fig. 3d;
- The hatch is still closed, but the seals are decompressed.

STEP 4

[0025]

- As the rotation continues, the handle 11 moves to the limit of its travel at an angle C shown in Fig. 4b;
- The rotor 111 concludes its rotation by causing the bolt 16 to rotate, which frees the hatch from the frame 14.
- The tailgate is open.

[0026] With the tailgate open (STEP 4) the handle 11 stays open at an angle between B and C.

[0027] With the door closed (STEP 1), the handle 11 returns flush with the lock body 10.

[0028] In normal operation, STEP 3 and STEP 4 are sequential and nothing is felt on the handle, the decompression and rotation of the bolt occur in a single movement that starts at angle A and arrives at angle C.

[0029] The closing and compression of the seals are accomplished by closing the hatch and pushing the handle 11 into the handle block 10.

[0030] The insertion of the safety device can take place with any position of the handle, if this is open at the next closing it will lock in the position of step 1.

[0031] With the safety lock engaged, pressing the pressure zone 112 does not open the handle 11.

[0032] For such a sequence of movements to take place, the reversible engagement means are advantageously driven by the handle 11 which, by means of a kinematic mechanism, converts the rotary motion of said handle, which takes place on an axis parallel to the plane of the door, into a rotary motion of the rotor 111, which takes place on an axis perpendicular to the plane of the door. The rotor 111 is engaged with the closing block 20 which, through a kinematic mechanism, converts said rotational motion into a compound motion comprising, in sequence:

- a translatory type motion in the axial distancing direction of the bolt 16 from the frame 14 followed by a rotational type of motion in the circumferential distancing direction of the bolt 16 from the frame 14 when the handle 11 moves from the first to the second position;
- a rotational type of motion in the circumferential approaching direction of the bolt 16 to the frame 14 followed by a translatory type motion in the axial approaching direction of the bolt 16 to the frame 14 when the handle 11 moves from the second to the first position.

[0033] The handle 11 typically moves within a circular sector defined by a predetermined release angle (A) relative to its angular resting position corresponding to the closing of the lock which corresponds an absence of motion of the shaft 19.

[0034] The conversion of the rotational motion of the closing block 20, may be advantageously performed by means of a cam device which moves on a cam guide so that there is no simultaneous roto-translation of the shaft 19, but the rotational and translatory motions of the shaft 19 occur in a defined time succession.

[0035] Fig. 5 shows a solution which employs a screwlock 21 adapted to guide the shaft 19 inside, in a rotational and axially translatable manner, by means of a pin 22 adapted to engage both with said shaft 19 and said guide 23 present on said screwlock 21, said screwlock 21 further comprising an adjustment bushing 24 adapted to cooperate with said pin 22 and with said guide 23 to allow said screwlock 21 to rotate relatively to said shaft 19, while said shaft 19 translates axially.

[0036] The lock according to the invention is particularly advantageous when the door, tailgate, or hatch to which it is applied requires more than one locking point.

[0037] For this purpose, a variant envisages the use of a kinematic mechanism adapted to transform the motion of the handle 11 into one or more further translatory motions transverse to the translatory motion of the bolt 16 to allow said translatory motions to be remotely transmitted to one or more closing blocks 13 by means of one or more rods or tie-rods 12.

[0038] The kinematic mechanism may advantageously comprise a gear and one or more racks associated with one or more levers 17 so that the rotation of the gear causes the translation of said one or more levers.

[0039] According to an embodiment, the further translatory motions are advantageously transferred to a pair of levers 17 arranged on the opposite sides of the closing block 20, which levers 17 are configured to move in the same transverse direction relative to the axial motion of the bolt 16, but with opposite orientations.

[0040] In a further configuration, the lock comprises:

a plurality of rods or tie-rods 12 associated, at a first end, with the kinematic mechanism;
one or more closing blocks 13, e.g., of the compression type, adapted to be fixed to said door and each associated with a second end of a rod or tie-rod 12 of said plurality of rods or tie-rods 12, said closing blocks 13 comprising reversible engagement means with the frame 14 of said door that can be actuated by means of said rods or tie-rods 12.

[0041] The reversible engagement means of the closing locks 13 typically comprise, like the closing assembly 20, a bolt 16' adapted to rotate to promote the engagement with the frame 14 of said door, and to translate in an axial direction, to carry out the successive fastening of the door.

