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(54) Improved device for locking bolts in a safety door

(57) The device for locking the bolt in a safety door, comprises a casing (1) provided with a hole (16) for the passage of a bolt (17) and adapted to be arranged in a seat formed in the upper edge of a door hinged to a door frame which is fixed to a wall. A spring-loaded sensor (19) is slideable in the casing (1) and has a chamfered end (30) which cooperates with the upper transverse member (33) of the door frame. A transversely movable pin (25) is arranged in the sensor (19), and has opposite ends engaged in slots (26,27) of the casing (1) that are shaped so as to lock the bolt (17) in a retracted position when the sensor (19) is expelled from the casing (1) by the action of a spring (31). The casing (1) is accommodated loosely in a cavity (14) formed in the upper rail of the door and comprises a flange (5) in which holes (6,7) are formed. The holes (6,7) are loosely engaged by bushes (8,9) which are rigidly coupled to a plate (10) that is superimposed on the flange (5), and are fixed by screws (11) to the upper rail of the door. The bushes (8,9) have a height which is greater than the thickness of the flange (5), so that by abutting against the upper rail of the door they allow tilting movements of the casing (1) in the cavity (14).

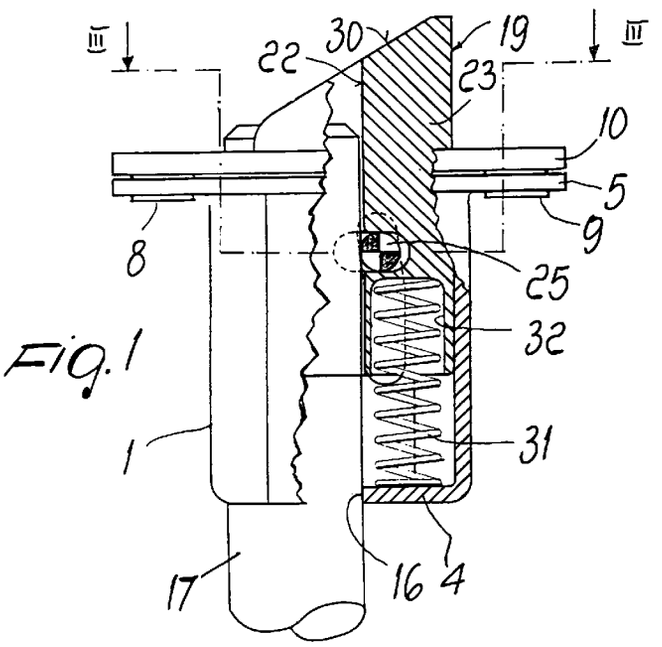

Fig. 1

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Description

The present invention relates to an improvement to a device for locking bolts in a safety door.

In conventional safety doors, the bolts are connected to the lock by rods and are preset so that when the door is open the lower bolt may move downwards and make contact with the floor. To prevent this from occurring, an appropriate rod locking device is provided. Said device comprises a casing adapted to be located in a seat of the upper edge of the door and is provided with a hole for the passage of the bolt. A spring-loaded sensor is slideable in the casing and has a chamfered end that cooperates with the transverse upper member or head member of the door frame which is fixed to the wall.

A transversely-movable pin is arranged in the sensor, and its opposite ends engage slots of the casing that are shaped so as to lock the bolt in a retracted position when the sensor is expelled from the casing due to the action of the spring.

This device can jam if the casing is not perfectly coaxial with respect to the bolt and can therefore compromise door opening and closure.

A principal aim of the present invention is therefore to provide an improved device for locking bolts in a safety door which obviates such drawbacks.

With this aim in view, there is provided an improved device for locking bolts in a safety door as defined in the appended claims.

Further characteristics and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a partially sectional view of the improved device;
figure 2 is a view of the improved device, with sectional, enlarged-scale views of two details;
figure 3 is a partially sectional view of the device, taken along the plane III-III of figure 1;
figures 4 and 5 are views of the device in two operating positions;
figures 6 and 7 are views of two situations that can occur during the installation of the improved device.

