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(11) **EP 0 866 198 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.09.1998 Bulletin 1998/39

(51) Int. Cl.⁶: **E05B 65/20**

(21) Application number: **98105024.8**

(22) Date of filing: **19.03.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

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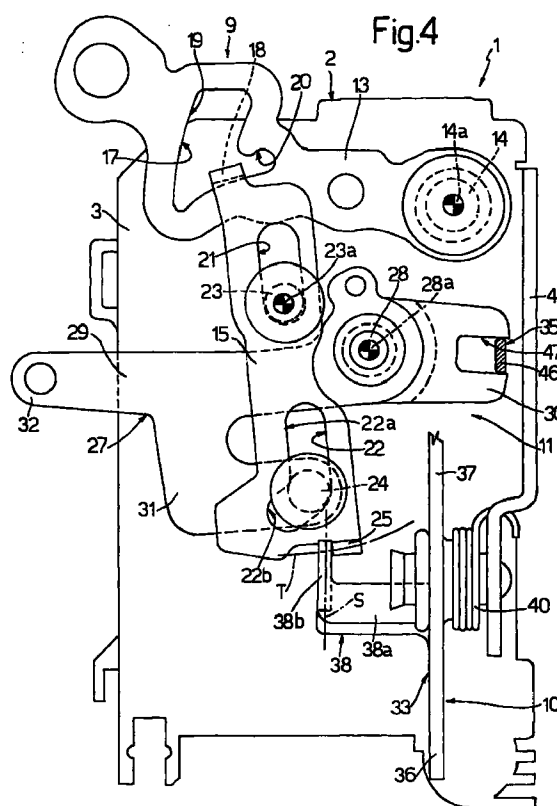
(30) Priority: **21.03.1997 IT TO970240**

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(54) **Lock for the door of a vehicle**

(57) Lock (1) for the door of a vehicle, in which an internal control lever (33) which can be actuated by means of an internal handle of the door is adapted to disconnect the safety mechanism and to actuate a stop (8) of the lock (1) by means of a transmission lever (15), the internal control lever (33) is provided with a shaped portion (38b) adapted to interact with the transmission lever (15) in order to prevent the said lever from being displaced into a position allowing for opening during a first actuation of the handle, in such a manner that the lock (1) can be opened by means of a second actuation of the said handle.



EP 0 866 198 A1

Description

This invention relates to a lock for the door of a vehicle.

In particular, this invention relates to a lock of the type comprising a closing mechanism having a fork and a stop adapted to block the said fork in a position for closing the lock, a first opening mechanism which can be connected to an external handle of the door in order to open the lock from the outside, a safety mechanism adapted to allow for selective opening of the lock by means of the first opening mechanism, and a second opening mechanism which can be connected to an internal handle of the door in order to open the lock from the inside.

More particularly, the first opening mechanism comprises an external control lever movable between a normal position and an opening position, and a transmission lever interposed between the external control lever and the said stop and movable between a first coupling position and a second uncoupling position between the external control lever and the stop.

The safety mechanism is adapted to displace the transmission lever between the said first and second positions and in turn comprises a safety lever positively coupled to the transmission lever, which can be actuated from inside the vehicle by means of a knob disposed on the inside of the door and movable between a position allowing the door to be opened from the outside corresponding to the first position of the transmission lever and a position preventing the door from being opened from the outside corresponding to the second position of the transmission lever, and a safety control lever operated by means of a key, positively coupled to the safety lever.

Finally, the second opening mechanism comprises an internal control lever movable between a respective normal position and a respective opening position in which it cooperates with the transmission lever in order to actuate the stop.

According to one known embodiment, the internal control lever is kinematically coupled to the safety control lever during a first section of the stroke thereof in order to bring the said safety lever from the inhibiting position to the enabling position, thereby allowing the safety mechanism to be disconnected and the lock to be opened in one single operation.

For safety reasons, it is sometimes required that the disconnection of the safety mechanism and the opening of the lock by means of the internal handle of the door cannot be effected in one single operation. The internal handle therefore has to be actuated once in order to disconnect the safety mechanism and a second time in order to open the lock.

Locks provided with the latter function are known.

However, in known locks, a function of this kind entails an increased number of components and greater complexity, in particular of the second opening mechanism.

Locks of this kind are therefore relatively expensive.

The aim of this invention is to produce a lock for the door of a vehicle of the type described, in which the disconnection of the safety mechanism and the opening of the said lock can be achieved by means of successive actuations of the internal handle of the door, and in which a function of this kind is obtained in a simple and economical manner.

