



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**13.04.2005 Bulletin 2005/15**

(51) Int Cl.7: **E05B 65/08, E05B 63/20,  
E05B 57/00**

(21) Application number: **04018552.2**

(22) Date of filing: **05.08.2004**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL HR LT LV MK**

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(30) Priority: **10.10.2003 IT BO20030584**

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(54) **Safety lock with front coupling for sliding doors**

(57) A front-coupling safety lock for sliding doors, of the type that comprises a hook element (4) that is pivoted inside a casing (2) of the lock (1) and is suitable to rotate about the pivot (3) until it protrudes partially from the casing (2), engaging within a respective selvage mounted on the jamb. The hook (4) is constituted by an angular lever (4) that is pivoted to the casing (2) at one of its ends, with a tab (7) that protrudes laterally to the side of the pivoting point to which the end of a frame (8) is pivoted, the frame being suitable to perform an axial translational motion by way of the action of a key-operated cylinder (24), the frame (8) being associated with a lever (15) provided with an end tooth (16) that is suitable to engage, by way of the action of an elastic means (17), in respective seats (10a, 10b) provided on the frame (8); a rocker (20) being mounted so that it can rotate about its own central portion proximate to the angular lever (4) on the portion that lies opposite the portion provided with the protruding tab (7), the rocker having an end (20a) that is suitable to engage in a recess (23) of the angular lever (4) and an opposite end that faces a pin (19) that can slide axially within a hole (18) provided in the casing (2) and normally protrudes therefrom.

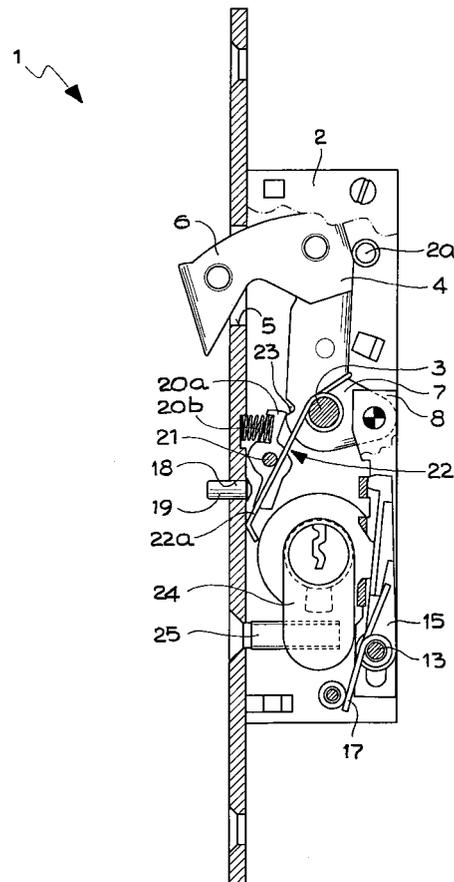


Fig. 1

## Description

**[0001]** The present invention relates to a safety lock with front coupling for sliding doors.

**[0002]** Sliding doors are widely used for aesthetic or dimensional requirements: the door panel slides (within a rail or by resting on low-friction means), passing from a first configuration, in which it clears completely the opening in the wall, to a second configuration, in which it occupies said opening, resting with its front against the jamb.

**[0003]** To ensure the closure of the door, locks are fitted which have a front hook that is suitable to engage in an appropriately provided selvage located in a corresponding position on the jamb.

**[0004]** According to the user's requirements, various models of lock with front coupling have been devised.

**[0005]** If it is necessary to provide a latch that ensures that when the door panel abuts against the jamb the front hook stably engages in the selvage of the jamb, a lock has been provided in which the hook is always forced so as to protrude by elastic means in this position. By arranging the door panel and the jamb adjacent to each other, the front surface of the hook, which is inclined, by resting on the edge of the selvage forces a rotation of the hook in the open position when the door panel approaches the jamb (in opposition to the position naturally assumed and imposed by the elastic means) until all or part of the head of the hook enters the selvage, with consequent return of the hook to the initial position by way of the action of the elastic means. To reopen the door it is necessary to turn the hook, overcoming the action of the elastic means, and move the front of the door away from the abutment jamb: this ensures therefore that once the door is closed, it can reopen only by way of the action of the user with the key or an appropriately provided handle.