With particular reference to figures 1, 2, and 3, the device comprises a cylindrical casing 1 having flat and parallel regions 2 and 3 in mutually opposite positions.

The casing 1 is provided with a bottom 4 and, at the end opposite to the bottom 4, with an ellipsoidal flange 5, wherein two holes 6 and 7 are formed; said holes are diametrically opposite with respect to the axis A of the casing. Two bushes 8 and 9 engage loosely in the holes 6 and 7 and are rigidly coupled to the lower face of a plate 10. The plate 10 is superimposed on the flange 5 and has the same shape as the flange 5.

The bushes 8 and 9 are higher than the thickness of the flange 5 and are crossed by screws 11 and 12, which fix the plate 10 in the upper rail of the door leaf 13. The larger diameter of the holes 6 and 7 with respect to the diameter of the bushes 8 and 9 and the greater height of said bushes with respect to the thickness of the flange 5 allow said flange 5, and therefore the casing 1, to perform small tilting motions. In order to perform said tilting motions, the casing 1 is inserted loosely in a cylindrical cavity 14 that is open on the upper edge 15 of the leaf and so that the flat regions 2 and 3 are at right angles to the plane of said door leaf.

A hole 16 is formed in the bottom 4, eccentrically with respect to the axis A of the casing 1, and the bolt 17 is driven therethrough; said bolt 17 is engageable with the upper transverse member or head member of the door frame, which is fixed to a wall, in order to lock the door in a closed position.

The bolt 17 is constituted by a cylindrical rod actuated by a lock, which may be of a conventional type. The hole 16, crossed by the bolt 17, is internally tangent to the casing 1, so that the bolt is in tangent contact with the inner part of the casing along a line 18 that lies on the intermediate centerline plane P and is parallel to the flat regions 2 and 3.

The eccentric position of the bolt 17 allows to place, between said bolt and the wall of the casing 1 lying opposite to the contact point 18, a sensor 19 which detects the closed or open position of the door, so as to accordingly control the release or locking of the bolt.

Said sensor 19 is constituted by an element having a substantially U-shaped cross-section that forms, with two wings 20 and 21, a substantially semicylindrical channel 22 inside which the bolt 17 is guided.

The wings 20 and 21 are connected by a thicker portion 23, in which a hole 24 is formed at right angles to the axis A of the casing 1; said hole is ovalized so as to intersect the channel 22.

A pin 25 is inserted in the hole 24, and its opposite ends engage in slots 26 and 27 formed in the flat regions 2 and 3 of the casing.

The slots 26 and 27 comprise a lower portion 28 that is parallel to the axis A of the casing and an upper portion 29 that is inclined so that by making the sensor 19 slide in the casing 1, the pin 25 moves transversely in the hole 24.

The end of the sensor 19, which protrudes from the casing 1, has a chamfer 30 that affects not only the portion 23 but also the wings 20 and 21, so as to form a sort of spring latch adapted to retract when the sensor strikes the head member 33 of the door frame which is fixed to the wall.

The described device is completed by a spring 31 (figure 1) interposed between the bottom 4 and the sensor 19 and partially accommodated in a recess 32 of the portion 23.

The operation of the described device is more evident in figures 4 and 5.

Figure 4 is a view of the device in the door opening condition, i.e., with the bolt 17 retracted. By virtue of the spring 31, the sensor 19 is pushed upwards, so that the pin 25, by following the profile of the slots 26 and 27, is moved laterally in the ovalized hole 24 and is forced against the bolt 17, which is thus locked in a retracted position.

On the other hand, when the door is moved into the closed position, the sensor 19, due to the abutment of the chamfer 30 against the head member 33 of the door frame, is pushed so as to retract into the casing 1, so as to cause the spacing of the pin 25 from the bolt 17 by virtue of the slots 26 and 27, thus allowing said bolt to engage in the opening 34 of the head member 33 when the strike lock is activated.

