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(71) Applicant: **BJÖRKBODA LAS OY AB**
**SF-25860 Björkboda (FI)**

(72) Inventor: **Ylikorpi, Tomi**
**00500 Helsinki (FI)**

(74) Representative: **Newby, Martin John**
**JY & GW Johnson,**
**Kingsbourne House,**
**229-231 High Holborn**
**London WC1V 7DP (GB)**

## (54) Method of assembling a lock

(57) A method for assembling operating devices for a lock case intended for a door or the like so as to be operable, whereby the operating devices include at least one bolt member and a turnable displacement device for the bolt member. The operating devices are moulded, preferably by injection moulding, of plastics material as a one piece moulding (1) including a body element (2) having parts jointly defining a basic plane and to which the operating devices are connected by breakable connection members or connection points (A-J). At least some of the operating devices are moulded to be at least somewhat in at least one separate plane relative to the basic plane of the body element. In order to assemble the operating devices so as to be operable, the moulding is pressed so that at least some of said connection members or connection points (A-J) are broken and the operating devices are moved to be located in the same basic plane with the body element (2).

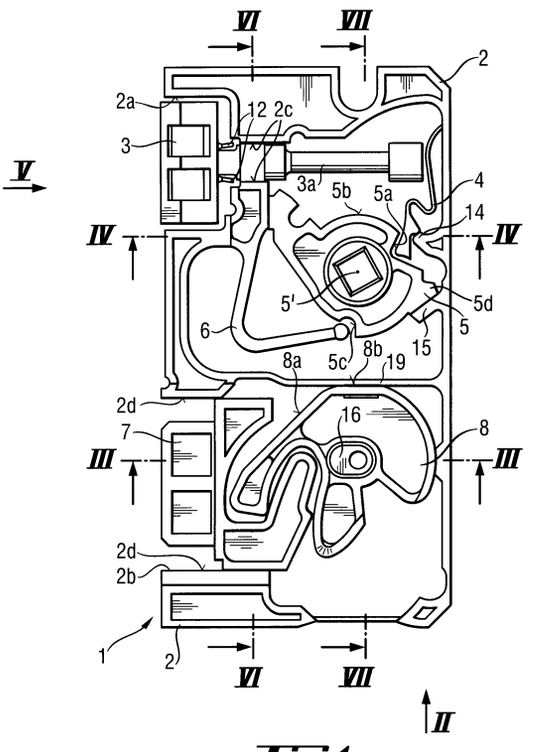


Fig. 1

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## Description

**[0001]** This invention relates to a method of manufacturing and arranging in operating positions operating devices for a lock intended for a door or the like, the method being in accordance with the preamble of claim 1. The invention also relates to an operating device mechanism and a lock in which the operating device mechanism is installed.

**[0002]** Locks and the operating devices thereof are conventionally manufactured of metal. However for certain uses it is also known to manufacture separate lock operating devices of plastics material. The manufacture and assembly of locks of numerous separate parts is both laborious and costly. Also the storage and handling of numerous parts is complicated.

**[0003]** An aim of the present invention is to provide a new method of manufacturing, assembling and arranging so as to be operable, a lock and its constituent parts, by means of which the drawbacks mentioned above can be minimised. An aim is specifically to simplify the manufacture and assembly of lock parts so that the transfer and handling of numerous separate lock parts is avoided.

**[0004]** According to one aspect of the present invention there is provided a method as claimed in the ensuing claim 1 of manufacturing and arranging in operating positions operating devices for a lock. The transfer and handling of a uniform moulding incorporating lock operating devices is thereby accomplished. Since detaching of the lock parts from each other is achieved by means of a pressing movement in one direction, the assembling step or phase is simplified and, if desired, easily automated.

**[0005]** The pressing step and the assembly of the lock parts can be more easily accomplished if the body element and the operating devices are of at least substantially equal thickness in a direction normal to the basic plane.

**[0006]** Advantageously the body element is cast to comprise a substantially uniform frame structure including at least one bolt opening. Thus, after detachment, all the parts are kept together ready for arrangement in their operating positions.

**[0007]** Conveniently the operating devices include also at least one spring member. With advantage, from the viewpoint of detaching and casting of the parts, the operating devices are cast so as to be located on either side of the body element.

**[0008]** In a preferred embodiment of the invention, the operating devices include a latch bolt and a follower, which are arranged in the moulding on the same side of the body element. The spring member can then, with advantage, be a return spring for the latch bolt which is arranged in the moulding on a different side of the body element to that of the latch bolt and the follower.

**[0009]** The follower is advantageously provided with a spring of its own which is cast to be part of the body element.

**[0010]** When necessary a dead bolt and its preferably key operated bolt lever element may additionally be cast to the moulding. To enable these parts to be easily kept apart from the parts of the latch bolt mechanism during assembly, a partition wall is cast to the body element and separates the latch bolt mechanism from the dead bolt mechanism. The partition wall can be dimensioned to be flexible so that after installation it guides the bolt lever element.

**[0011]** In practice the dead bolt and the bolt lever element are advantageously cast so as to occupy different sides of the body element in different planes with regard to the body element.

**[0012]** The moulding can be designed so as to comprise all the essential component parts of the lock. The casting process can, however, be simplified, if the moulding is installed in a separate lock having a front plate and a lock housing fixed thereto. In this case the front plate and lock housing can be made of different material to the plastics injection moulded operating devices. The pressing step can be accomplished directly against the lock housing so that the body element and the operating devices remain inside the lock housing after pressing. When the installation occurs directly in the lock housing in one direction along a rectilinear path, the assembly can be fully automated.

**[0013]** In order to assemble and arrange for the operating devices to be in their operating positions, the connection members or connection points are so located in the moulding that when the operating devices are broken from the body element in the pressing stage they are arranged relative to each other in their correct positions required for their operation thereof. Further at least one guiding member may be cast to the body element. In this case the guiding member(s) together with the spring for the follower guide the follower into a correct position when the follower is turned for the first time after the pressing step or phase. In addition the follower may have a guiding surface which, when the follower is turned, guides, together with guiding surfaces of the body element, simultaneously the spring for the latch bolt into a correct place and to a prestressed operating position, whereby the spring for the latch bolt presses the latch bolt towards its operating position.

**[0014]** The lock housing is with advantage provided with a stub shaft. In this case the moulding may include a wedge element which during the pressing step, under the influence of the stub shaft, guides the bolt lever element in the direction of the movement according to the bolt operation of the dead bolt towards the dead bolt simultaneously pressing the dead bolt into its operating position, in which it extends beyond the inner edge of the bolt opening in the lock case. In this way the dead bolt is arranged to be directly in its operating condition as a consequence of the pressing phase.

**[0015]** According to another aspect of the present invention, there is provided an operating device mecha-

nism intended for a lock to be installed to a door or the like and which comprises a one piece moulding of plastics material.

**[0016]** According to a further aspect of the present invention there is provided a lock intended for a door or the like and including a front plate and a lock housing fixed thereto and in which a plastics operating device mechanism is installed.

**[0017]** An embodiment of the invention will now be described, by way of example only, with particular reference to the accompanying drawings, in which:

Figure 1 is a side view of a moulding for a lock case of a door lock provided according to the invention;

Figure 2 shows the moulding of Figure 1 viewed from below;

Figure 3 is a section taken on the line III-III of Figure 1;

Figure 4 is a section taken on the line IV-IV of Figure 1;

Figure 5 shows the moulding of Figure 1 viewed from the left side;

Figure 6 is a section taken on the line VI-VI of Figure 1;

Figure 7 is a section taken on the line VII-VII of Figure 1;

Figure 8 is an axonometric view of the moulding of Figure 1;

Figure 9 is an enlarged axonometric view of a part of the moulding of Figure 1 in which the fixing of a latch bolt to a body element is apparent;

Figure 10 is an enlarged axonometric view of a part of the moulding of Figure 1 in which the fixing of a follower to a body element is apparent;

Figure 11 is an enlarged axonometric view of a part of the moulding of Figure 1 in which the fixing of a latch bolt spring to a body element is apparent;

Figure 12 is an enlarged axonometric view of a part of the moulding of Figure 1 in which the fixing of a dead bolt to a body element is apparent;

Figure 13 is an enlarged axonometric view of a part of the moulding of Figure 1 in which the fixing of a displacement piece for a dead bolt to a body element is apparent;

Figure 14 shows the moulding of Figure 1 installed in a body housing of a lock case before the bolts are arranged so as to be operable;

Figure 15 is a section taken on the line XV-XV of Figure 14;

Figure 16 shows the moulding of Figure 1 installed in a body housing of a lock case after the bolts have been arranged so as to be operable;

Figure 17 is a section taken on the line XVII-XVII of Figure 16; and

Figure 18 shows the moulding of Figure 1 installed in a body housing of a lock with the bolts in protruding operating positions.