**[0006]** As an alternative, there are locks in which the hook remains constantly inside the door panel; to close the door it is therefore necessary to move it adjacent to the jamb and turn the hook (for example by turning the key) until said hook is fully engaged in the selvage of the jamb. In this case, the lock acts as a bolt.

**[0007]** Currently there is no front-coupling lock that is capable of acting both as a latch and as a bolt.

**[0008]** In the described latch solution, it is relatively easy to tamper with the lock by forcing an opening rotation of the hook by way of a thin tool interposed between the jamb and the door panel, below the hook.

**[0009]** The aim of the present invention is to obviate the above-mentioned drawbacks and meet the cited requirements, i.e., by providing a safety lock with front coupling for sliding doors that can act both as a latch and as a bolt and prevents the rotation of the hook when said rotation is not imposed by the rotation of the key in the cylinder.

**[0010]** Within this aim, an object of the present invention is to provide a safety lock that is simple, relatively

easy to provide in practice, safe in use, effective in operation, and has a relatively low cost.

**[0011]** This aim and this and other objects that will become better apparent hereinafter are achieved by the present front-coupling safety lock for sliding doors of the type that comprises a hook element that is pivoted inside a casing of said lock and is suitable to rotate about said pivot until it protrudes partially from said casing, engaging within a respective selvage mounted on the jamb, characterized in that said hook is constituted by an angular lever that is pivoted to the casing at one of its ends, with a tab that protrudes laterally to the side of said pivoting point to which the end of a frame is pivoted, said frame being suitable to perform an axial translational motion by way of the action of a key-operated cylinder, said frame being associated with a lever provided with an end tooth that is suitable to engage, by way of the action of an elastic means, in respective seats provided on said frame; a rocker being mounted so that it can rotate about its own central portion proximate to said angular lever on the portion that lies opposite the portion provided with the protruding tab, said rocker having an end that is suitable to engage in a recess of said angular lever and an opposite end that faces a pin that can slide axially within a hole provided in the casing and normally protrudes therefrom.

**[0012]** Further characteristics and advantages of the present invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of a front-coupling safety lock for sliding doors, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a sectional view, taken along a plane that is perpendicular to the direction of insertion of the key in the cylinder, of a lock according to the invention in the configuration in which the hook is retracted;

Figure 2 is a sectional view, taken along a plane that is perpendicular to the direction of insertion of the key in the cylinder, of a lock according to the invention, in the configuration in which the hook is extracted and is not locked;

Figure 3 is a sectional view, taken along a plane that is perpendicular to the direction of insertion of the key in the cylinder, of a lock according to the invention, in the configuration in which the hook is extracted and locked;

Figure 4 is a perspective view of a frame provided with seats of a lock according to the invention;

Figure 5 is a perspective view of a lever with an end tooth of a lock according to the invention.

**[0013]** With reference to the figures, the reference numeral 1 generally designates a safety lock with front coupling for sliding doors.

**[0014]** Inside a casing 2 there is, in a substantially central portion, a pivot 3 on which a hook-like angular

lever 4 is mounted so that it can rotate. The casing 2 has a front opening 5, through which a triangular head 6 of the lever 4 can protrude from the casing 2. The angular lever 4 is constituted by a plurality of superimposed laminas, which are mutually joined by means of transverse elements (screws or pins) or by respective welding spots. Proximate to the pivoting point, the lever 4 has a lateral tab 7 on which the upper end of a frame 8 is pivoted.

**[0015]** The frame 8 is constituted by two elongated lateral laminas 9, which are identical and mutually parallel, face each other, and are joined by means of transverse metallic flaps 10. In an upper region, the two laminas 9 have respective facing holes 11, which are designed to accommodate the pivoting element 12; in a lower region, the frame 8 is mounted on a pin 13 that protrudes from the frame 2 by means of slots 14. A lever 15 with an end tooth 16 is also rotatably mounted on the pin 13 and is interposed between the laminas 9. The frame 8 substantially has, between two successive flaps 10, seats 10a and 10b that are designed to accommodate the end tooth 16 of the lever 15, which is forced into said seats by way of the action of a spring 17, which is also mounted at the pin 13.