The fundamental prerogative of the present invention resides in the fact that the casing 1, by virtue of the play between the flange 5 and the plate 10, can tilt freely and can thus cancel any axial misalignments between the bolt 17 and the sensor 19 that might cause bolt jamming. Even if the bolt 17 were not perfectly parallel to the axis A (see figures 6 and 7), the play between the flange 5 and the plate 10 would anyway allow the casing 1 to be arranged so as to allow the free sliding of the sensor 19 on the bolt 17.

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. Improved device for locking the bolt in a safety door, comprising a casing (1) provided with a hole (16) for the passage of the bolt (17), and adapted to be arranged in a seat formed in the upper edge of a door, a sensor (19) being slideable in said casing, loaded by a spring (31), and having a chamfered end (30) for cooperation with the head member of a door frame fixed to a wall, a transversely movable pin (25) being arranged in said sensor, said pin (25) having opposite ends engaged in slots (26, 27) of said casing that are shaped so as to lock the bolt in a retracted position when said sensor is expelled from said casing by the action of said spring, characterized in that said casing (1) is accommodated loosely in a cavity (14) of the upper rail of the door (13) and comprises a flange (5) in which holes (6, 7) are formed, said holes being loosely engaged by bushes (8, 9) rigidly coupled to a plate (10) that is superimposed on said flange and traversed by screws (11) for fixing to the upper rail of the door, said bushes (8, 9) being higher than the thickness of said flange (5), so that by abutting against the upper rail of the door they allow tilting movements of the casing (1) in said cavity (14).

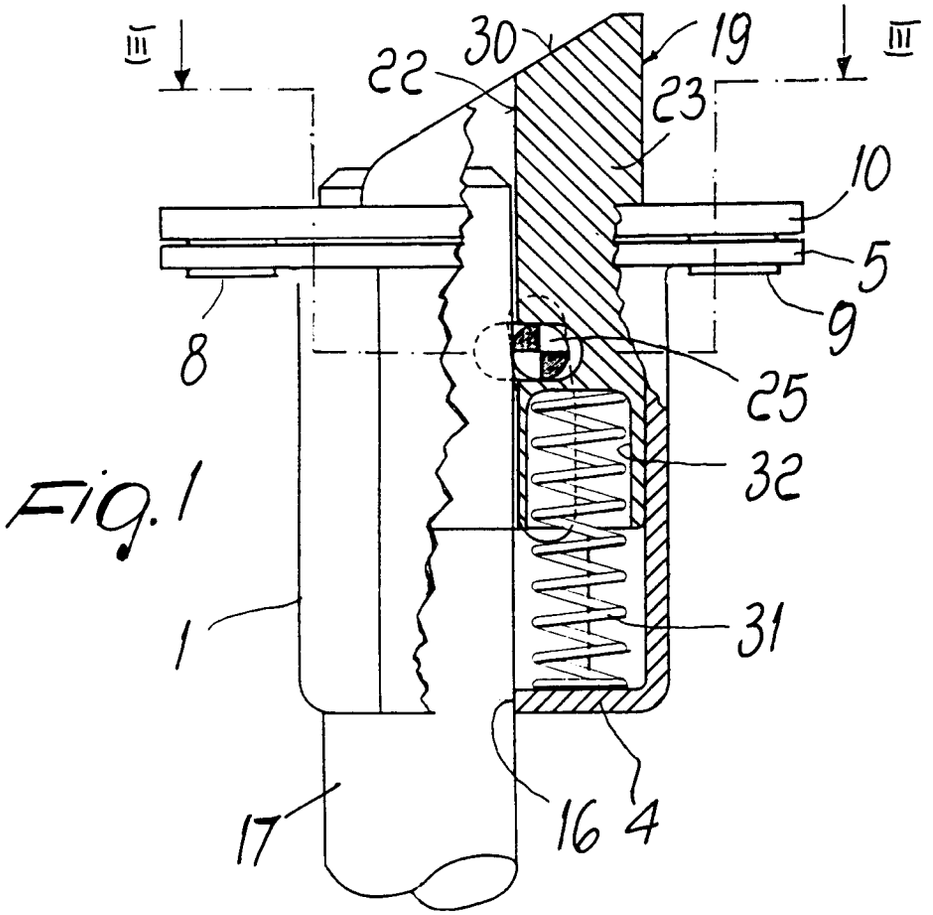
2. Device according to claim 1, characterized in that said flange (5) has an ellipsoidal shape and in that the plate (10) comprises two bushes (8, 9) adapted to loosely engage in two respective holes (6, 7) of said flange (5) that are formed along the major axis thereof at the ends opposite to the casing.