**[0018]** In Figure 1 reference numeral 1 designates a moulding, or piece of casting, for operating devices of a lock. The moulding is preferably made in one piece by injection moulding of plastics material. The moulding includes a frame-like body element 2 having bolt openings 2a and 2b and to which all the essential operating devices of the lock, as a consequence of the moulding or casting, are either fixed by connection members or connection points (as described in more detail later on) or which are permanently integrated as parts of the body element. In the embodiment shown these operating devices include a latch bolt 3, a spring 4 for the latch bolt, a follower 5 for moving the latch bolt through means, for instance a handle, to be installed at an operating axis 5', a spring 6 for the follower, a dead bolt 7 and a bolt lever element 8 for moving the dead bolt 7.

**[0019]** As can be more clearly seen in Figures 2 to 8, the operating devices are located on opposite sides of a central plane of the body element 2. In particular the operating devices and the body element are conveniently positioned in three separate spaced apart and parallel planes. The moulding is made by injection moulding, preferably using a two part mould including only one joint surface. The operating devices are located relative to the body element 2 and to each other so that the moulding 1 can be installed as one piece in one direction along a rectilinear path into a desired lock casing (cf. Figure 14). This enables full automation of the assembly process to be achieved using simple devices. The design and location of the operating devices relative to each other, as well as the design of the body element 2, are also so selected that there is sufficient space provided between the movable parts for the walls of the casting mould and for the movements required by the normal operation thereof after installation of the moulding and detachment of the movable parts. In addition the body element 2 is designed so as to comprise guiding surfaces 2c and 2d which guide the movements of the bolts after installation as is described in more detail later on.

**[0020]** Figure 9 shows connection members A and B

by means of which the latch bolt 3 is fixed at its arm part 3a to the body element 2 of the moulding 1. Figure 10 shows connection members C and D by means of which the follower 5 is fixed to body element 2. Figure 11 shows connection members E and F by means of which the spring 4 for the latch bolt is fixed to the body element 2. Figure 12 shows connection members G and H by means of which the dead bolt 7 is fixed to the body element 2, and Figure 13 shows connection members I and J by means of which the bolt lever element 8 is fixed to the body element 2.

**[0021]** Figure 14 shows a lock casing 9 having a lock housing 10 and a front plate 11 fixed thereto and provided with bolt openings. A cover for the lock housing 10 is not shown in the drawings. The location and the dimensions of the connection members A - J are selected so that when the moulding 1 is installed, as shown in Figure 14, in one direction along a rectilinear path into the lock housing 10 and the operating devices are pressed, the connection members can be simultaneously broken and the operating devices moved relative to each other so as to occupy a common plane with the body element.

**[0022]** With reference to Figures 14 and 16, the installation of the latch bolt part of the lock and arranging the latter to be operable occurs as follows. After the moulding 1 has been pressed into the lock housing 10 so that the connection members A - J are broken and the operating devices are detached from the body element 2, limiting members 12 of the latch bolt 3 are pressed towards the arm part 3a of the latch bolt guided by the guiding members 13 in the lock housing. In addition the arm part 3a is guided by the guiding surfaces 2c of the body element. The spring 6 for the follower is an integral part of the body element 2 and is designed and positioned so that the follower 5 can be installed in the lock casing 9 in the same position as it is when moulded. The lock housing 10 includes a guiding opening 10a for the follower 5, into which the follower 5 enters so that it is turnably journalled in the guiding opening 10a (cf. Figures 15 and 17). The spring 4 for the latch bolt is located between the follower 5 and a guiding cam 14 in the body element in such a position which allows installation of the latch bolt 3 in the same position as it occupies when moulded. The situation corresponds to that shown in Figure 14.

**[0023]** When the follower 5 is turned for the first time by means of a handle or the like (not shown) about an operating axis 5', the return spring 4 for the latch bolt turns, due to a guiding surface 5a on the follower 5 and a guiding cam 14 in the body element, into its operating position, in which it remains under guidance of another guiding surface 5b on the follower 5 and the guiding cam 14. Simultaneously, the latch bolt 3 is pushed by the spring 4 of the latch bolt towards its operating position, whereby the limiting members 12 of the latch bolt arm 3a are released and prevent the latch bolt 3 from being pressed back into an inner position corresponding to its installation position. In addition, at the same time a recess 5c in the follower 5 is moved towards the head of the spring 6 of the follower. The spring 6 enters the recess 5c and is retained in the recess by its spring force. When a handle or the like is pressed below a horizontal plane, a guiding member 5d on the follower 5 moves beyond a guiding member 15 located in the body element 2. The situation corresponds to that shown in Figure 16. At the same time the guiding member 15 prevents the follower 5 from moving into its original position and keeps the handle in its correct position and the spring 6 of the follower prestressed.

**[0024]** A wedge element 16 is used to install the bolt lever element 8 and the dead bolt 7. For this purpose the wedge element 16 cooperates with a stub shaft 17 arranged in the lock housing 10. Before the pressing measure associated with the installation, the wedge element 16 and the stub shaft 17 are positioned relative to each other as is shown in Figures 14 and 15. After the pressing measure, the wedge element 16 and stub shaft 17 are positioned as shown in Figures 16 and 17. As is apparent from Figures 14-17, when the wedge element 16 is pressed over the stub shaft 17, the guiding surface 16 on the wedge element causes the wedge element to be moved to the left as viewed in the Figures. As a consequence, the bolt lever element 8 and the dead bolt 7 are also moved to the left in the Figures, pressed by the wedge element 16. Thus the dead bolt 7 is moved towards the bolt opening in the front plate 11 somewhat inside the opening. In this position, the dead bolt 7 is additionally under guidance of the guiding surfaces 2d on the body element, cf. Figure 16. Due to this arrangement the dead bolt 7 and the bolt lever element 8 can be moulded so as to be positioned in inner positions relative to their operating position so that they can be installed in the lock housing 10 as a stationary part of the moulding 1.

**[0025]** Figure 18 shows the lock casing 9 of Figure 16 in a situation in which the latch bolt 3 is in its normal protruding position pressed by the spring 4 and the dead bolt 7 is also in its protruding position and dead-locked, effected by the bolt lever element 8. In this arrangement reciprocating movements of the dead bolt 7 are provided through the bolt lever element 8, turning of which is achieved by means of a key (not shown) insertable through a key hole 18 arranged in the lock housing 10. Dead-locking of the dead bolt 7 is achieved by means of two cams in the bolt lever element 8. A partition wall 19 separates the dead bolt part and the latch bolt part of the body element 2 from each other and is dimensioned so as to be flexible. The flexible nature of the partition wall 19, together with suitably designed guiding surfaces 8a and 8b on the bolt lever element 8, keep the bolt lever element 8 in its position depending on the operating position in each case.

**[0026]** From the viewpoint of assembly it is naturally more simple for the whole operating device part to be formed of a single moulding or casting as described

above. In principle, when desired, even the whole lock casing may be moulded in one or several pieces by injection moulding of plastics material, when only the selection of the materials corresponds to the requirements set by the operating conditions, for instance requirements for strength. On the other hand, when necessary, the lock casing may also comprise only one bolt part, i. e. the latch bolt part or the dead bolt part.

**[0027]** The lock body element, the operating devices and the connection members may be designed, when necessary, in many different ways as regards their details. The installation of the lock parts and arranging the lock to be put in an operable condition should, however, be achieved with as few measures as possible. In practice, when desired, a part of the connection members may be arranged to be broken for detaching of the parts after installation by utilizing separate measures in order to provide for the lock to be operable. In other words all the connection members need not necessarily be broken already when the piece of casting is installed to its place in the lock housing. There is also a matter of choice as to on which side of the body element the different operating devices are moulded, how many planes are involved with the moulding and to which extent the pieces are located inside each other and/or relative to the body element.

**[0028]** Thus, the invention is not limited to the embodiment shown, but several modifications are feasible within the scope of the accompanying claims.

## Claims

1. A method of manufacturing operating devices for a lock and arranging the operating devices in operating positions, the operating devices including at least one bolt member and a turnable displacement device for the bolt member, characterised in that the method comprises forming a plastics moulding having a body element (2), the parts of which jointly define a basic plane, with said operating devices being connected to the body element by breakable connection members or connection points (A - J), in that at least some of the operating devices are moulded so as to occupy at least one separate plane relative to the basic plane of the body element, and in that in order to arrange the operating devices in their operating positions the moulding is pressed to break said connection members or connection points (A - J) and to move the operating devices so that they occupy said same basic plane with the body element (2).

2. A method according to claim 1, characterised in that said moulding is cast in a mould by injection moulding of said plastics material.