[0042] Advantageously, the closing blocks 13 each comprise a shaft having the rotation axis 25 substantially orthogonal to the plane of the door, and connected with an end to said sliding door bolt 16' and with the other end to a toothed wheel 17, e.g., eccentric relative to the axis of said shaft and adapted to engage with a rack 18 connected, in turn, to said second end of the rod 12. A same screwlock configuration can convert the rotational motion of the toothed wheel to roto-translatory motion of the bolt in a manner similar to that seen for the bolt of the handle assembly.

[0043] In this manner, a very reliable and easy-to-use compression lock is created that can guarantee a seal that is all the greater the higher the number of closing blocks used, all operated by simply turning a handle.

[0044] The description of the preferred embodiments of the invention above refers to the accompanying drawings. The same reference numbers in the various figures identify the same elements or similar elements. The detailed description given above does not limit the scope of the disclosed invention because the scope of protection of the present invention is defined by the accompanying claims.

Claims

1. A lock comprising a handle block (10) adapted to be integrally fixed to the outer side of a door, said handle block (10) comprising a handle (11) associated with a rotor (111) and adapted to rotate on an axis parallel to the plane of the door from a first position to a second position, wherein said first position corresponds to a closing position of said lock and said second position corresponds to an opening position of said lock, said handle block (10) being engaged by means of the rotor (111) to a closing block (20) adapted to be integrally fixed onto the inner side of said door and comprising reversible engagement means with the frame (14) of said door, **characterized in that** said reversible engagement means comprise a bolt (16) adapted to rotate, so as to promote the engagement with the frame (14) of said door, and to translate in an axial direction, to carry out the subsequent locking of the door, said reversible engagement means being actuatable by the handle (11) through a kinematic mechanism which converts the rotation that occurs on an axis parallel to the plane of the door into a compound motion comprising, in sequence:

a translatory type motion in the axial distancing direction of the bolt (16) from the frame (14) followed by a rotational type of motion in the circumferential distancing direction of the bolt (16) from the frame (14) when the handle (11) moves from the first to the second position;
a rotational type of motion in the circumferential approaching direction of the bolt (16) to the frame (14) followed by a translatory type motion in the axial approaching direction of the bolt (16) to the frame when the handle (11) moves from the second to the first position.

2. A lock according to claim 1, wherein the reversible engagement means comprise a shaft (19) connected at one end to the bolt (16), the other end being coupled to the kinematic mechanism so that the shaft (19) can both rotate and translate axially allowing the bolt (16) to perform a corresponding roto-translation.

3. A lock according to claim 1 or 2, wherein the conversion of the rotational motion of the rotor (111) of the handle block (10) is performed by means of a cam device which moves on a cam guide so that there is no simultaneous roto-translation of the shaft (19), but the rotational and translational motions of the shaft (19) occur in a defined time in succession.

4. A lock according to one or more of the preceding claims, wherein the handle (11) moves within a circular sector defined by a predetermined release angle (A) relative to its angular resting position corresponding to the closing of the lock to which corresponds an absence of motion of the shaft (19).

5. A lock according to claim 4, wherein at the angular handle resting position (11) corresponding to the closing of the lock, the handle (11) is flush with the handle block (10) in a position substantially coplanar with the door.

6. A lock according to claim 4 or 5, wherein the handle block (10) comprises a pressure zone (112), the pressure of which determines the rotation of the handle (11) from its resting position to its maximum angular extension defined by the release angle (A), spring return means being present to return the han-

dle (11) to its resting position when the pressure is released.

7. A lock according to one or more of the preceding claims, wherein the kinematic mechanism comprises a screwlock (21) adapted to guide the shaft (19) inside, in rotation and axially translatable manner, by means of a pin (22) adapted to engage both with said shaft (19) and said guide (23) present on said screwlock (21), said screwlock (21) further comprising an adjustment bushing (24) adapted to cooperate with said pin (22) and with said guide (23) to allow said screwlock (21) to rotate relative to said shaft (19), while said shaft (19) translates axially.

8. A lock according to one or more of the preceding claims, wherein a kinematic mechanism is provided for transforming the motion of the handle (11) into one or more further translatory motions transverse to the translatory motion of the bolt (16) to allow said translatory motions to be remotely transmitted to one or more closing blocks (13) by means of one or more rods or tie-rods (12).

9. A lock according to claim 8, wherein the kinematic mechanism comprises a gear and one or more racks associated with one or more levers (17) so that the rotation of the gear causes the translation of said one or more levers (112).

10. A lock according to claim 8 or 9, wherein the further translatory motions are transferred to a pair of levers (17) arranged on the opposite sides of the locking block (20), said levers (17) being configured to move in the same transverse direction relative to the axial motion of the bolt (16), but with opposite orientations.