A lock for the door of a vehicle is provided according to this invention, comprising:

- a closing mechanism having a fork and a stop adapted to block the said fork in a position for closing the lock;
- a first opening mechanism which can be connected to an external handle of the door and in turn comprising an external control lever movable between a normal position and an opening position, and a transmission lever interposed in a selectively releasable manner between the said external control lever and the said stop;
- a safety mechanism comprising a safety lever operatively coupled to the said transmission lever and movable between an inhibiting position in which the transmission lever is disposed in a released position between the said external control lever and the said stop, thereby preventing opening of the lock from the outside, and an enabling position in which the said transmission lever is disposed in a constrained position between the said external control lever and the said stop, thereby allowing for opening of the lock, and a safety control lever which can be actuated by means of a key, positively coupled to the said safety lever and movable between a first position corresponding to the said inhibiting position of the said safety lever and a second position corresponding to the said enabling position of the said safety lever;
- a second opening mechanism which can be connected to an internal handle of the door in order to open the lock from the inside and comprising an internal control lever movable along an opening stroke between a respective normal position and a respective opening position, and
- means for kinematic coupling of the said internal control lever and the said safety control lever operative during a first section of the said opening stroke of the said internal control lever in order to displace the said safety control lever from the said first position to the said second position, characterised in that the said internal control lever comprises control means for the said transmission lever cooperating with the said transmission lever disposed in the said constrained position thereof during a second section of the said opening stroke in order to actuate the said stop, and locking means adapted to be displaced from the said first section

of the said opening stroke along a path described by a striker portion of the said transmission lever when the latter is displaced from the said released position to the said constrained position.

This invention will now be described with reference to the accompanying drawings illustrating one non-limiting embodiment and in which:

Figure 1 is a side elevation, partly in section and partly broken away for the sake of clarity, of an embodiment of a lock according to this invention in a first operating position;

Figure 2 is a front elevation of the lock of Figure 1, partly in section and partly broken away for the sake of clarity;

Figure 3 is a side elevation of the lock, partly in section and partly broken away for the sake of clarity, in a second operating position;

Figure 4 is a front elevation of the lock, partly in section and partly broken away for the sake of clarity, in the operating position of Figure 3, and

Figure 5 is a front elevation of the lock, partly in section and partly broken away for the sake of clarity, in a third operating position.

With reference to Figures 1 and 2, the reference numeral 1 designates in its entirety a lock for the door (not shown) of a vehicle (not shown).

The lock 1 comprises a frame 2 adapted to be fixed to the said door and substantially defined by two walls 3 and 4 substantially orthogonal to one another and a closing mechanism 6 in turn comprising a fork 7 adapted to cooperate with a fixed striker (not shown) integral with a pillar (not shown) of the door, and a stop 8 adapted to releasably block the said fork 7 in a closing position on the striker.

The lock 1 moreover comprises two opening mechanisms 9 and 10 which are supported by the walls 3 and 4 respectively and can be connected respectively to an external handle and an internal handle of the door in order to open the said lock 1 from the outside and from the inside respectively.

The lock 1 finally comprises a safety mechanism 11 supported by the wall 3 and adapted to prevent the lock 1 being opened from the outside.

The mechanism 9 comprises an external control lever 13 connected in a known manner to the said external handle and mounted to rotate on a pin 14 supported by the wall 3 coaxially with a respective axis 14a orthogonal to the wall 3, and a transmission lever 15 which is coupled in a selectively releasable manner to the lever 13, is movable in a plane parallel to the wall 3 and is adapted to cooperate unidirectionally with a peg 16 projecting from the stop 8 for the purposes of opening the lock 1.

In particular, the lever 13 has a slot 17 engaged by a transverse tooth 18 of the transmission lever 15 and is

adapted to rotate about the axis 14a against the force of a helical torsion spring (not shown) mounted on the pin 14, between a raised normal position and a lowered opening position (not shown) in which it is adapted to act on the stop 8 by means of the lever 15 and the peg 16 in order to open the lock 1, thereby disengaging the fork 7 from the said striker.

The slot 17 is substantially L-shaped and comprises a releasing portion 19 formed substantially along a circumference having its centre in the axis 14a and within which the tooth 18 can slide freely irrespective of the position of the lever 13, and a constraining portion 20 which extends transversely from the portion 19 to the axis 14a and within which the tooth 18 is constrained in order to impart a substantially vertical and rectilinear movement to the lever 15 when the lever 13 is displaced between the two operating positions.

In addition to the tooth 18, the lever 15 has two slots 21 and 22 disposed successively along the said lever 15 from the said tooth 18. The slot 21 extends parallel to a longitudinal axis of the lever 15 and is slidably engaged by a supporting pin 23 of the lever 15 mounted in the wall 3 coaxially with an axis 23a parallel to the axis 14a. The slot 22 is slidably engaged by a respective pin 24 provided on the safety mechanism 11 parallel to the pin 23 and has two rectilinear portions 22a and 22b respectively longitudinal and inclined with reference to the larger dimension of the lever 15, converging in an intermediate elbow defining a stable support for the said pin 24. The lever 15 finally has a further projection 25 extending on the opposite side of the tooth 18 with respect to the lever 15 transversely of the said lever 15, disposed so that it corresponds with one end 26 of the lever 15 and adapted to be engaged by the opening mechanism 10, as will be explained more clearly hereinafter.