3. A method according to claim 1 or 2, characterised in that the body element (2) and the operating devices are manufactured to be of at least substantially of the same thickness in a direction normal to said basic plane.

4. A method according to claim 1, 2 or 3, characterised in that the body element (2) comprises a substantially uniform frame structure including at least one bolt opening (2a, 2b).

5. A method according to any one of the preceding claims, characterised in that the operating devices include at least one spring member and in that the operating devices are moulded so as to be located on either side of the body element (2) .

6. A method according to claim 5, characterised in that said at least one bolt member comprises a latch bolt (3), in that the operating devices further include a follower (5), the latch bolt (3) and the follower (5) being arranged in the moulding (1) on the same side of the body element (2), and in that said at least one spring member comprises a return spring (4) for the latch bolt which in the moulding (1) is arranged on the side of the body element (2) opposite to that of the latch bolt (3) and the follower (5).

7. A method according to claim 6, characterised in that a follower spring (6) for the follower is moulded as part of the body element (2).

8. A method according to claim 6 or 7, characterised in that said at least one bolt member comprises a dead bolt (7) and in that the moulding (1) further comprises a bolt lever element (8), which is preferably key operated, and a partition wall (19) which separates a latch bolt mechanism from a dead bolt mechanism.

9. A method according to claim 8, characterised in that the dead bolt (7) and the bolt lever element (8) are moulded on different sides of the body element (2) in different planes to said basic plane.

10. A method according to claim 8 or 9, characterised in that the partition wall (19) is dimensioned to be flexible so that after installation it is able to guide the bolt lever element (8).

11. A method according to any one of the preceding claims, characterised in that the moulding (1) is installed in a separate lock casing, which includes a front plate (11) and a lock housing (10) fixed thereto, and in that said pressing step is accomplished directly against the lock housing (10) so that the body element (2) and the operating devices remain inside the lock housing (10).

**12.** A method according to any one of the preceding claims, characterised in that the operating devices and said connection members or connection points (A - J) are so located in the moulding (1) that when the operating devices are broken from the body element in the pressing step they are arranged relative to each other in their correct positions required for their operation.

**13.** A method according to any one of claims 6 to 10, or claims 11 or 12 when dependent on any one of claims 6 to 10, characterised in that at least one guiding member (15) is moulded to the body element (2), the guiding member(s) with the spring (6) for the follower guiding the follower (5) into a correct position when the follower (5) is turned for the first time after the pressing step.

**14.** A method according to any one of claims 6 to 10 or 13, or claim 11 or 12 when dependent on any one of claims 6 to 10, characterised in that the follower has a guiding surface (5a) which, when the follower (5) is turned, guides, together with guiding surfaces (14) of the body element, the spring (4) for the latch bolt into a correct position and to a prestressed operating position, whereby the spring (4) for the latch bolt presses the latch bolt (3) towards its operating position(s).

**15.** A method according to claim 11 when dependent on any one of claims 8 to 10, or any one of claims 12 to 14 each when dependent on claim 11 and any one of claims 8 to 10, characterised in that said lock housing (10) is provided with a stub shaft (17), and in that the moulding includes a wedge element (16) which at the pressing step, under the influence of said stub shaft (17), guides the bolt lever element (8) in the direction of the movement according to the bolt operation of the dead bolt (7) towards the dead bolt (7) simultaneously pressing the dead bolt (7) into its operating position in which it extends beyond the inner edge of its bolt opening in the lock casing.

**16.** An operating device mechanism intended for a lock casing (9), the operating devices of the mechanism including at least one bolt member, a displacing device for the bolt member and at least one spring member, characterised in that the operating device mechanism further comprises a one piece injection moulding (1) of plastics material which includes a body element (2) to which the operating devices are connected by breakable connections (A - J) and which is located in a basic plane, and in that at least some of the operating devices are located in at least one separate plane which is spaced from and parallel to the basic plane.

**17.** An operating device mechanism according to claim! 16, characterised in that the body element (2) and the operating devices are at least substantially of the same thickness.

**18.** An operating device mechanism according to claim 16 or 17, characterised in that the body element (2) comprises a substantially uniform frame structure which includes at least one bolt opening (2a, 2b) and bolt guiding surfaces (2c, 2d) .

**19.** An operating device mechanism according to any one of claims 16 to 18, characterised in that the operating devices are located in at least two separate planes positioned on opposite sides of, and parallel to, said basic plane.

**20.** An operating mechanism according to claim 19, characterised in that the at least one bolt member comprises a latch bolt (3), in that the operating devices further include a follower (5) arranged on the same side of the body element (2) as the latch bolt (3), and in that said spring member is a return spring (4) for the latch bolt which is located on the opposite side of the body element (2) to that of the latch bolt (3) and the follower (5).

**21.** An operating device mechanism according to claim 20, characterised in that a spring (6) for the follower (5) is part of the body element 12).

**22.** An operating device mechanism according to any one of the claims 16 to 21, characterised in that said at least one bolt member comprises a dead bolt (7), in that the operating devices include a preferably key operated bolt lever element (8) for the dead bolt (7) and in that the body element (2) comprises a partition wall (19) separating a latch bolt mechanism from a dead bolt mechanism.

**23.** An operating device mechanism according to claim 22, characterised in that the dead bolt (7) and the bolt lever element (8) are located in different ones of said separate planes.

**24.** An operating device mechanism according to claim 22 or 23, characterised in that it includes a wedge element (16), preferably supported against the bolt lever element (8), and which, when the operating device mechanism is installed to be in operating condition, is arranged to guide the bolt lever element (8), and in that the wedge element (16) and the bolt lever element (8) are located in different ones of said separate planes.

**25.** A lock for a door or the like including a lock casing having a front plate (11) and a lock housing (10) fixed to the front plate and an operating device

mechanism installed in the lock housing (10), characterised in that the operating device mechanism includes a body element (2) comprising a substantially uniform frame with at least one bolt opening (2a, 2b) and, inside the frame, at least one bolt and displacing means for the bolt, and in that the operating device mechanism is manufactured of plastics material.

**26.** A lock according to claim 25, characterised in that the parts of the operating device mechanism are at least substantially of the same thickness and correspond to the thickness of the inner space of the lock housing (10).

**27.** A lock according to claim 25 or 26, characterised in that the body element (2) has guiding surfaces (2c, 2d) for guiding reciprocating displacing movements of the bolt.

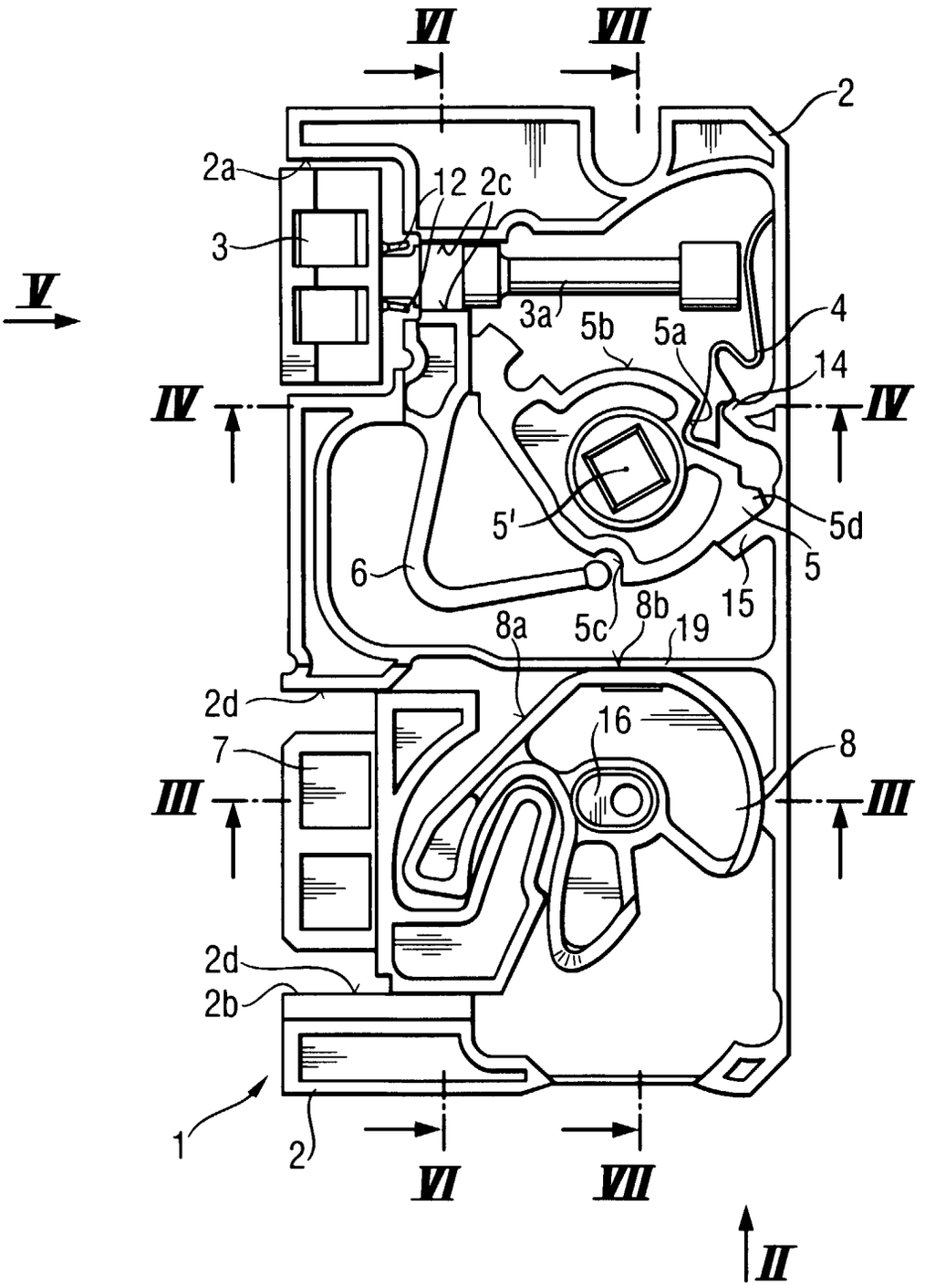
**28.** A lock according to any one of claims 25 to 27, characterised in that the bolt is a latch bolt (3) and in that the displacing means for the bolt include a follower (5) and a spring (4) for the latch bolt.