3. Device according to claim 1 or 2, characterized in that said casing (1) comprises a bottom (4) with an eccentric hole (16) for the passage of said bolt (17) and two oppositely arranged flat regions (2, 3) in which said slots (26, 27) are formed; in that said sensor (19) has a U-shaped cross-section with a portion that is guided between said bolt (17) and said casing (1) and with two wings (20, 21) that wrap around said bolt and form a channel (22) for said bolt, said pin (25) being accommodated in a hole (24) that is ovalized so as to intersect said channel (22) to act on said bolt when said sensor is in the position for expulsion from said casing (1) by virtue of the action of said spring (31).

4. Device according to claim 3, characterized in that said slots (26, 27) have a portion (28) that is parallel to the sliding direction of the sensor (19) and a portion (29) that is inclined so that during the stroke for the expulsion of the sensor (19) on the part of said spring (31), said pin (25) moves transversely in said ovalized hole (24) to act so as to lock said bolt.

5. Device according to one of claims 2 to 4, characterized in that said passage hole (24) is arranged eccentrically, so that the bolt (17) is in tangent contact with the inside wall of the casing (1).

6. Device according to one of claims 2 to 5, characterized in that the spring (31) acting on said sensor (19) is partially accommodated in a recess (32) thereof and rests on the bottom (4) of the casing (1).


III
III
22
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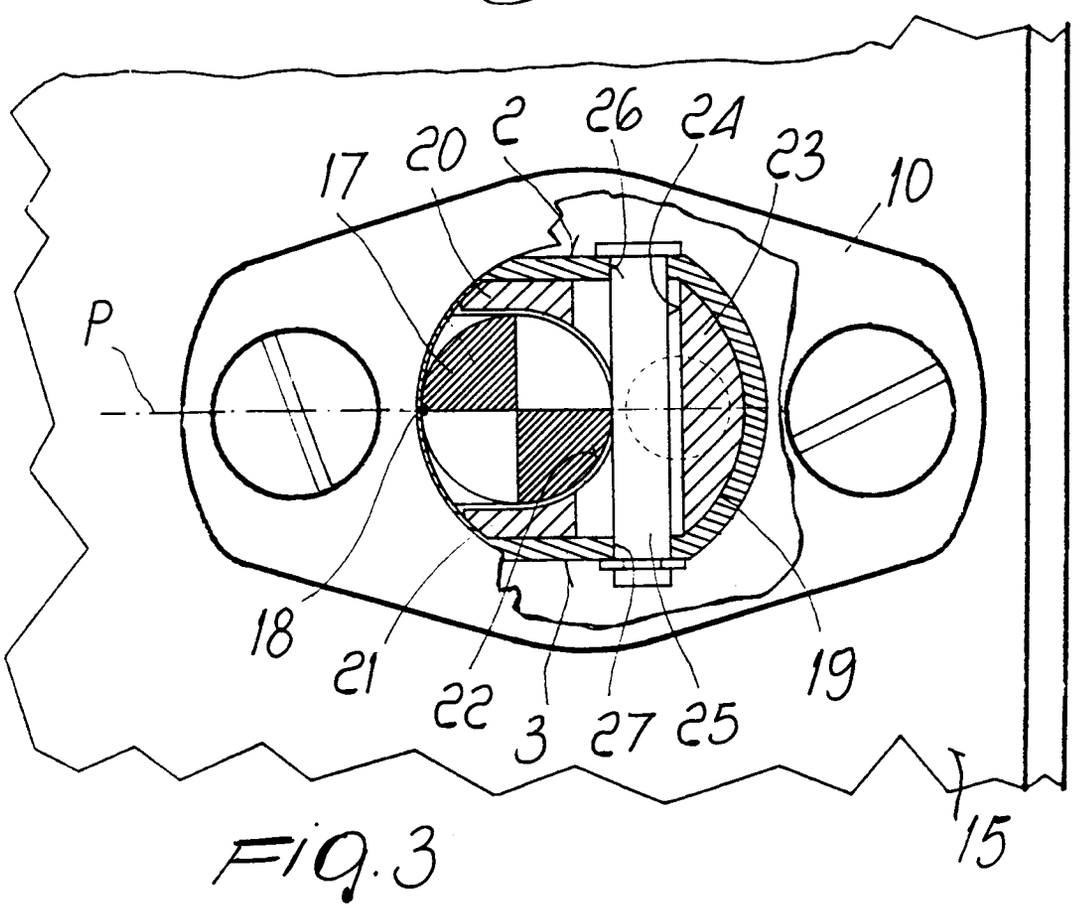
19
23
10
5
9
8
25
32
31
1
17
16
4