11. A lock according to one or more of the preceding claims 8 to 10, **characterized in that** it further comprises a plurality of rods or tie-rods (12) associated, at a first end, with said kinematic mechanism;
one or more closing blocks (13) adapted to be fixed to said door and each associated with a second end of a rod or tie-rods (12) of said plurality of rods or tie-rods (12), said closing blocks (13) comprising reversible engagement means with the frame (14) of said door which can be actuated by means of said rods or tie-rods (12).

12. A lock according to claim 11, **characterized in that** said closing blocks (13) are of the compression type.

13. A lock according to claim 11 or 12, **characterized in that** said reversible engagement means of the closing blocks (13) comprise a sliding door bolt (16) adapted to rotate, to promote the engagement of said door with the frame (14) and to translate in an axial direction to successively lock the door.

14. A lock according to one or more of the preceding claims from 11 to 13, **characterized in that** said closing blocks (13) each comprise a shaft (19) having the rotation axis (25) substantially orthogonal to the plane of the door, and connected by an end to said sliding door bolt (16) and by the other end to a toothed wheel (17), e.g. eccentric relative to the axis of said shaft (19) and adapted to engage with a rack (18) connected, in turn, to said second end of the rod (12).

15. A lock according to one or more of the preceding claims, **characterized in that** said handle block (10) comprises a cylindrical lock adapted to control a stop bolt adapted to engage with an appropriate housing present on the handle (11) in the closing position.

16. A lock according to one or more of the preceding claims, **characterized in that** said locking block (20) and said handle block (10) are integrated in the same component of the lock.