**29.** A lock according to any one of claims 25 to 28, characterised in that it includes a follower spring (6) for the follower formed as part of the body element (2), and in that the body element (2) is additionally provided with at least one guiding member (15) which, together with the follower spring (6), keeps the follower (5) in a correct position required by the installation of the body element (2).

**30.** A lock according to any one of claims 25 to 29, characterised in that the body element (2) is provided with a guiding cam (14) which, together with a guiding surface (5b) of the follower, keeps the spring (4) for the latch bolt prestressed in its place.

**31.** A lock according to any one of claims 25 to 30, characterised in that the operating device mechanism also includes a dead bolt (7) and a, preferably key operated, bolt lever element (8) for operating the dead bolt and in that the body element (2) comprises a partition wall (19) separating a latch bolt mechanism from a dead bolt mechanism and which is dimensioned to be flexible to enable it to guide the bolt lever element (8).

**32.** A lock according to claim 30 when dependent directly or indirectly on claim 28, characterised in that the lock housing (10) is provided with a stub shaft (17), to which the bolt lever element (8) is turnably journalled by means of a separate wedge element (16), and a guiding opening (10a), to which the follower (5) is turnably supported.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VII
2
2a
12
2c
3
V
3a
5b
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4
14
IV
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5'
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6
5
15
8a
5c
8b
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2d
16
7
8
III
III
2d
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1
2
VI
VII
II