The safety mechanism 11 is adapted to act on the lever 15 by means of the pin 24, rotating the lever 15 about the axis 23a, and comprises a safety lever 27 positively coupled to the said lever 15 by means of the pin 24 and movable between an inhibiting position (shown in Figure 2) in which it rotates the lever 15 by means of the pin 24 (in an anti-clockwise direction in Figure 2 and about the axis 23a) and releases the levers 13 and 15, thereby displacing the tooth 18 of the lever 15 into the releasing portion 19 of the slot 17 so as to prevent the lock 1 being opened from the outside, and an enabling position (shown in Figure 5) in which it constrains the levers 13 and 15, thereby displacing the tooth 18 into the portion 20 of the slot 17 so as to allow the lock 1 to be opened from the outside.

As the lever 15 rotates between the inhibiting position and the enabling position, the tooth 25 of the said lever 15 describes a circular path T having its centre on the axis 23a.

The lever 27 is mounted to rotate on a pin 28 supported by the wall 3 coaxially with a respective axis 28a orthogonal to the wall 3 and comprises two substantially

radial arms 29, 30.

The arm 29 has an end portion 32 which can be connected in a known manner to a knob (not shown) disposed in the vicinity of a window (not shown) of the door and an L-shaped intermediate extension 31 which supports the pin 24 at one free end thereof.

The arm 30 extends on the opposite side of the said arm 29 with respect to the pin 28 and has an end notch 47 the function of which will be described hereinafter.

The safety mechanism 11 moreover comprises a control lever 35 which is engaged with the lever 27 and can be actuated by means of a key in order to activate or deactivate the said mechanism 11, as will be explained more clearly hereinafter.

The control lever 35 is mounted to rotate on a respective pin 41 supported by the wall 4 coaxially with a respective axis 41a orthogonal to the said wall 4.

The lever 35 comprises an arm 44 adapted to be connected to a control rod (not shown) which can be actuated by the key in order to activate or deactivate the mechanism 11. The lever 35 moreover comprises a shaped cam 45 extending transversely of a lower end of the arm 44 and displaying convexity directed downwards, and a further radial arm 46 disposed on the opposite side of the arm 44 with respect to the pin 41 and positively engaged inside the notch 47 of the arm 30 of the lever 27.

The lever 35 is movable between a first position (Figure 1) corresponding to the inhibiting position of the lever 27 and a second position (Figure 3) corresponding to the inhibiting position of the lever 27. The lever 35 is held stable in each of the said positions by a bistable spring 42 (of a known type) engaged at one end by a portion 43 extending transversely of the arm 44 and at the other end by the wall 4.

The opening mechanism 10 comprises an internal control lever 33 connected in a known manner to the said internal handle and mounted to rotate on a pin 34 supported by the wall 4 coaxially with a respective axis 34a orthogonal to the said wall 4.

The lever 33 comprises three arms 36, 37 and 38 extending radially of the pin 34. The arm 36 can be connected in a known manner to the said internal handle.

The arm 37 substantially aligned with the arm 36 on the opposite side of the said arm 36 with respect to the pin 34 has a cam 39 in correspondence with one free end thereof, extending transversely from the arm 36 to the wall 4, displaying convexity directed upwards and substantially facing the cam 45.

The arm 38 has a first portion 38a extending substantially parallel to the axis 34 towards the extension 31 of the arm 29 of the lever 27 and an end portion 38b folded along a plane parallel to the wall 4, i.e. orthogonally to the working plane of the lever 15.

The portion 38b has a lateral control edge 53 which is directed towards the lever 15 and is substantially hook-shaped in order to engage the projection 25 of the said lever 15.

The lever 33 is adapted to rotate about the axis 34a against the force of a helical torsion spring 40 mounted on the pin 34 between a stable normal position (shown in Figure 1) in which the arm 38 is raised and disengaged with respect to the projection 25 and a respective opening position in which the portion 38b can cooperate with the projection 25 as described in detail hereinafter.

As it travels between the normal position and the opening position, the portion 38b of the arm 38 describes a path S which intersects with the path T of the projection 25. The portion 38b moreover extends in the circumferential direction about the axis 34a to such an extent that it intercepts the path T after a first "idle" section of the opening stroke of the lever 33.

The operation of the lock 1 is essentially known as far as connecting and disconnecting the safety mechanism and opening from the outside or from the inside with the safety mechanism disconnected are concerned. These functions are therefore described briefly hereinafter, departing from the closed state of the lock.

When the lever 15 is disposed in the inhibiting position (Figure 2), opening from the outside by means of the handle is impossible as the rotation of the lever 13 towards the opening position is not transmitted to the lever 15, the tooth 18 being slidable in the releasing portion 19 of the slot 17. In order to be able to open the lock from the outside, the lever 15 has to be displaced from the inhibiting position of Figure 2 to the enabling position of Figure 5, in which the tooth 18 engages the constraining portion 20 of the slot 17.

This can be effected by acting on the lever 35 from the outside by means of a key or by acting on the lever 27 from the inside by means of the control knob of the safety mechanism.

When the lever 15 is in the enabling position (Figure 5), actuation of the external control lever 13 results in substantial vertical displacement of the lever 15 which is slidably guided by the pin 23 and the pin 24 and cooperates by means of its tooth 25 with the peg 16 of the stop 8 in the constrained position of the lever 15.