**[0016]** A hole 18 is provided at the front portion of the casing 2, below the opening 5 for the exit of the hook-shaped lever 4, and a pin 19 is accommodated therein so that it can slide longitudinally.

**[0017]** The pin 19, if pushed toward the inside of the casing 2, rests against a rocker 20, constituted by a laminar element whose end portions are substantially rectangular and mutually parallel and are connected at the centerline of the rocker 20 in a substantially circular portion provided with a central hole for mounting, so that it can rotate, on a stem 21 of the casing 2. An axially-acting spring 20b acts on the opposite end 20a of the rocker 20 and keeps the end 20a spaced from the casing 2 and rested in a recess 23 of the lever 4.

**[0018]** A spring 22 acts on the hook-shaped lever 4, forcing it to exit from the casing 2, and its arm 22a rests on the casing 2.

**[0019]** When the lever 4 is rotated toward the outside of the casing 2, the upper comer 20a of the upper end portion of the rocker 20 enters the recess 23 of the lever 4, locking the lever in this configuration.

**[0020]** The protrusion of the comer 20a from the recess 22 due to the counterclockwise rotation of the rocker 20 can be produced by the full-length retraction of the pin 19 into the casing 2, with consequent resting against the lower portion of the rocker 20, overcoming the action of the spring 20b.

**[0021]** A key-operated cylinder 24 is inserted transversely at the lower portion of the casing 2. The bit of the cylinder 24, during the rotation imparted by the key, interferes with the lever 15, turning it clockwise about the pivot 13 and thus disengaging the tooth 16 from the seat 10a (or 10b) comprised between the flaps 10.

**[0022]** The cylinder 24 is kept in position by means of

a screw 25 that passes through the front surface of the casing 2.

**[0023]** The operation of the invention is as follows: the lock 1 is mounted in a sliding door so that the pin 19 and the head 6 of the hook-shaped lever 4 protrude frontally with respect to said door.

**[0024]** Depending on the type of use to be assigned to the door, it is possible to have different operating possibilities.

**[0025]** By turning the cylinder 24 (by way of the appropriately provided key), it is possible to retract the hook-shaped lever 4 by retracting the head 6 fully or partially (latch version provided with a stroke limiting pin 2a) into the casing 2. The movement of the bit of the cylinder 24 disengages the tooth 16 of the lever 15 from the seat 10a that is comprised between the flaps 10 and moves the frame 8 by lowering it; since the frame is rigidly coupled to the lever 4 at the tab 7, it imposes the rotation of the lever 4 until it is fully accommodated within the casing 2 (or its insertion until it rests on the pin 2a). At this point, the tooth 16 engages in the upper seat 10b, locking the lock 1 in this configuration (bolt version).

**[0026]** In this manner, the door can be placed close to the jamb without the hook-shaped lever 4 engaging in the appropriately provided selvage of the jamb. Closure of the door by means of the lock 1 is achieved by placing the door 1 adjacent to the jamb and turning the key in the closure direction, forcing a movement that is the opposite of the one described previously, thus making the head 6 protrude and locking it in this position by engaging the tooth 16 in the lower seat 10a of the frame 8.

**[0027]** The lock 1 can also be left so that the head 6 protrudes from the casing 2 when the door is open. In this configuration, the pin 16 lies outside the casing 2 and therefore the end 20a of the rocker 20 is forced by the spring 20b into the recess 23 of the lever 4. The lever 4 is therefore locked in this position by the rocker 20, while the tooth 16 rests against the rear face of one of the metallic flaps 10 (the one comprised between the seat 10a and the seat 10b).

**[0028]** The arrangement of the door adjacent to the jamb entails a retracting rotation of the lever 4, with consequent partial penetration of the head 6 into the casing 2, until the entire head 6 has fully moved beyond the edge of the selvage, entering it fully. At this point, the pin 19 rests against the jamb, retracting into the casing 2 and releasing the lever 4, which rotates further outward, entailing an upward translational motion of the frame 8 with consequent engagement of the tooth 16 in the seat 10a in the locking position.