Fig. 1

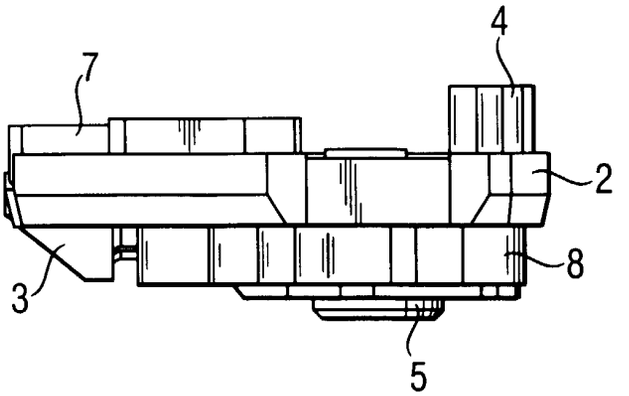



Fig. 2

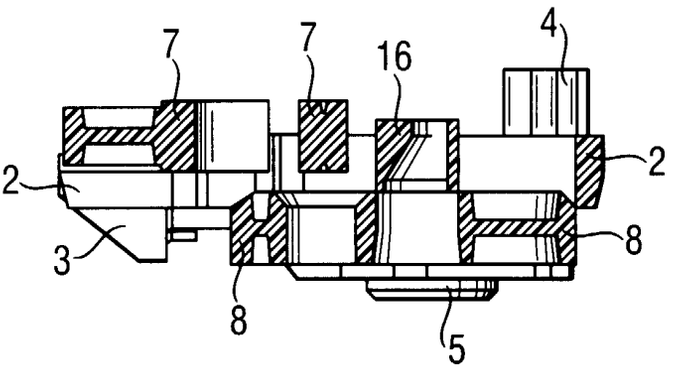



Fig. 3

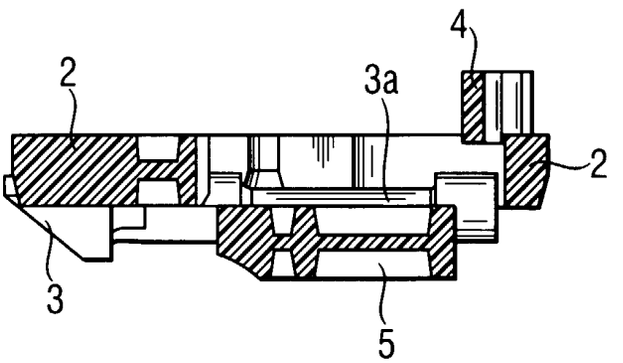



Fig. 4

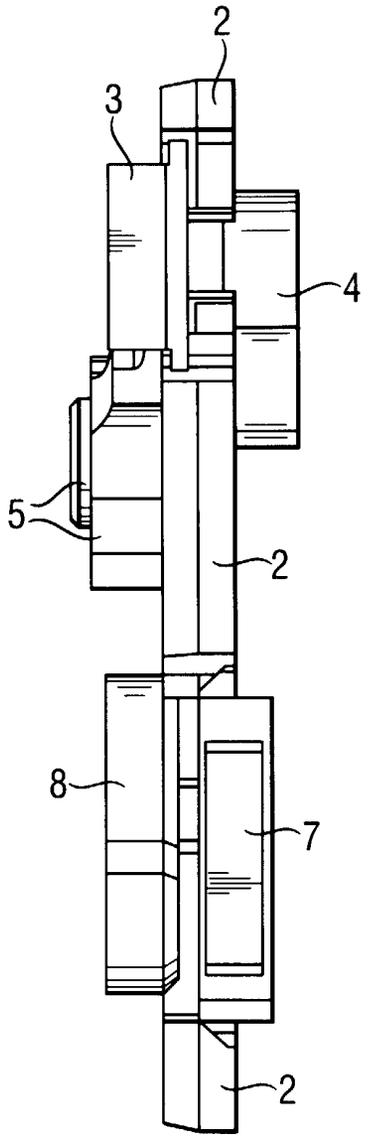



Fig. 5

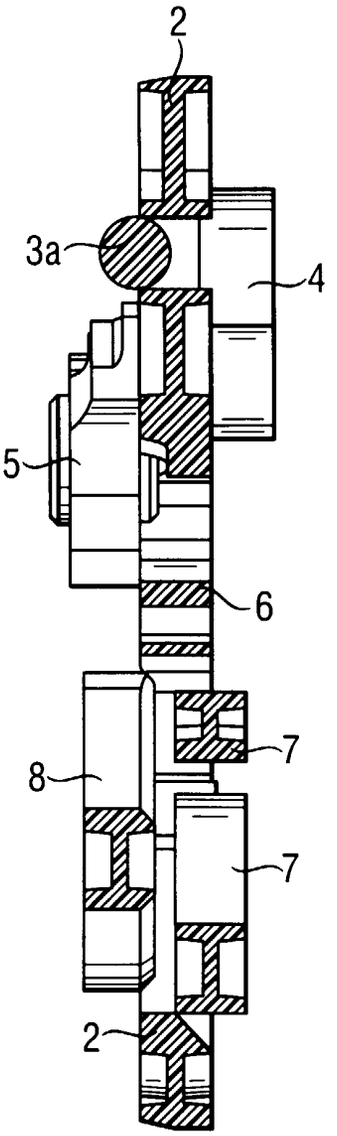



Fig. 6

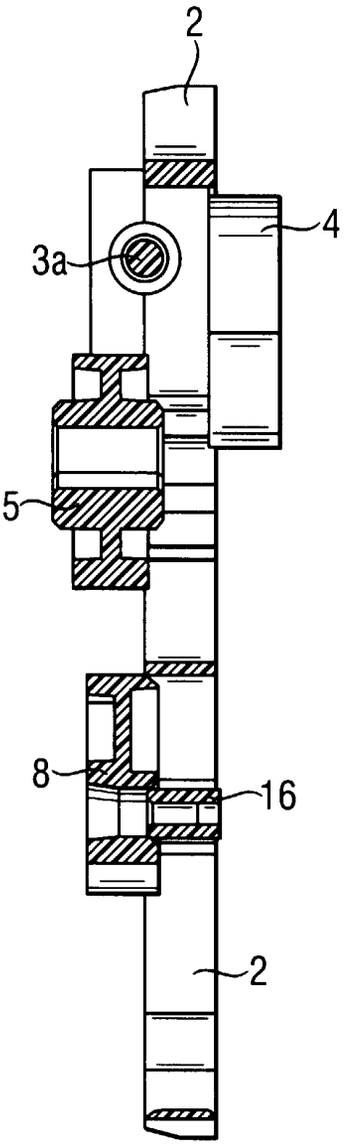
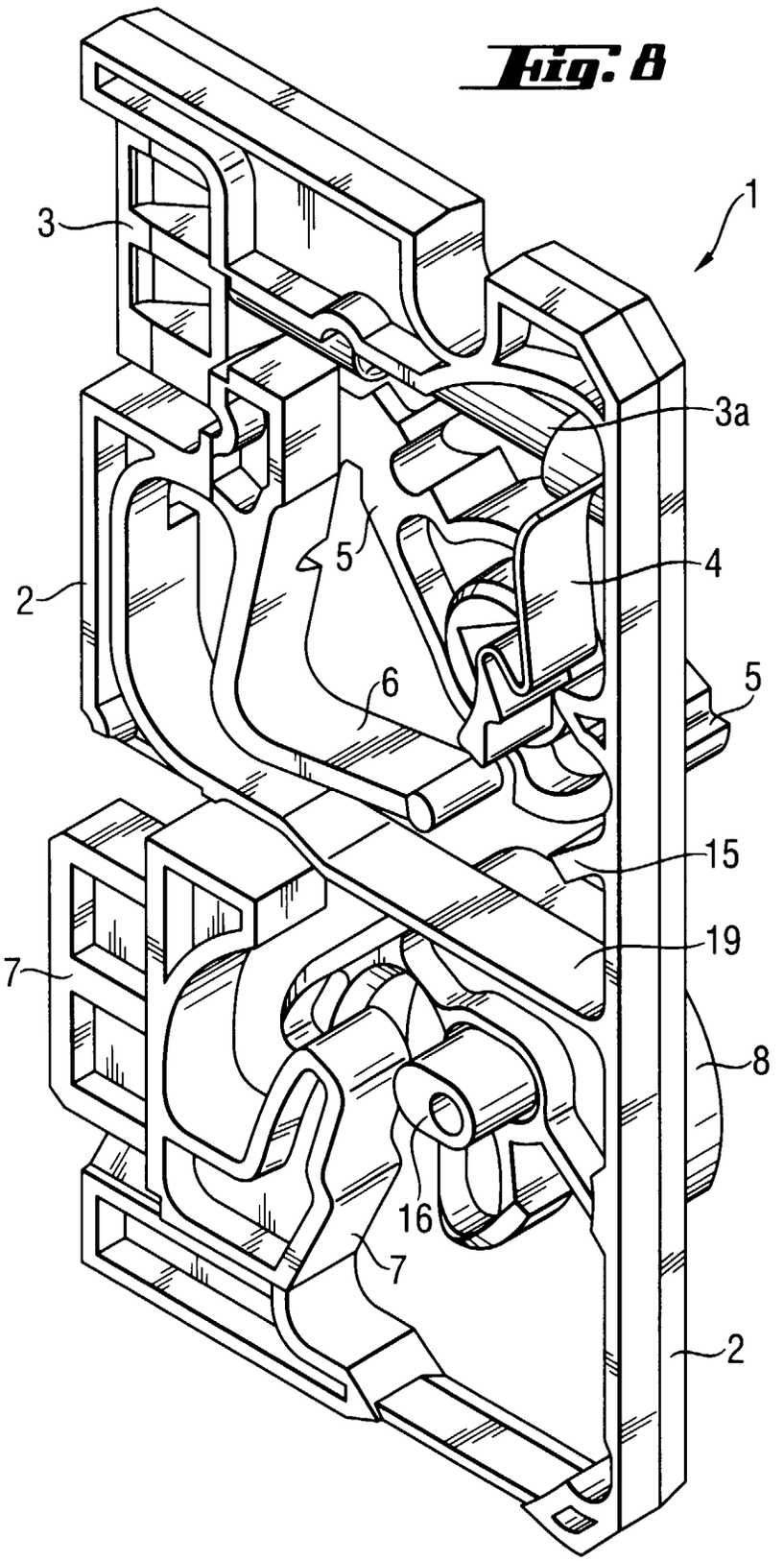