The safety mechanism can also be disconnected by acting on the internal handle of the door. Actuation of the internal handle results in rotation of the internal control lever 33 from the normal position of Figure 1 to the opening position. After a first idle stroke section, this rotation brings the cam 39 of the lever 33 into contact with the cam 45 of the lever 35. The lever 35 is therefore rotated in turn, while the portion 38b of the arm 38 of the lever 33 is disposed in a position in which it intercepts the path T (Figures 3 and 4).

The rotation of the lever 35 is transmitted to the lever 27, which is displaced towards the enabling position, the lever 15 also being displaced in this direction by means of the pin 24. However, the enabling position cannot be reached as the projection 25 of the lever 15 comes to a stop against the portion 38b of the arm 38 of the internal control lever 33. Figures 3 and 4 show the operating state of the lock 1 at the end of the opening

stroke of the lever 33.

In order to open the lock, the internal handle is released so that the lever 33 returns to the normal position by the return action of the spring 40. In this manner, the portion 38b of the arm 38 of the lever 33 releases the projection 25 of the lever 15 and the safety mechanism 11 springs into the enabling position by virtue of the residual elastic energy of the spring 42.

If the internal handle is then actuated again, the rotation of the internal control lever 33 brings the portion 38b of the arm 38 into cooperation with the projection 25 from top to bottom by means of the edge 53 thereof. The lever 15 is therefore lowered and acts together with the said projection 25 on the peg 16 of the stop, thereby resulting in opening.

An examination of the features of the lock 1 according to this invention clearly shows the advantages that can be obtained.

In particular, the door can only be opened from the inside of the door when the safety mechanism is connected by two successive actuations of the handle.

This function is achieved in an extremely simple manner by means of the interaction of the portion 38a of the internal control lever 38 with the projection 25 of the transmission lever 15 and therefore does not involve either additional components, or higher production and assembly costs relative to known locks of an equivalent type but without this function.

Finally, it will be clear that modifications and changes can be made to the lock 1 described without thereby going beyond the scope of this invention.

In particular, the lock 1 can be provided with a door-locking actuator, in which case the lever 27 is provided with a further control arm adapted to interact with an output element of the said actuator.

Claims

1. Lock (1) for the door of a vehicle, comprising:

- a closing mechanism (6) having a fork (7) and a stop (8) adapted to block the said fork (7) in a position for closing the lock (1);
- a first opening mechanism (9) which can be connected to an external handle of the door and in turn comprising an external control lever (13) movable between a normal position and an opening position, and a transmission lever (15) interposed in a selectively releasable manner between the said external control lever (13) and the said stop (8);
- a safety mechanism (11) comprising a safety lever (27) operatively coupled to the said transmission lever (15) and movable between an inhibiting position in which the transmission lever (15) is disposed in a released position between the said external control lever (13) and the said stop (8), thereby preventing open-

ing of the lock (1) from the outside, and an enabling position in which the said transmission lever (15) is disposed in a constrained position between the said external control lever (13) and the said stop (8), thereby allowing for opening of the lock (1), and a safety control lever (35) which can be actuated by means of a key, positively coupled to the said safety lever (27) and movable between a first position corresponding to the said inhibiting position of the said safety lever (27) and a second position corresponding to the said enabling position of the said safety lever (27);

- a second opening mechanism (10) which can be connected to an internal handle of the door in order to open the lock (1) from the inside and comprising an internal control lever (33) movable along an opening stroke between a respective normal position and a respective opening position, and
- means (39, 45) for kinematic coupling of the said internal control lever (33) and the said safety control lever (35) operative during a first section of the said opening stroke of the said internal control lever (35) in order to displace the said safety control lever (35) from the said first position to the said second position, characterised in that the said internal control lever (33) comprises control means (38) for the said transmission lever (15) cooperating with the said transmission lever (15) disposed in the said constrained position thereof during a second section of the said opening stroke in order to actuate the said stop (8), and locking means (38b) adapted to be displaced from the said first section of the said opening stroke along a path (T) described by a striker portion (25) of the said transmission lever (15) when the latter is displaced from the said released position to the said constrained position.

2. Lock according to claim 1, characterised in that the said control means (53) and the said locking means (38b) are provided on one single arm (38) of the said internal control lever (33).

3. Lock according to claim 2, characterised in that the said striker portion (25) is an end projection of the said transmission lever (15).

4. Lock according to any one of claims 2 and 3, characterised in that the said locking means are defined by a shaped end portion (38a) of the said arm (38) and that the said control means are formed by a lateral edge (53) of the said shaped portion (38b).

5. Lock according to any one of the preceding claims, characterised in that the said internal control lever

(33) is hinged on to an axis (34a) orthogonal to the plane of the said transmission lever (15), the said arm (38) of the said internal control lever (33) comprising a first portion (38a) extending parallel to the said axis (34a), the said shaped portion extending 5
orthogonally to the said first portion (38a) of the said arm (38).