**[0029]** In this manner, therefore, the lock 1 can act both as a simple latch and as a bolt, directly providing separate functions that are currently provided by means of different locks.

**[0030]** It has thus been shown that the invention achieves the intended aim and object.

**[0031]** The invention thus conceived is susceptible of

numerous modifications and variations, all of which are within the scope of the appended claims.

[0032] All the details may further be replaced with other technically equivalent ones.

[0033] In the embodiments cited above, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other embodiments.

[0034] In practice, the materials used, as well as the shapes and dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0035] The disclosures in Italian Patent Application No. BO2003A000584 from which this application claims priority are incorporated herein by reference.

[0036] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

## Claims

1. A front-coupling safety lock for sliding doors, of the type that comprises a hook element (4) that is pivoted inside a casing (2) of said lock (1) and is suitable to rotate about said pivot (3) until it protrudes partially from said casing (2), engaging within a respective selvage mounted on the jamb, **characterized in that** said hook (4) is constituted by an angular lever (4) that is pivoted to the casing (2) at one of its ends, with a tab (7) that protrudes laterally to the side of said pivoting point to which the end of a frame (8) is pivoted, said frame (8) being suitable to perform an axial translational motion by way of the action of a key-operated cylinder (24), said frame (8) being associated with a lever (15) provided with an end tooth (16) that is suitable to engage, by way of the action of an elastic means (17), in respective seats (10a, 10b) provided on said frame (8); a rocker (20) being mounted so that it can rotate about its own central portion proximate to said angular lever (4) on the portion that lies opposite the portion provided with the protruding tab (7), said rocker (20) having an end (20a) that is suitable to engage in a recess (23) of said angular lever (4) and an opposite end that faces a pin (19) that can slide axially within a hole (18) provided in the casing (2) and normally protrudes therefrom.
2. The lock according to claim 1, **characterized in that** said hook (4) has an end head (6) that has a substantially triangular profile, the face of said hook (4) that is directed toward the jamb being the one that forms the hypotenuse of said triangle in a side

view and being inclined with respect to the surface of the door panel and of the jamb in order to facilitate the rotation of said hook (4) within the casing (2) as the door panel approaches the jamb, resting against said jamb, until it moves beyond the edge of said selvage and the hook (4) returns to the closed position.

3. The lock according to claim 1, **characterized in that** said frame (8) is constituted by two identical elongated lateral laminas (9) that are mutually parallel and face each other, said laminas (9) being joined by means of transverse metallic flaps (10).
4. The lock according to claim 3, **characterized in that** said frame (8) is mounted, inside said casing (2), in its lower portion, on a pin (13) that protrudes by means of mutually facing slots (14) provided on the lateral laminas (9); said lever (15) provided with an end tooth (16) being interposed between said laminas (9), at said slots (14), and pivoted on said pivot (13) at the end that lies opposite the one provided with the tooth (16).
5. The lock according to claim 4, **characterized in that** said end tooth (16) of the lever (15) that is pivoted to said pin (13) is suitable to engage in the interspaces, seats (10a, 10b), that are comprised between the transverse metallic flaps (10) of the frame (8), locking said frame (8), by being forced against them by way of elastic elements (17).
6. The lock according to the preceding claims, **characterized in that** a key-operated cylinder (24) is mounted transversely to said casing (2) proximate to said frame (8), the path of the bit of said cylinder (24) that interferes with said lever (15) with an end tooth (16) disengaging said tooth (16) from said seats (10a, 10b) during its passage and thus freeing the translational motion of said frame (8).
7. The lock according to claim 1, **characterized in that** said rocker (20) is constituted by a laminar element in which the end portions are substantially rectangular and mutually parallel and are connected at the centerline of the rocker (20) in a substantially circular portion provided with a central hole for rotary mounting on a stem (21) of said casing (2).
8. The lock according to claim 7, **characterized in that** said angular lever (4) is proximate to said rocker (20), a torque spring (22) being mounted on the pivoting axis of said angular lever (4), one arm (22a) of said spring (22) resting against the front part of said casing (2).
9. The lock according to one or more of the preceding claims, **characterized in that** said pin (19) can slide

between two extreme configurations, a first one in which said pin protrudes from said casing-(2) with its head while its tail, the end arranged opposite the head, lies proximate to the rocker portion (20), and a second one in which the pin (19) is fully inside said casing (2), its tail resting on the portion (20a), rotating it in contrast with the action of a spring (20b), until the end (20a) of the rocker portion (20) is disengaged from said recess (23).