17. A door **characterized in that** it comprises a lock according to one or more of the preceding claims.

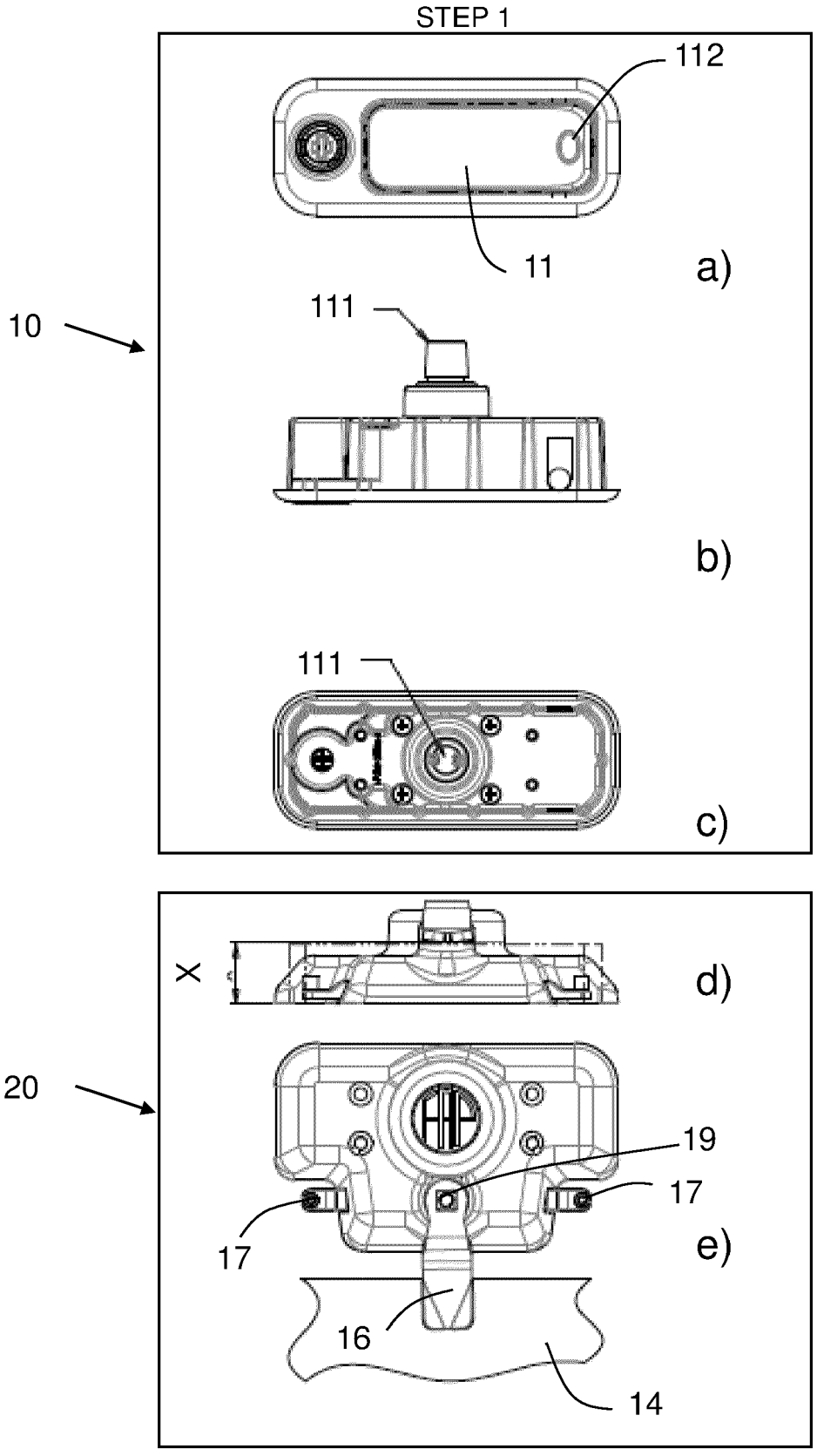

Fig. 1

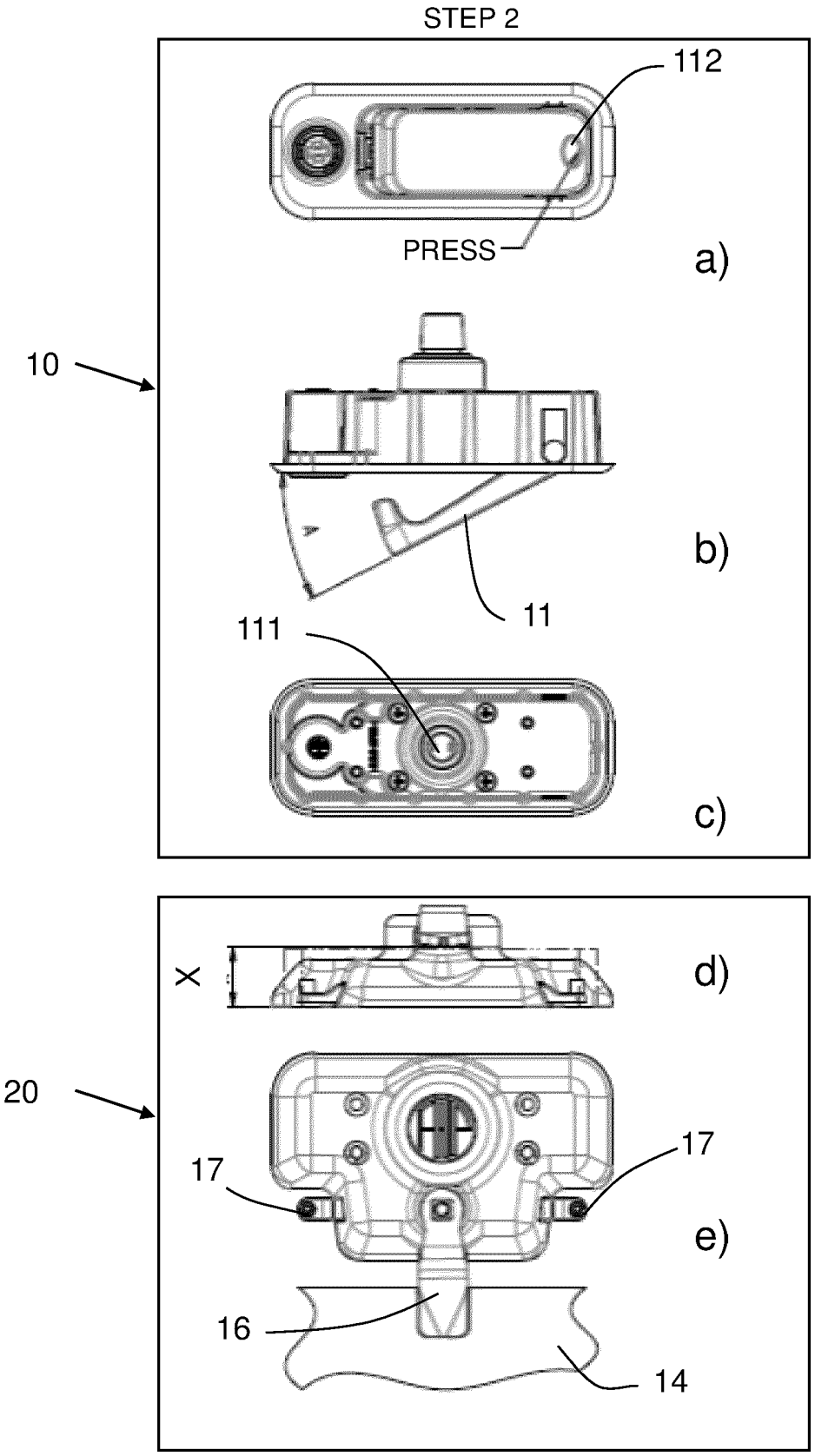

Fig. 2

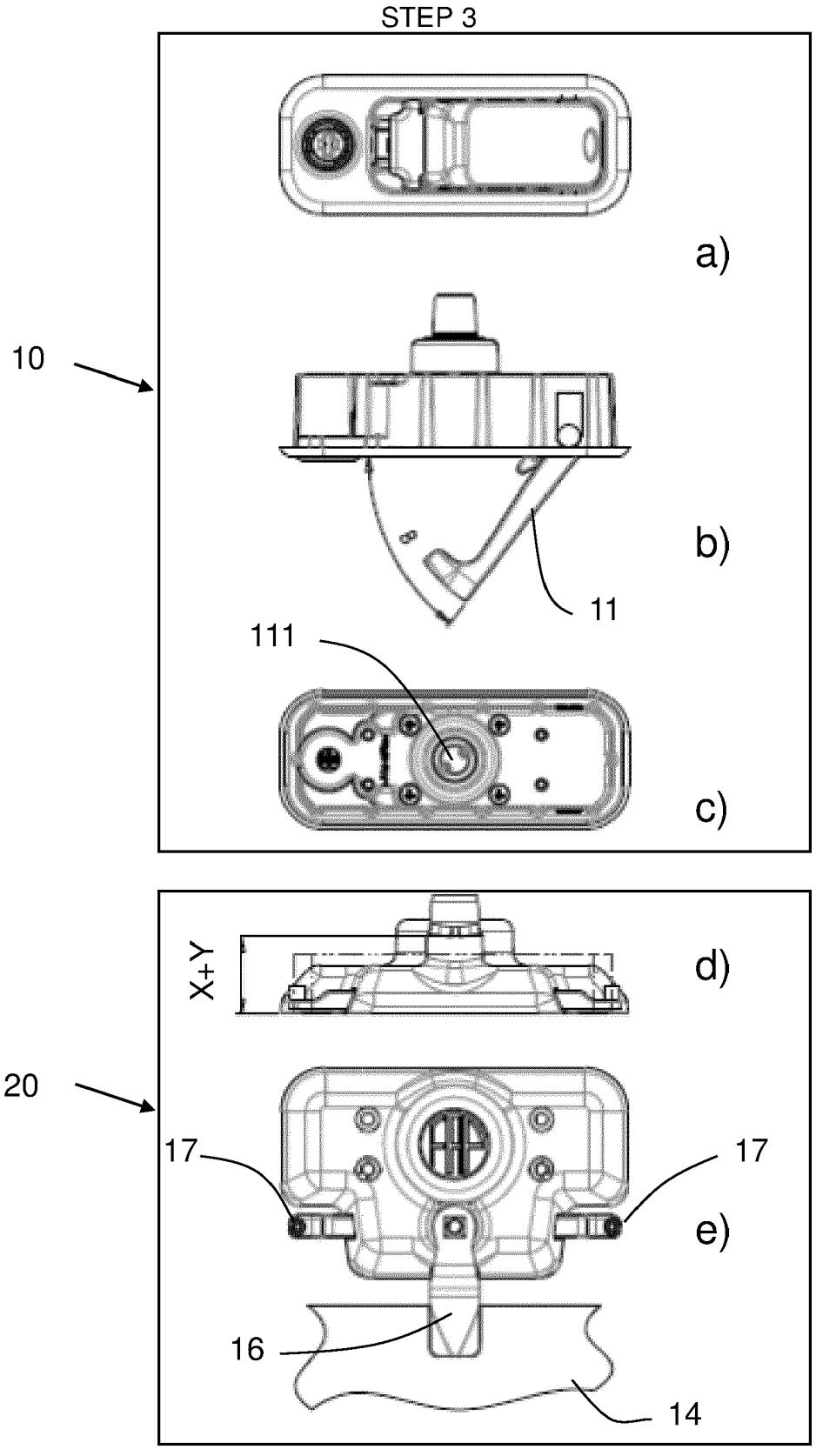

Fig. 3

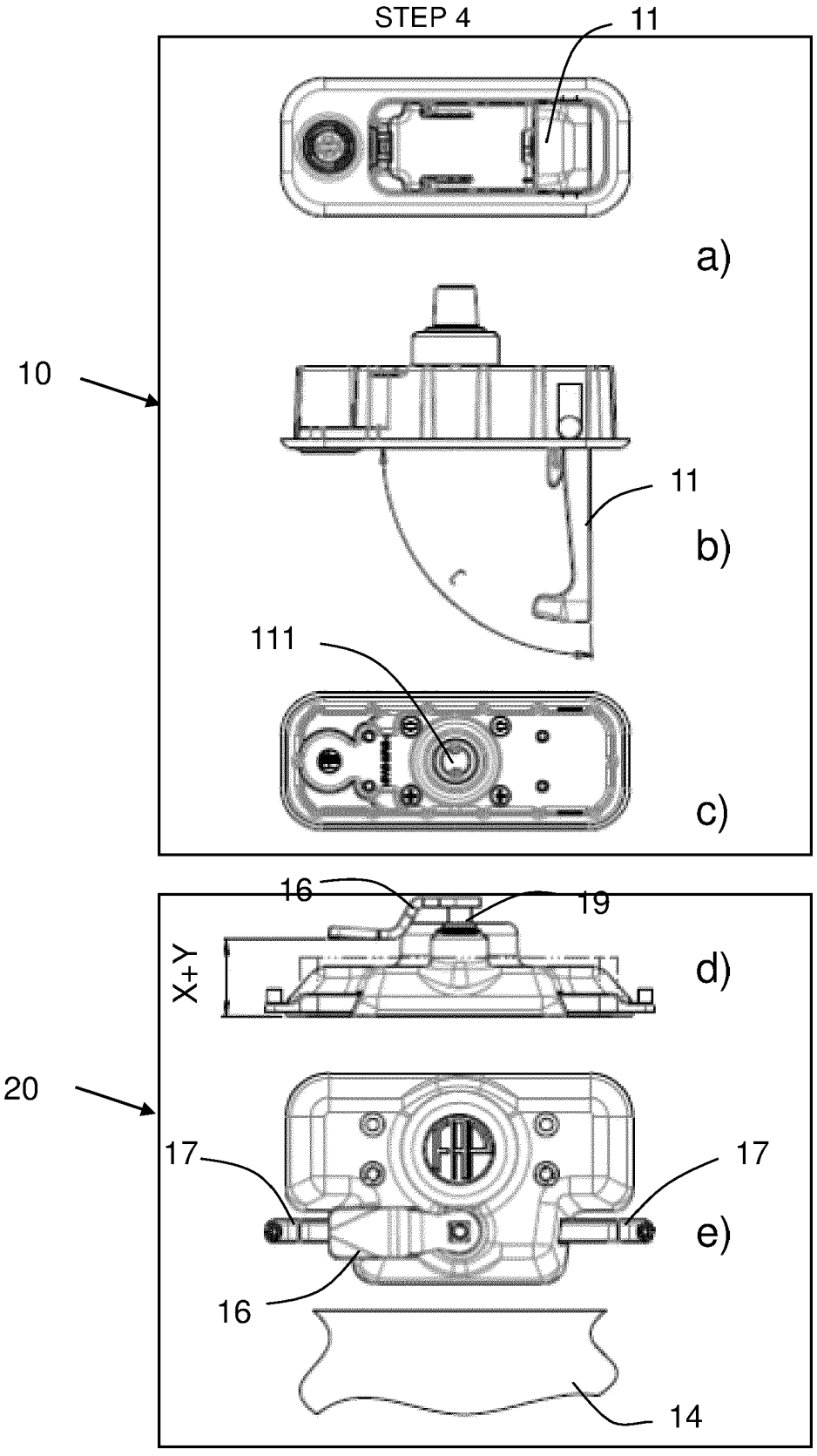