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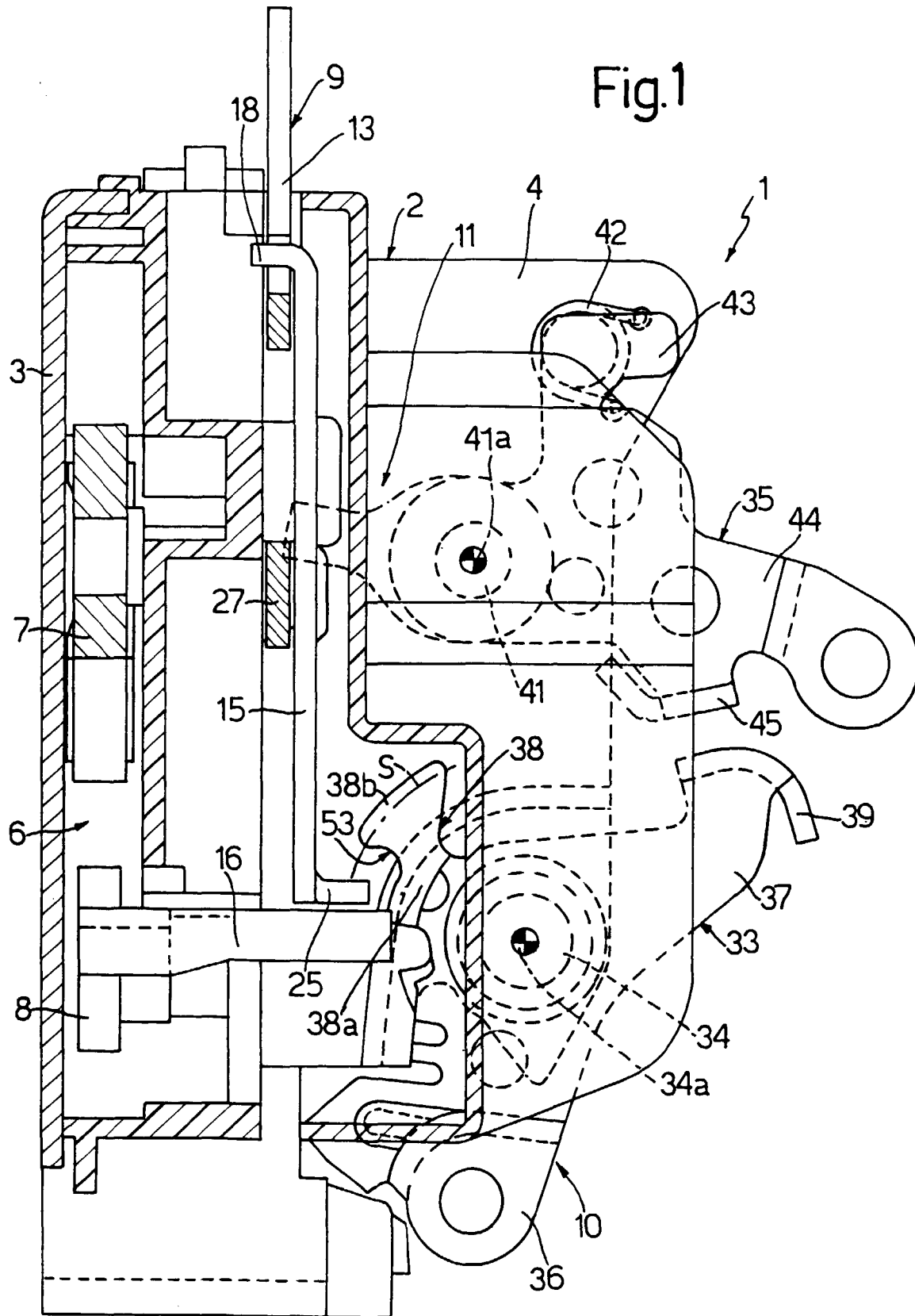