Fig. 7

Fig. 8



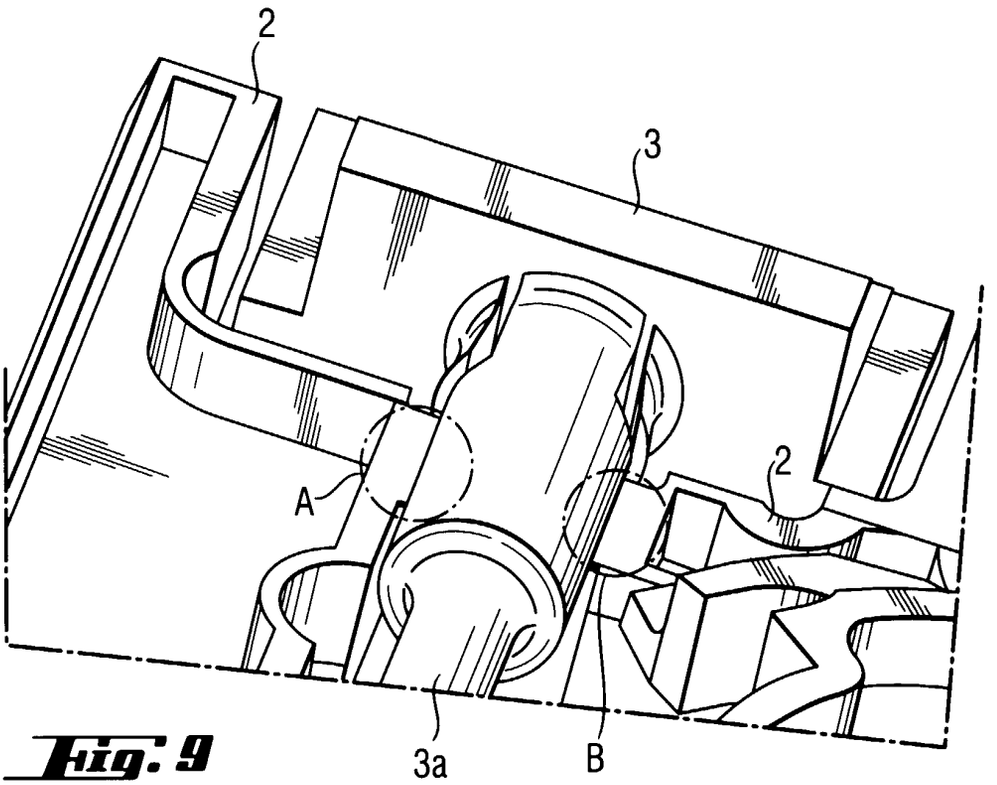



Fig. 9

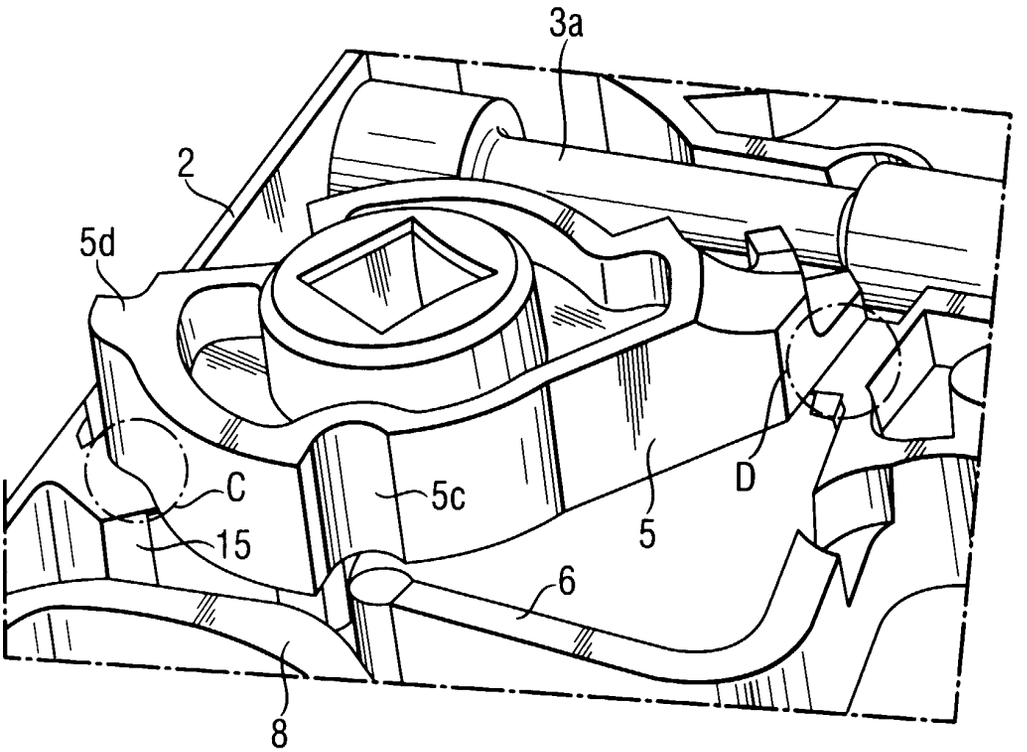



Fig. 10

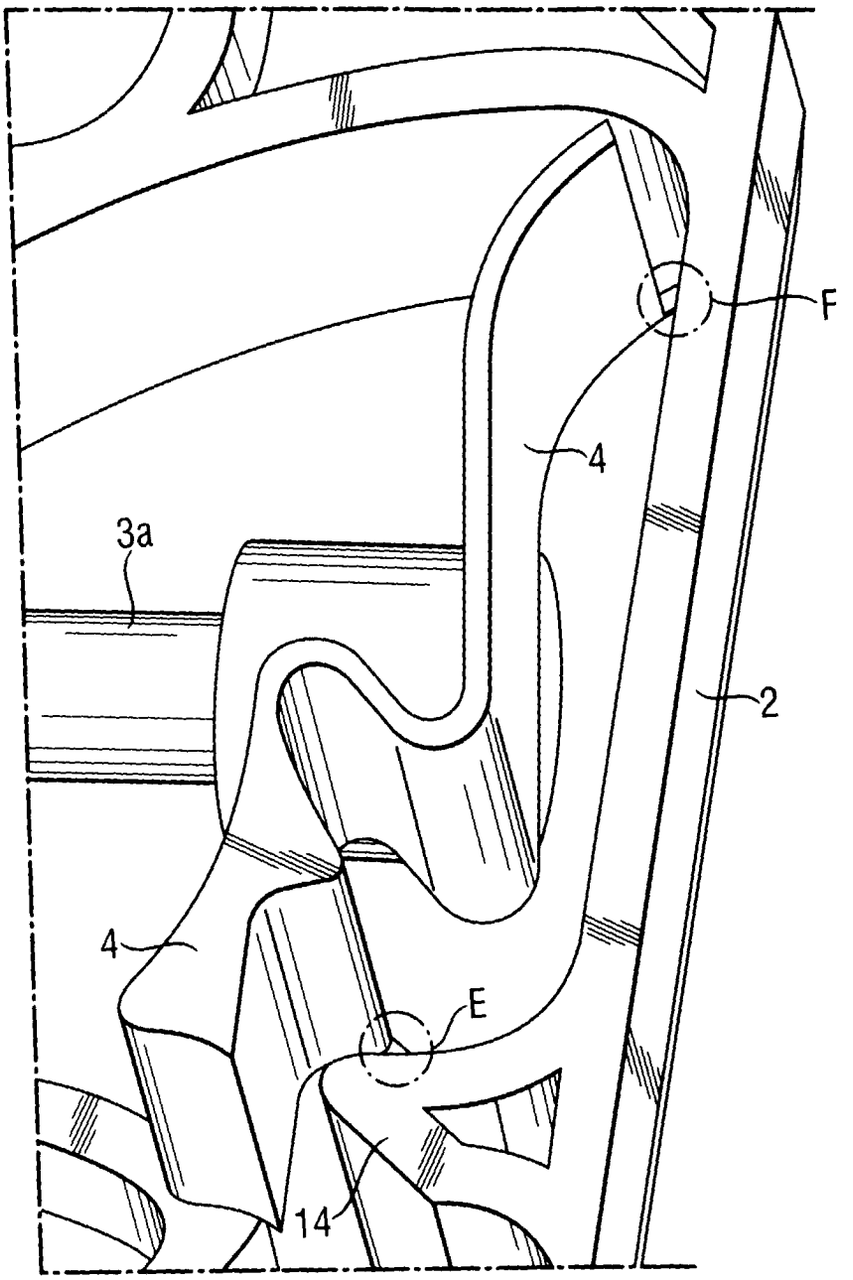



Fig. 11

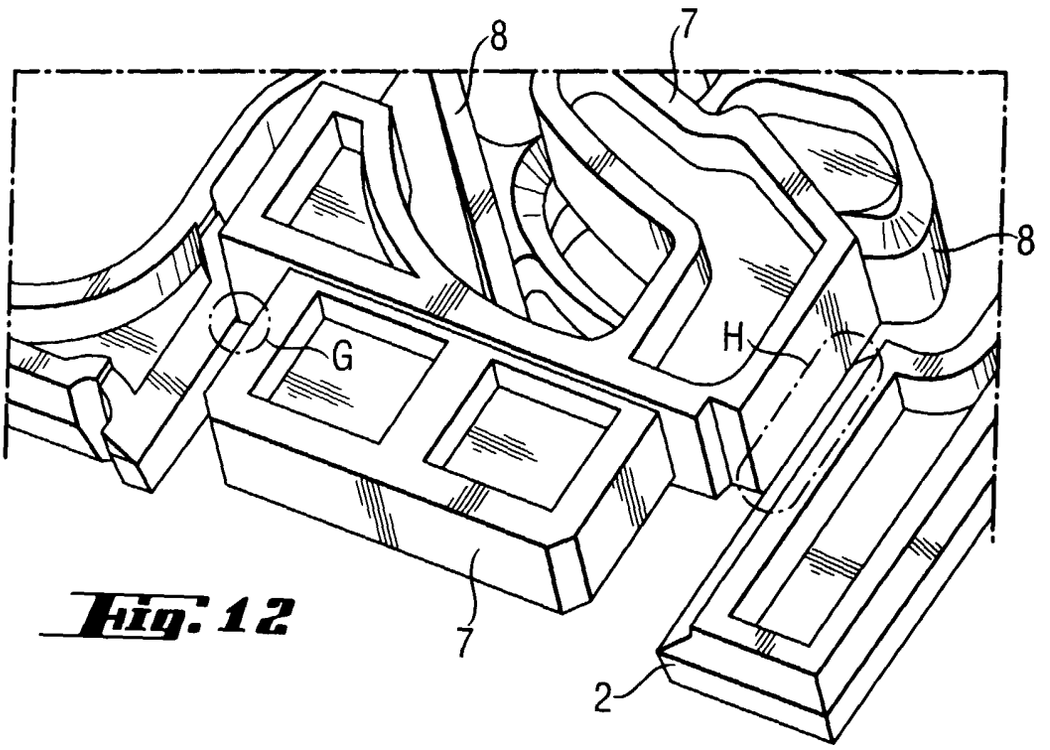



Fig. 12

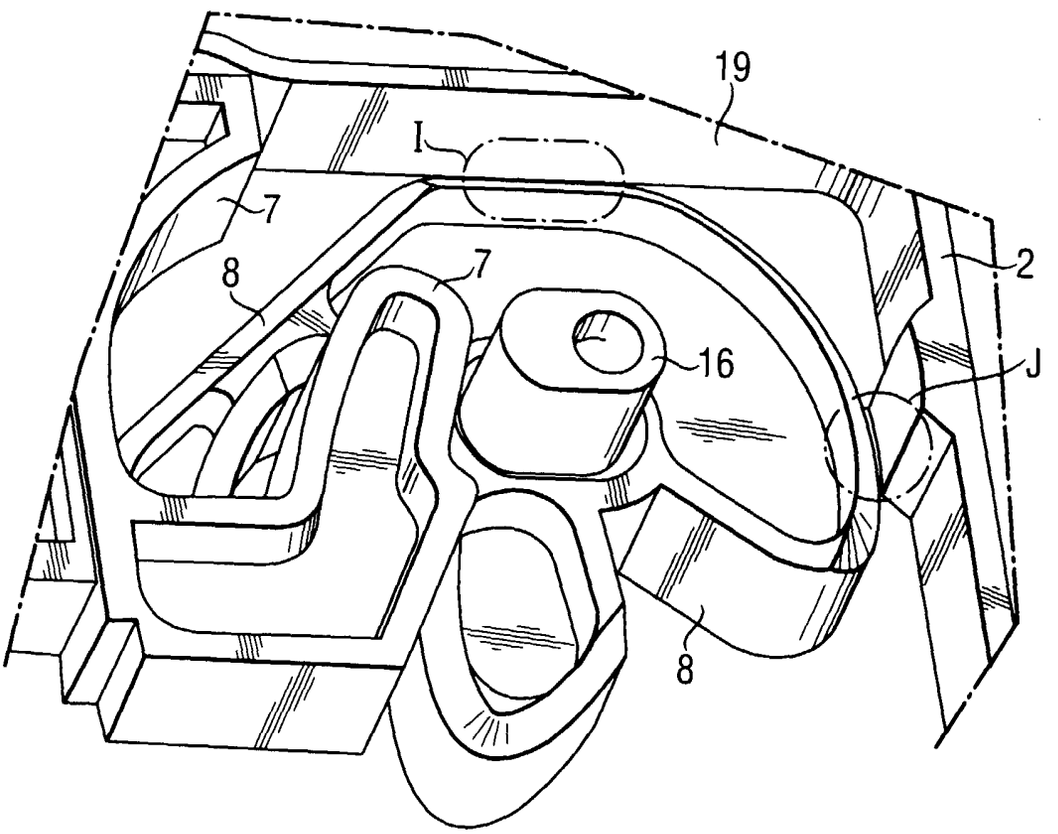