FIG. 1


17
20
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24
23
10
P
18
21
22
3
27
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19
15

FIG. 3

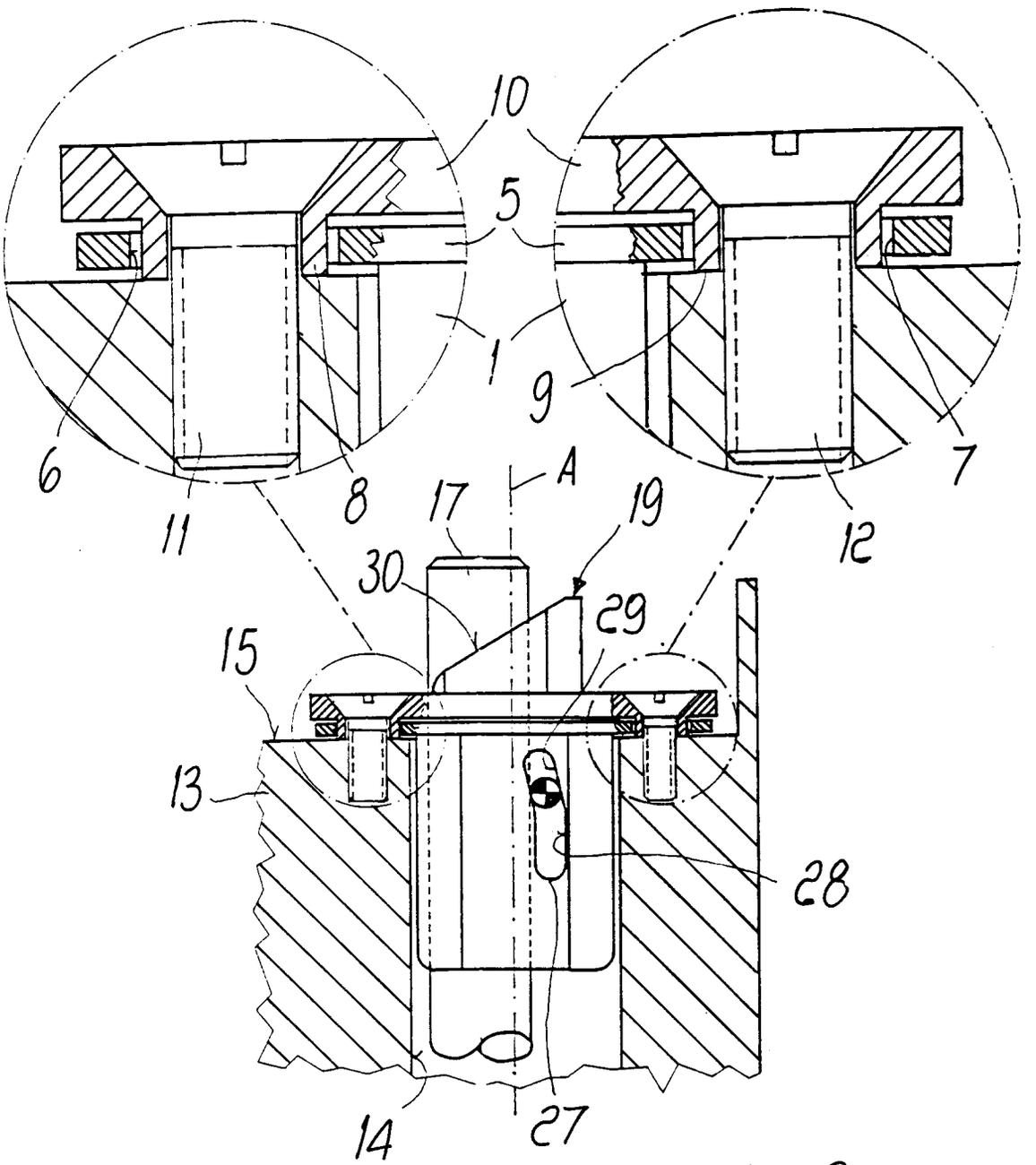

Fig. 2

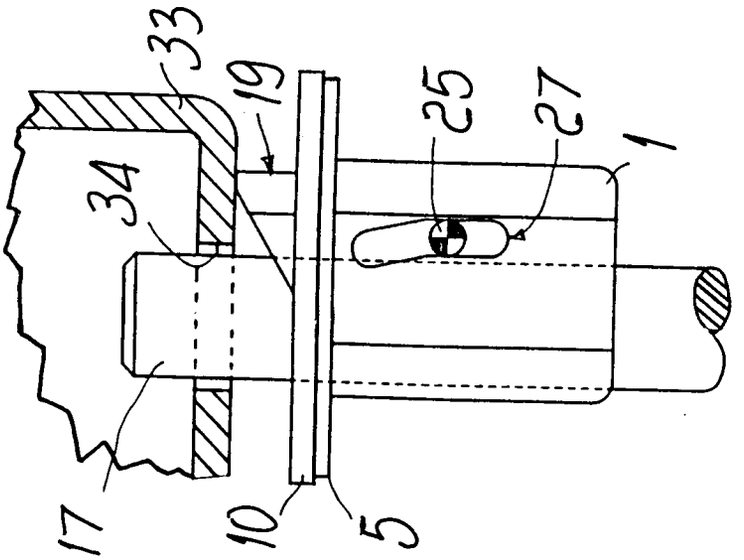

Fig. 5