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10. The lock according to one or more of the preceding claims, **characterized in that** said angular lever (4) is provided by superimposing a plurality of laminar shapes and fixing them to each other.

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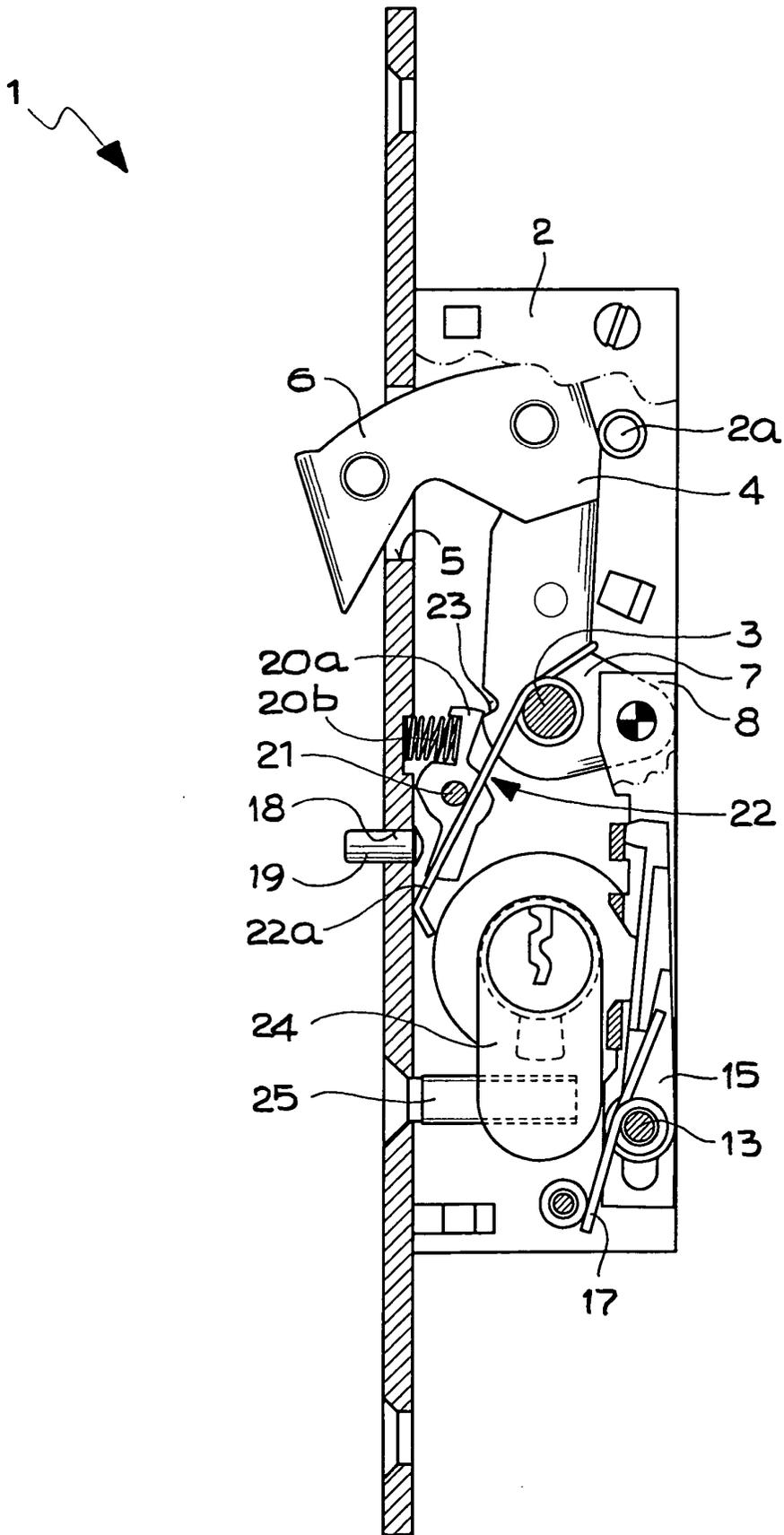