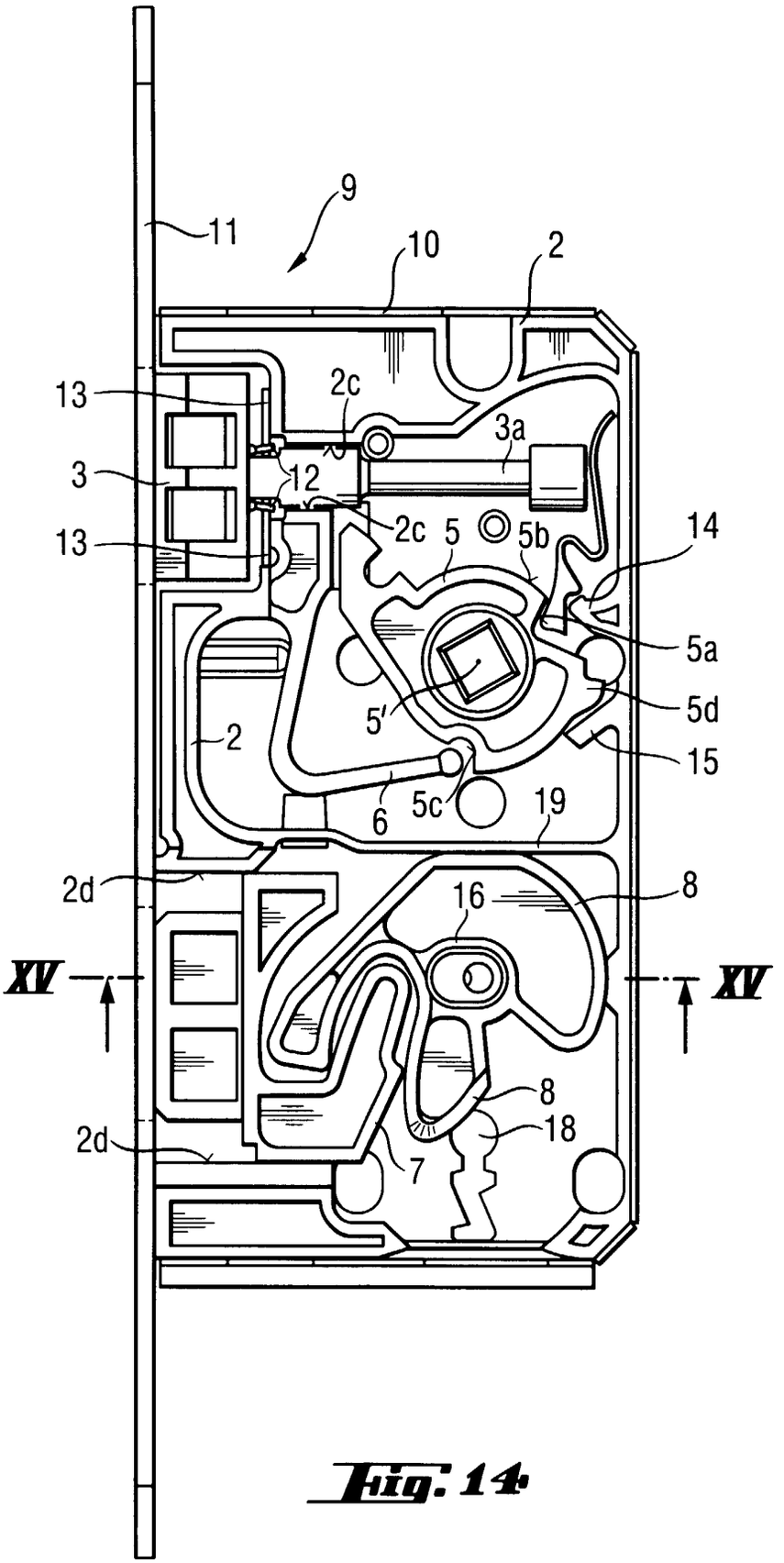



Fig. 13


9
11
10
2
13
2c
3a
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5b
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5a
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XV
XV
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18
2d
7