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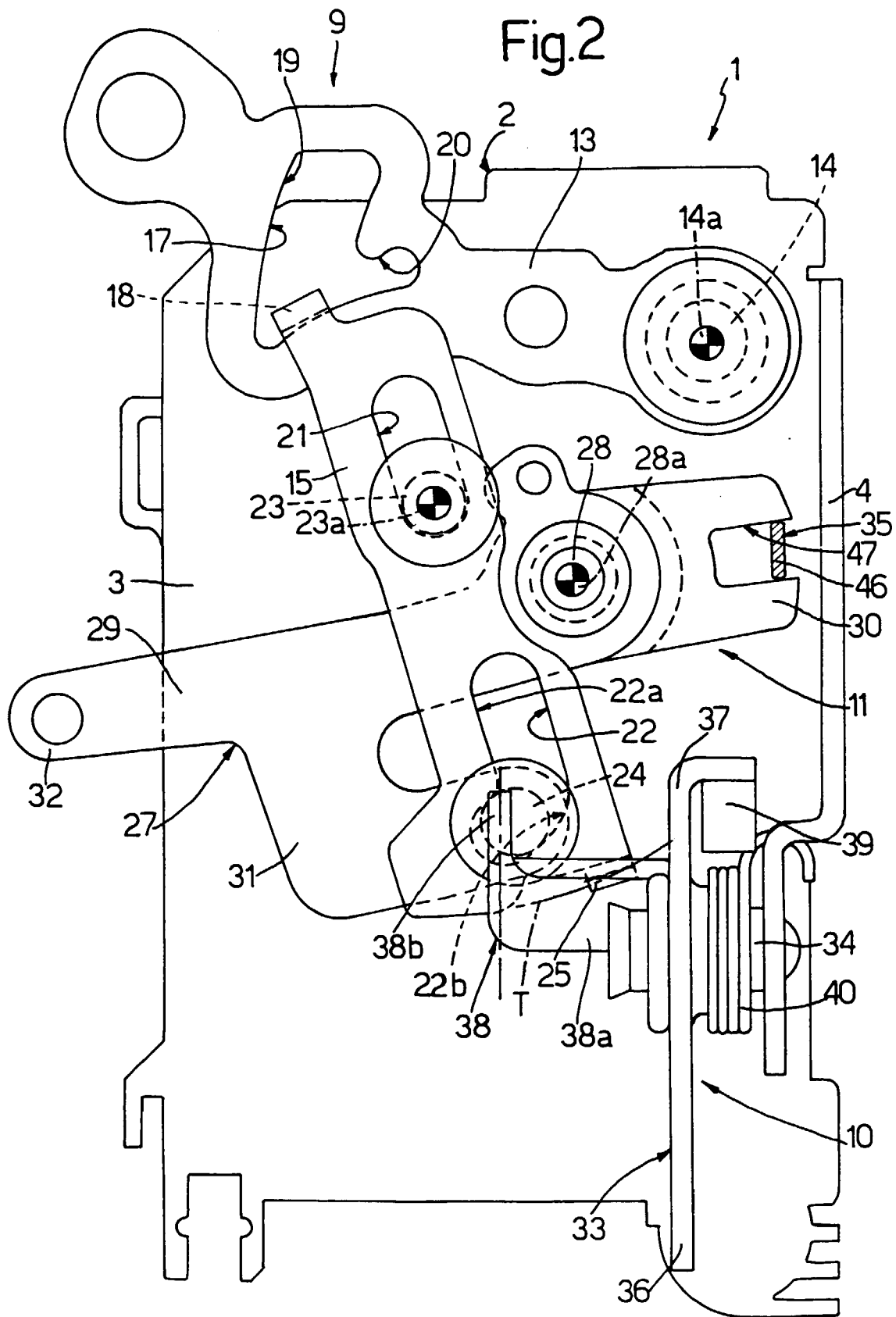
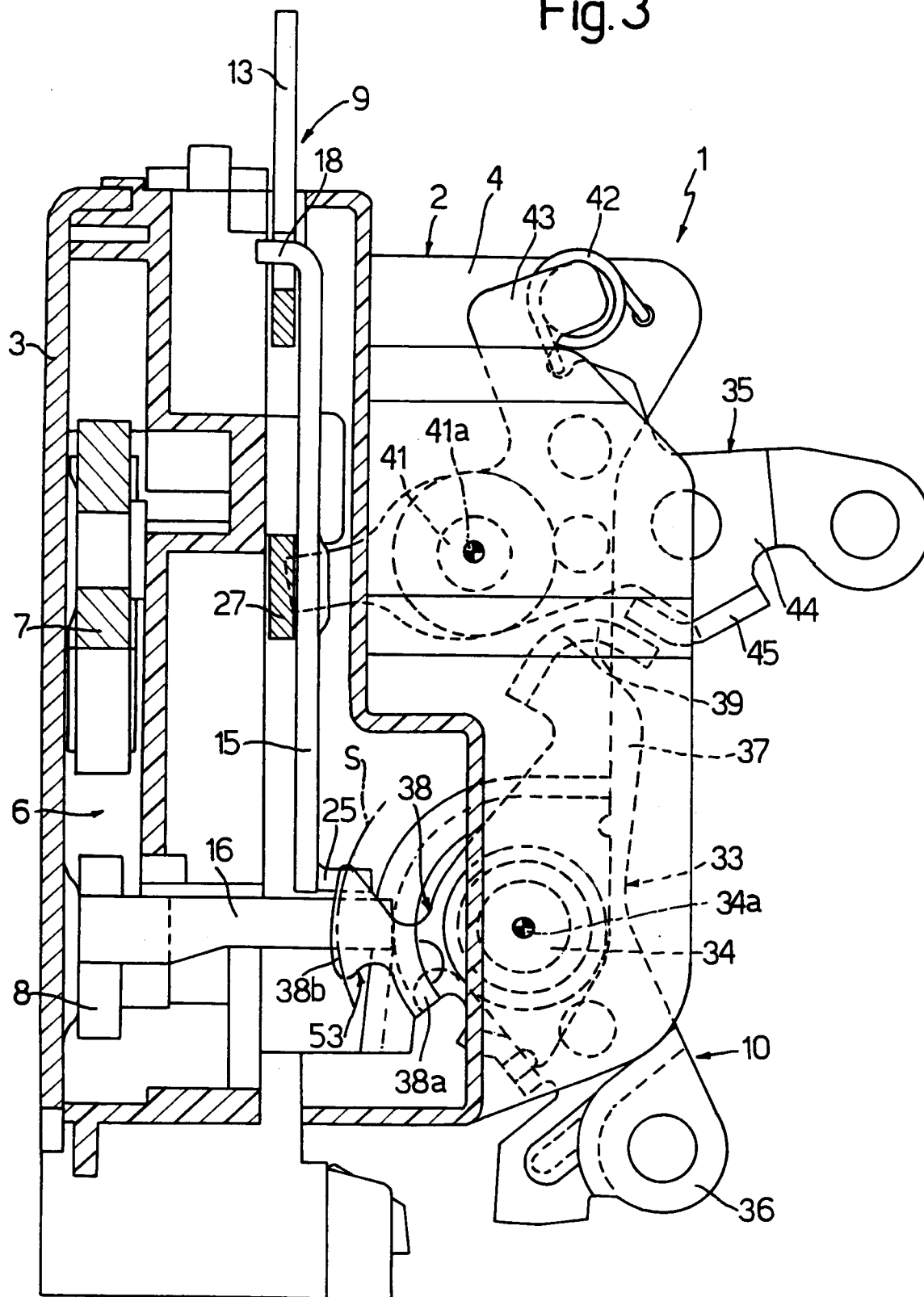