Fig. 1

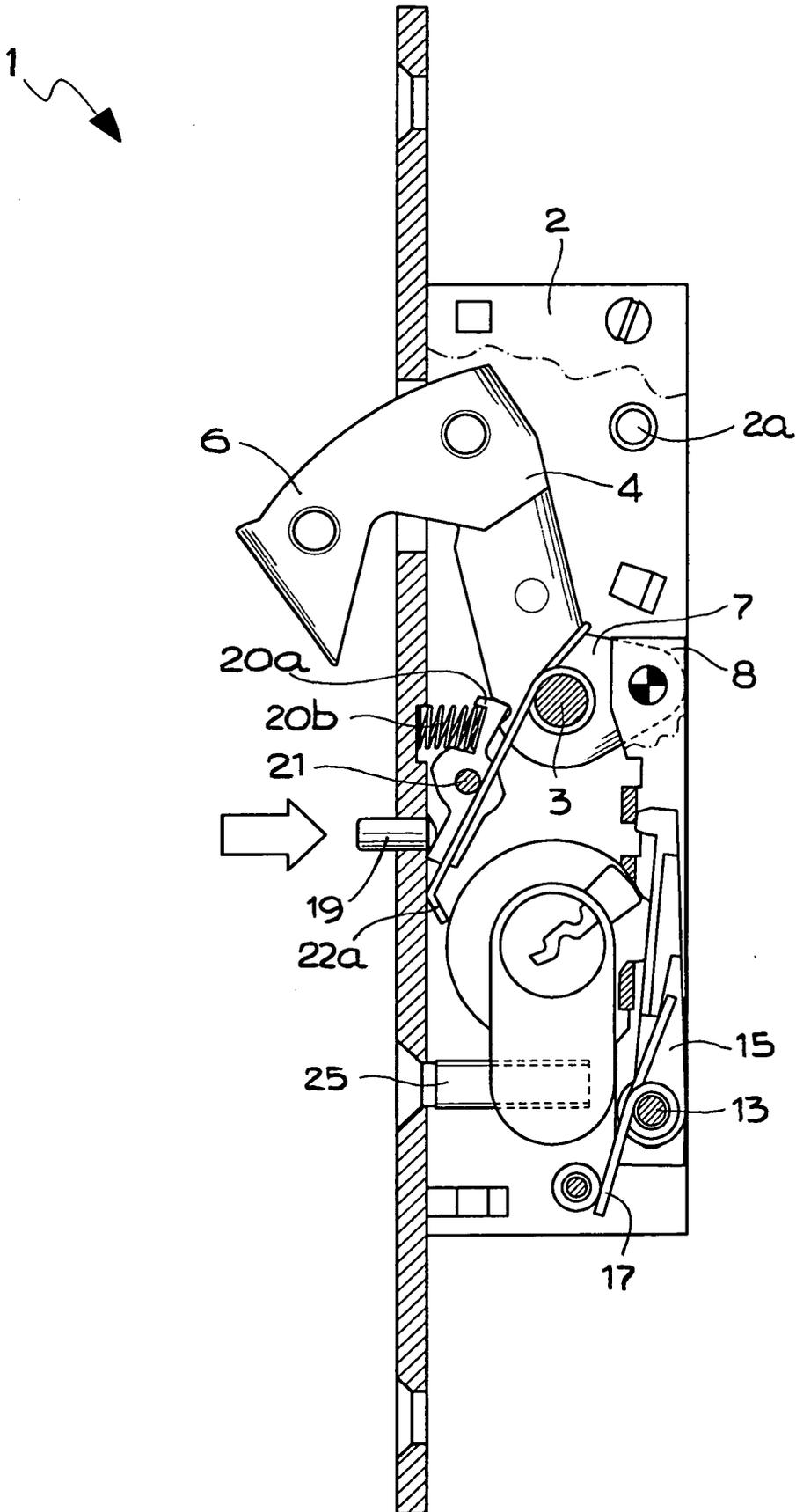


Fig.2