Fig. 14

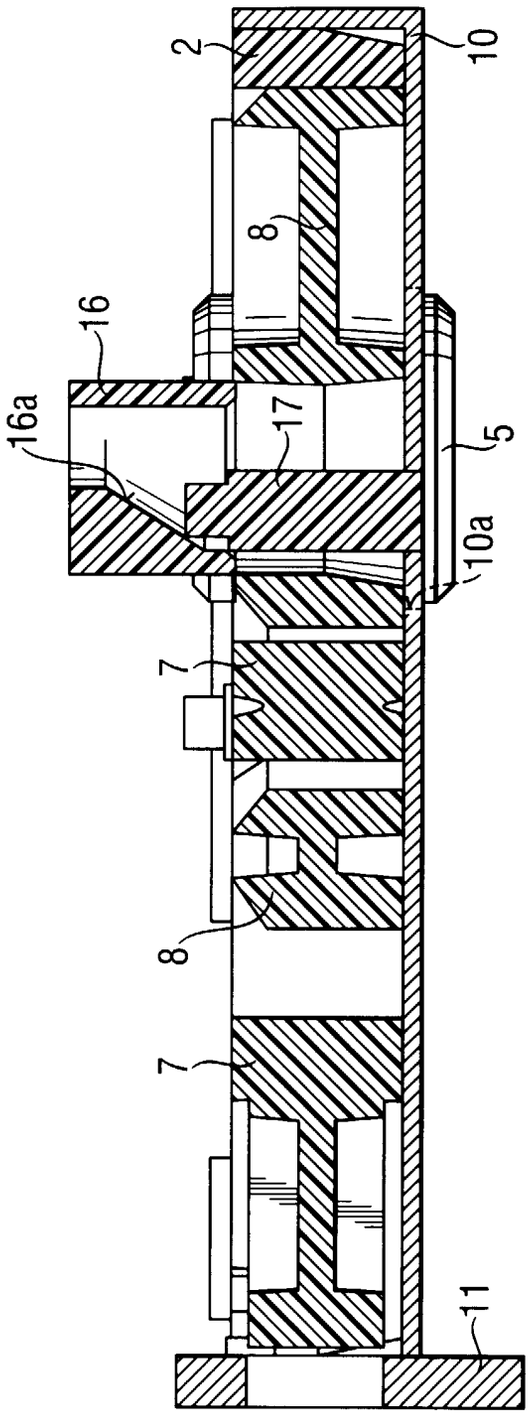


Fig. 15

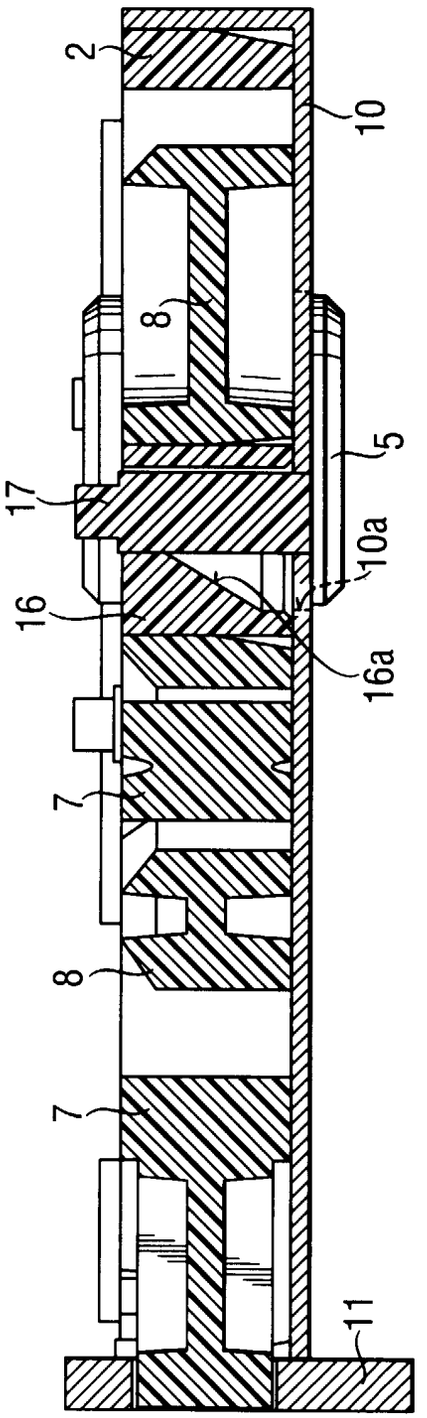


Fig. 17

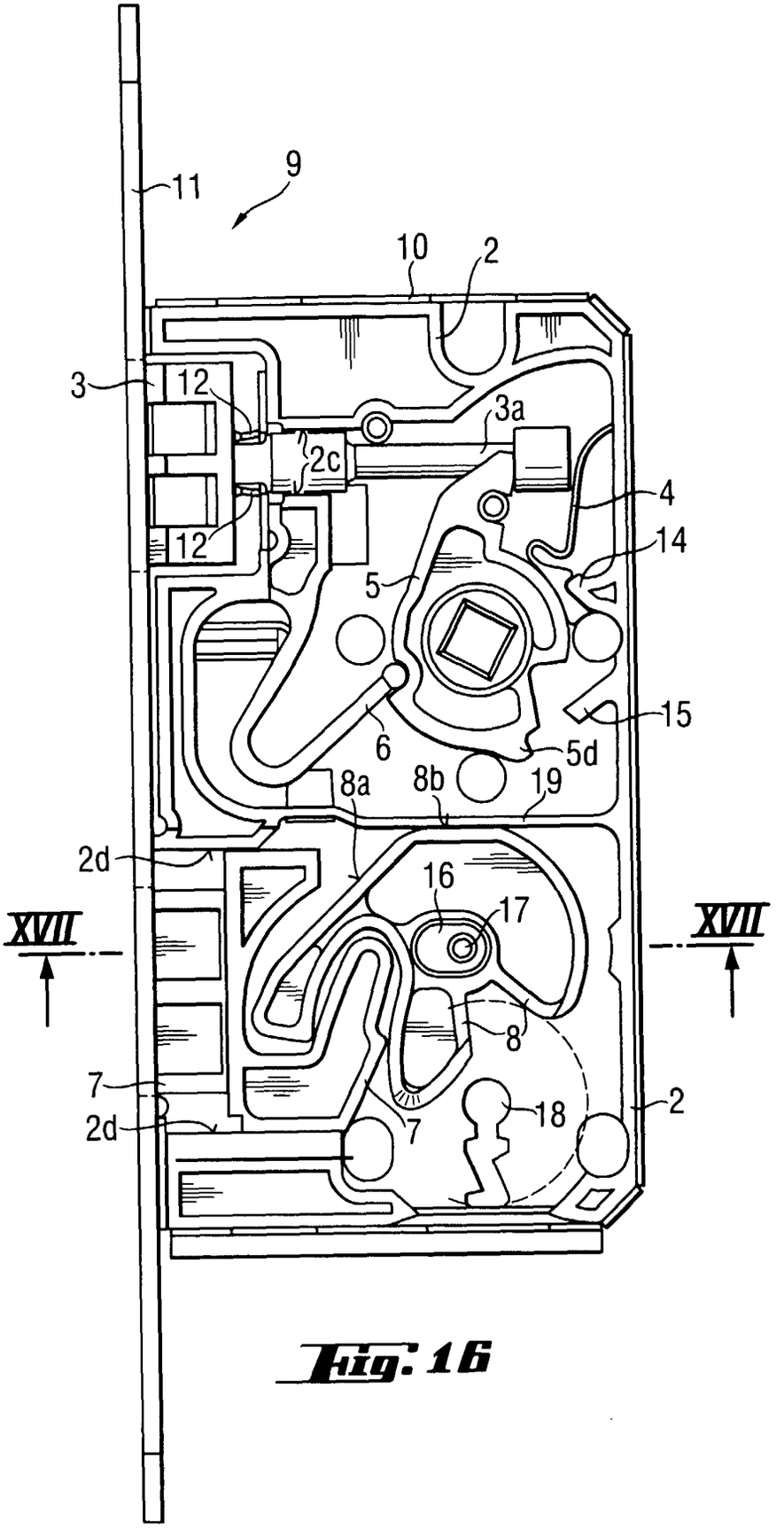
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Fig. 16

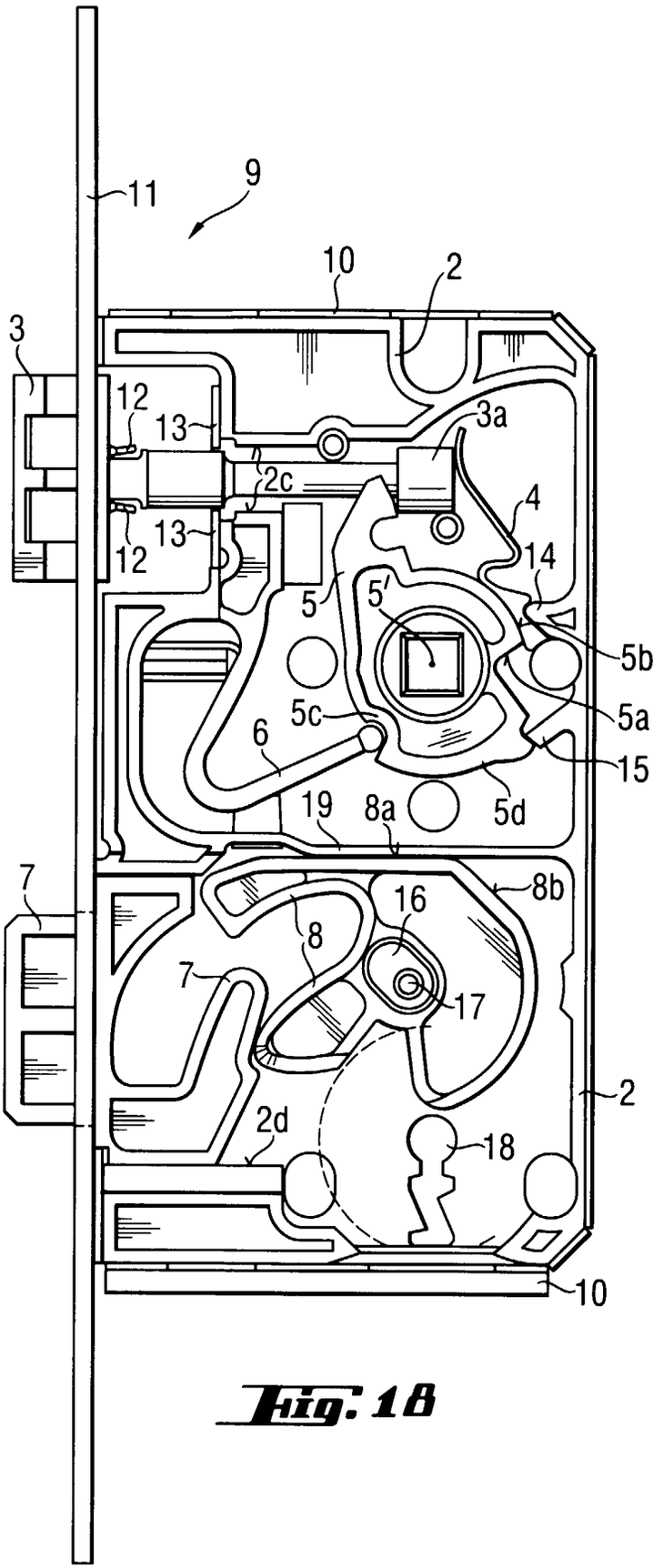
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Fig. 18