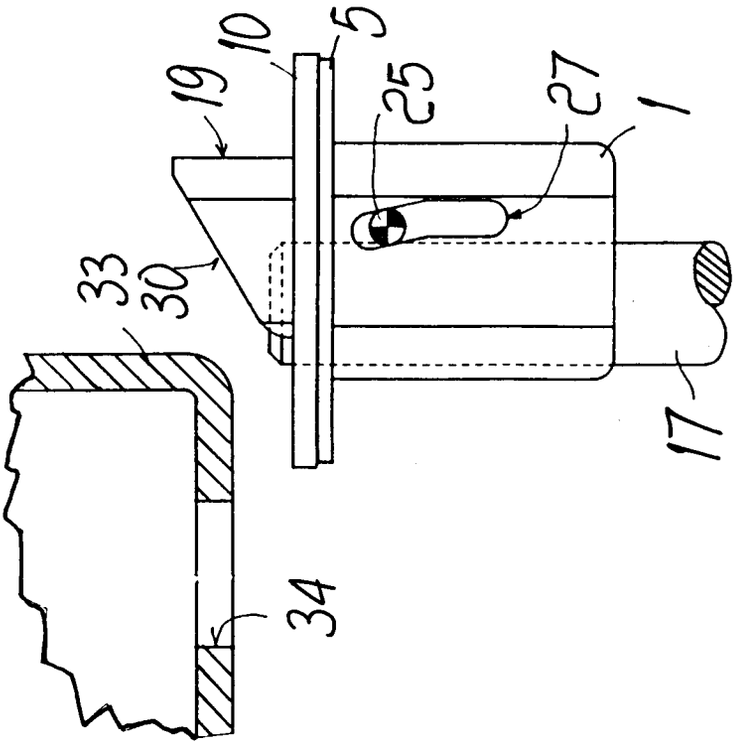

Fig. 4

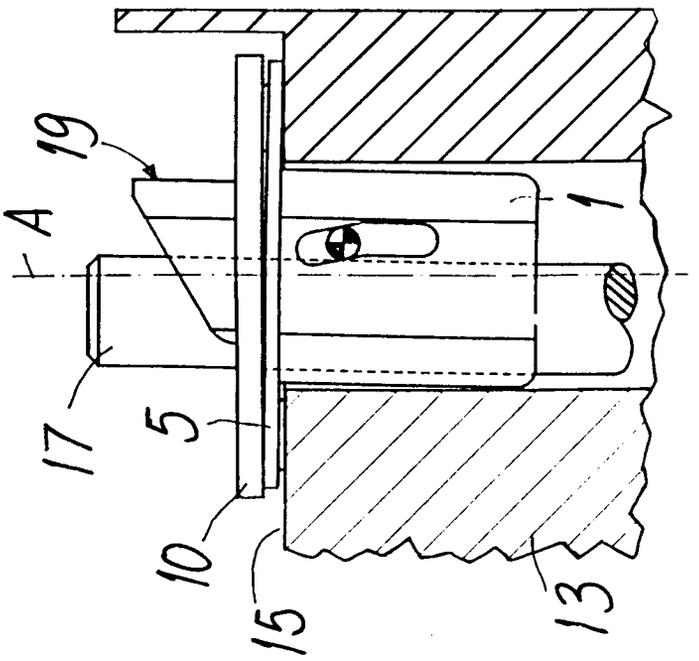

Fig. 7

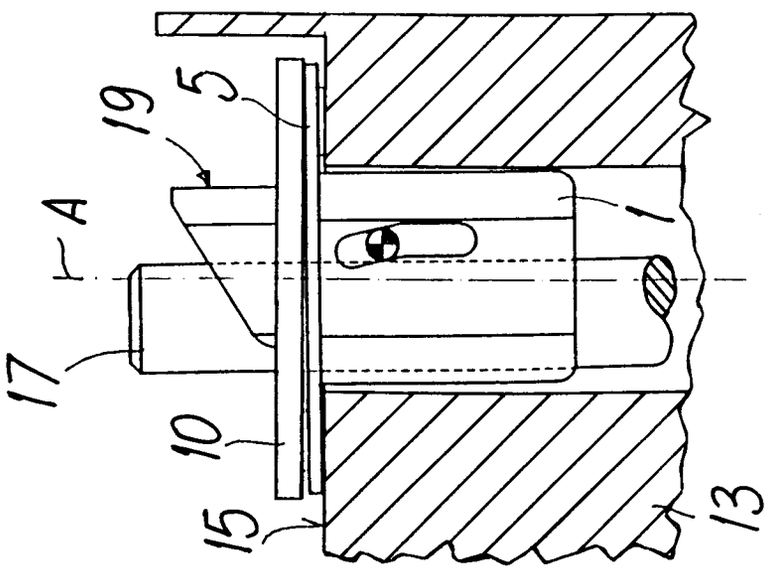

Fig. 6