Fig. 4

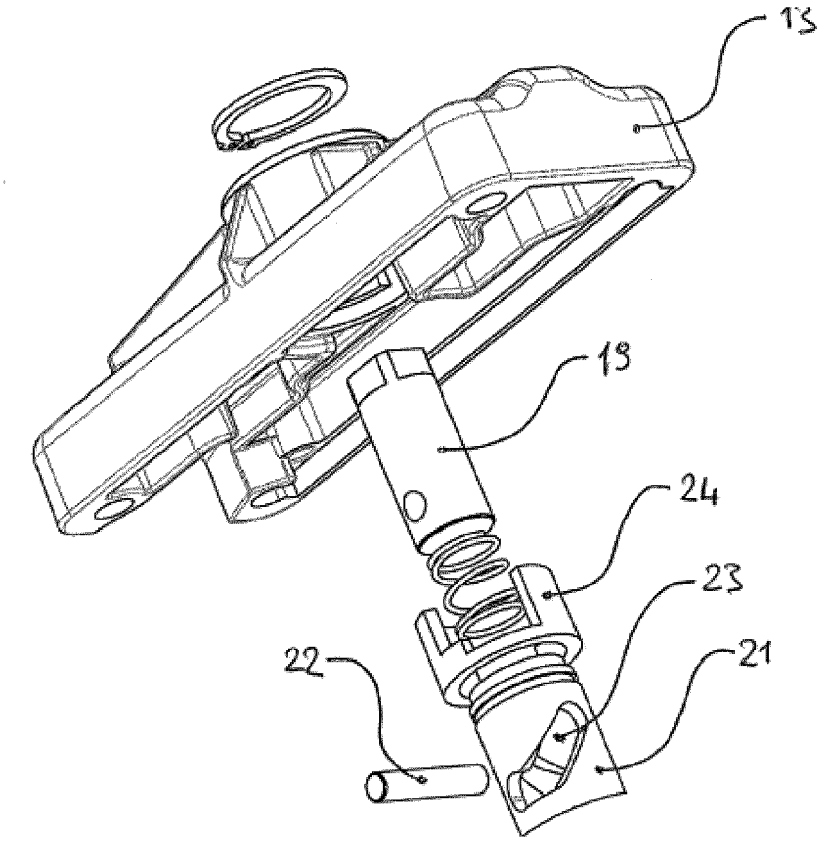

Fig. 5

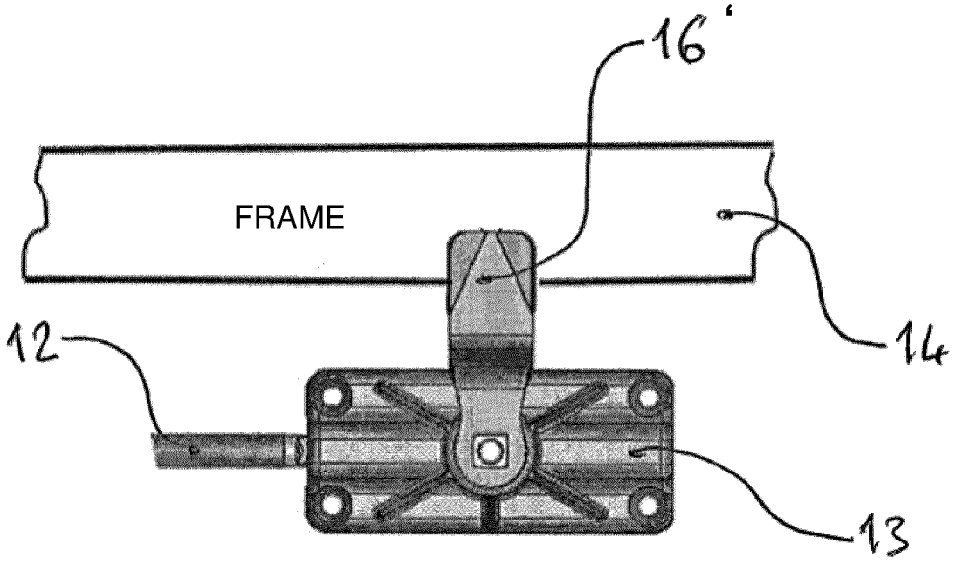

Fig. 6

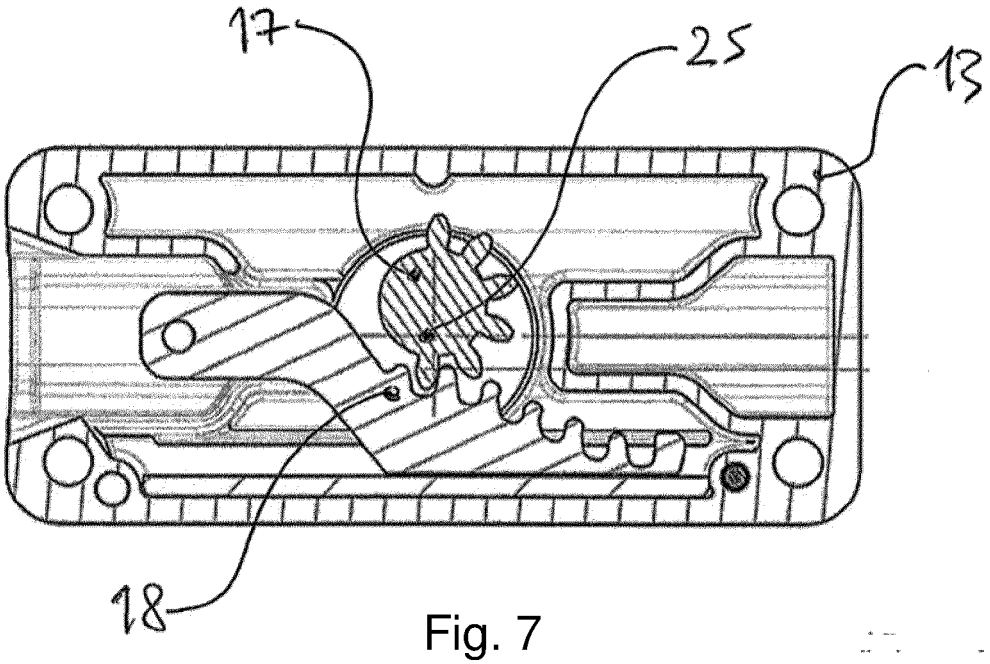

Fig. 7

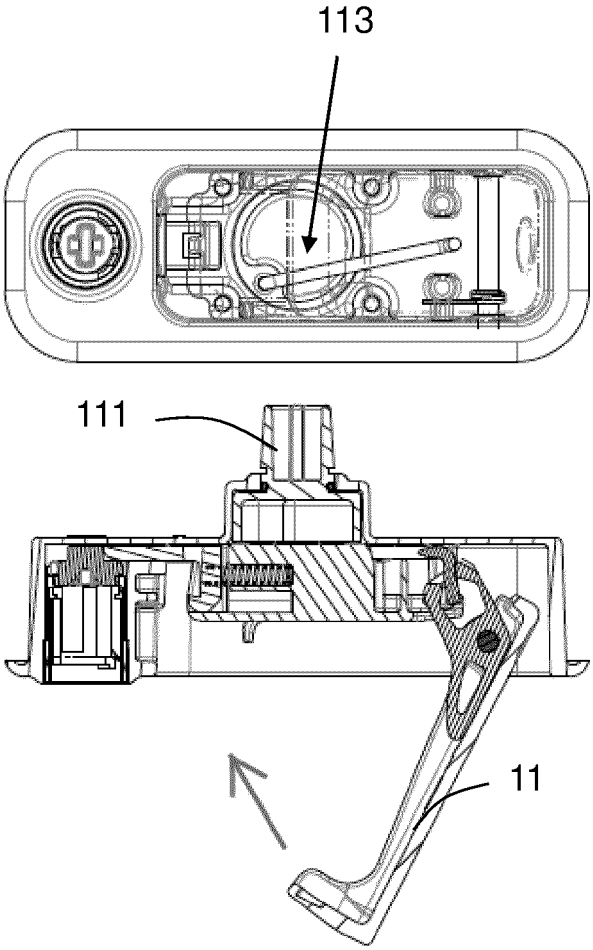

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 6056

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2014/284946 A1 (BENNETT NICHOLAS PAUL [GB] ET AL) 25 September 2014 (2014-09-25) * paragraphs [0006], [0011], [0013], [0019], [0064]; figures 1-34 *	1,4,16, 17	INV. E05B17/00 E05B83/44 E05C5/02 E05B7/00
A	WO 00/58585 A1 (SOUTHCO [US]) 5 October 2000 (2000-10-05) * page 6, line 15 - page 13, line 18; figures 1-106 *	1-17	E05B5/02 E05C9/02
A	EP 3 287 578 A1 (FAP S R L [IT]) 28 February 2018 (2018-02-28) * the whole document *	1-17	
A	EP 3 578 745 A1 (IND I NAESSJOE AB [SE]) 11 December 2019 (2019-12-11) * paragraphs [0028] - [0052]; figures 1-7c *	1-17	

TECHNICAL FIELDS SEARCHED (IPC)

E05B
E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 June 2022	Boufidou, Maria

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 15 6056

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-06-2022

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