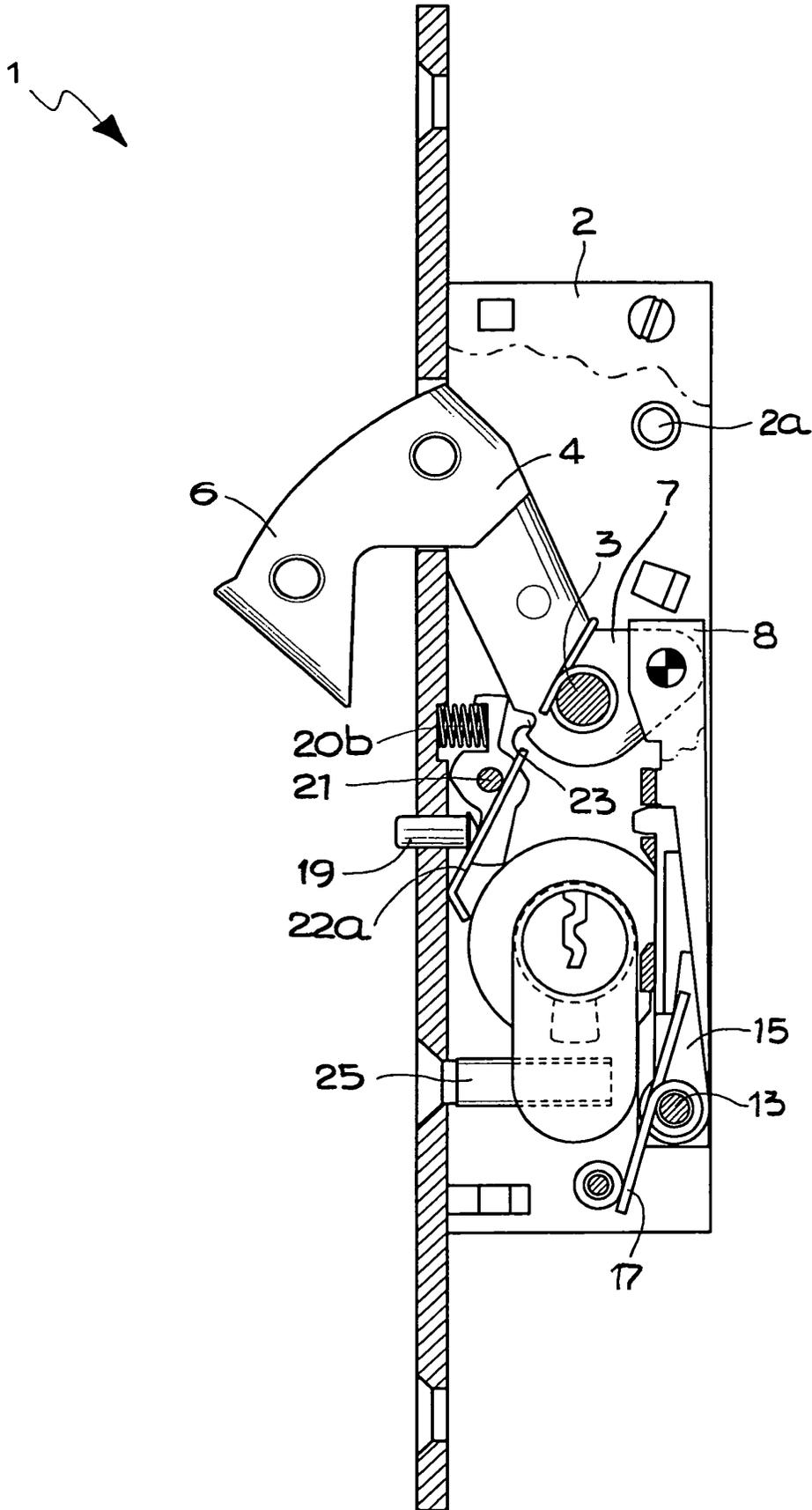


Fig.3

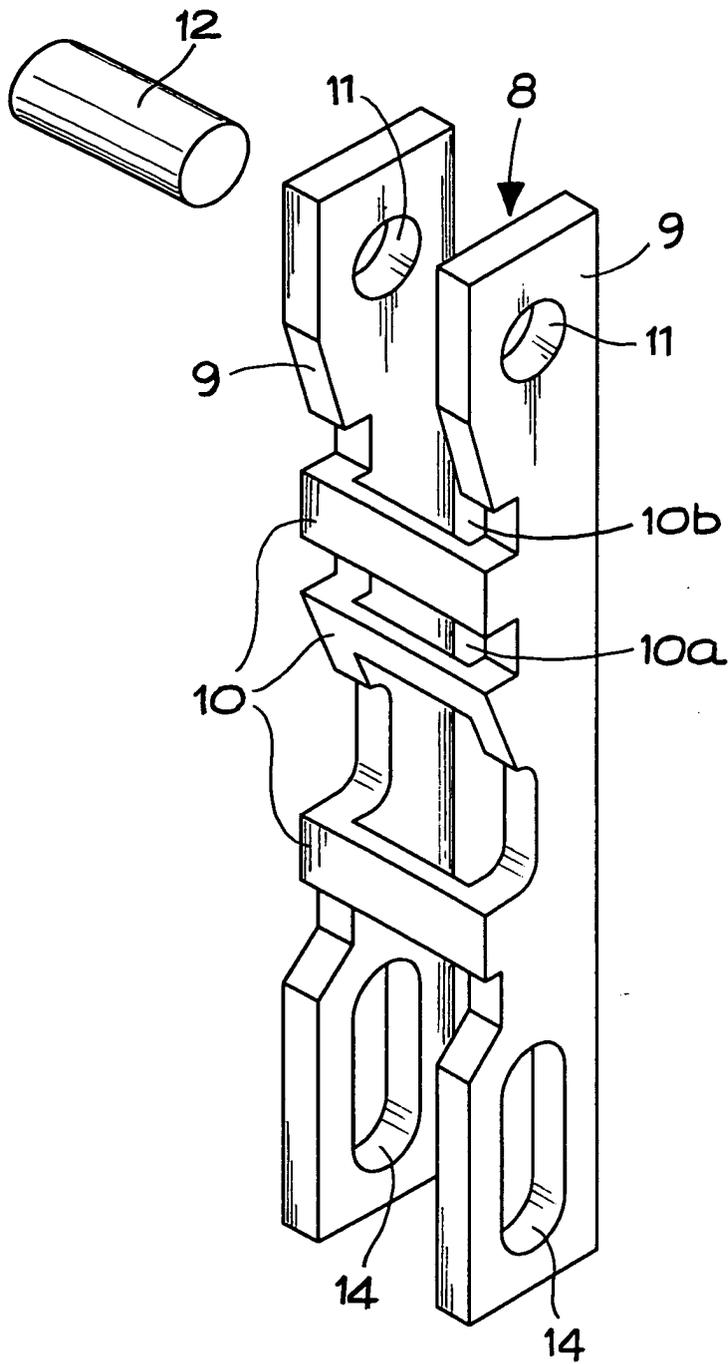


Fig.4

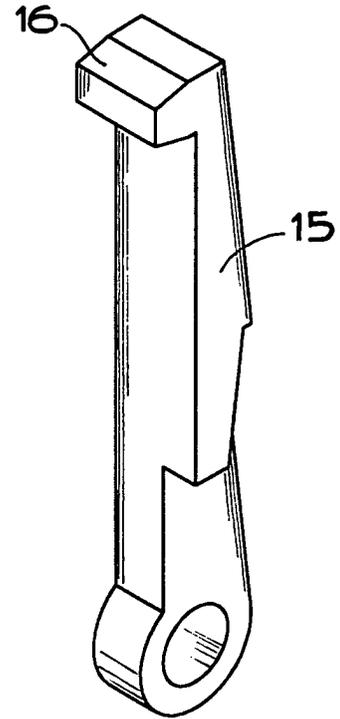


Fig.5