Fig.3



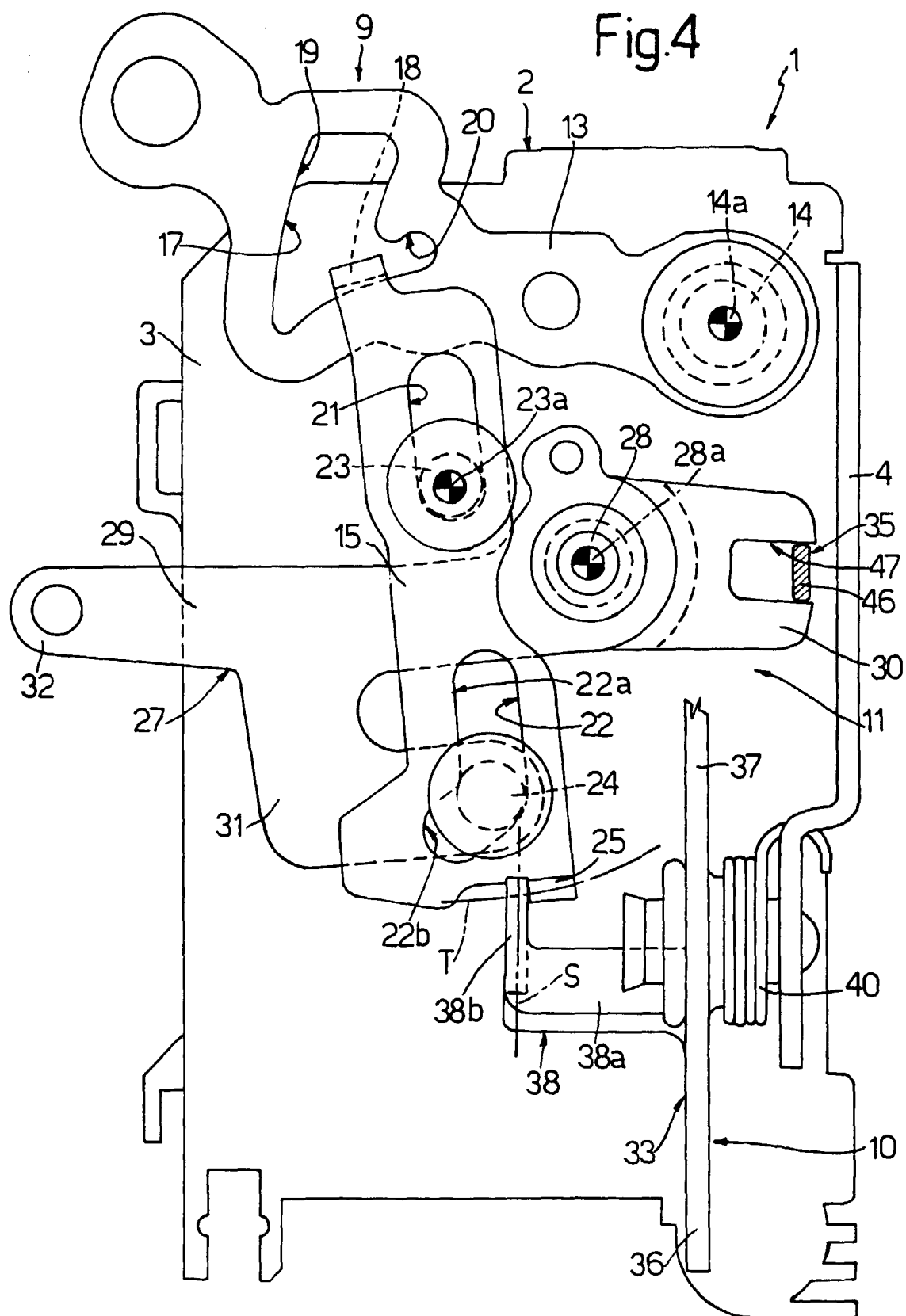
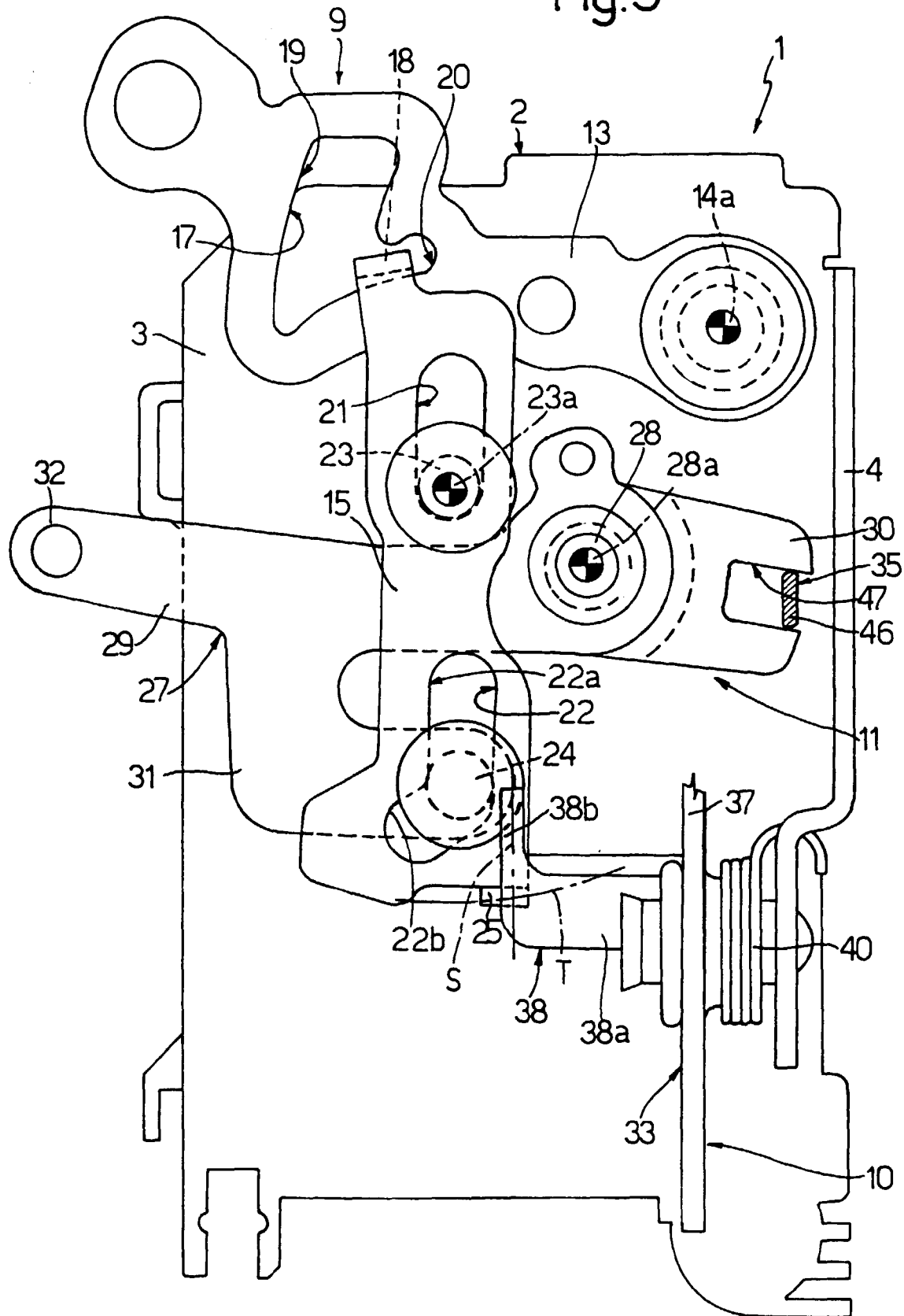


Fig.5





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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 5024

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 44 34 860 A (BOMORO BOCKLENBERG & MOTTE GMBH & CO KG) 4 April 1996 * column 1, line 7 - line 15 * * column 5, line 31 - line 62 * ----	1	E05B65/20
A	DE 38 19 521 A (MOTROL S.P.A.) 22 December 1988 * column 8, line 13 - line 42 * ----	1	
A	DE 40 00 928 A (MITSUI KINZOKU KOGYO K.K.; FUJI JUKOGYO K.K.) 26 July 1990 * column 4, line 52 - line 59 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E05B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		2 July 1998	Westin, K
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