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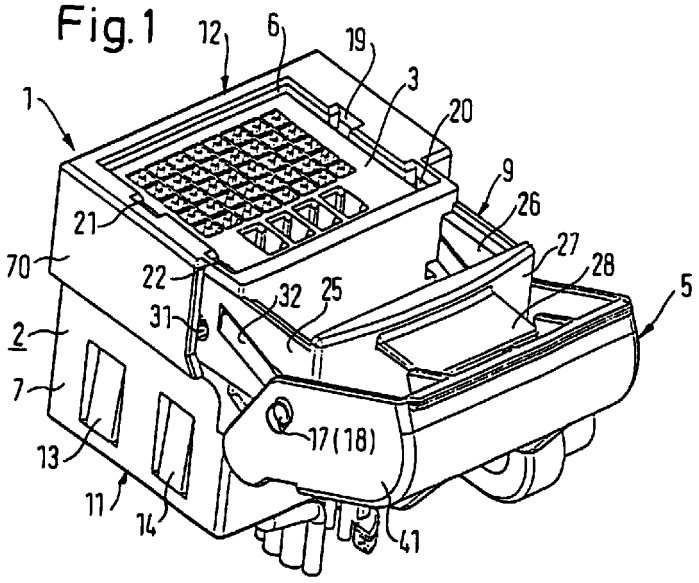
(54) Electrical plug connector

(57) The invention specifies an electrical plug connector having a housing (2) which has a holder (6) passing through the housing (2), a connector (3) which can be inserted into the front (12) of the holder (6), a complementary mating connector (4) which can be inserted into the back (11) of the holder (6), a secondary locking mechanism (9) for securing at least one of the connectors (3, 4), the locking mechanism (9) being able to be moved into the holder (6) transversely with respect to the plug-in direction, and a lever (5) which is articulated on the side of the housing (2) and whose pivot spindle (40) runs at right angles to the plug-in direction and at right angles to the direction in which the secondary locking mechanism (9) is moved. The secondary locking mechanism (9) has a latching arm (28) which runs outwards transversely with respect to the plug-in direction and has a latching lug (24). In addition, the lever (5) has a cutout (45) into which the latching lug (24) latches when the secondary locking mechanism (9) is pushed in and when the lever (5) is pivoted into the closed position, with the result that the connectors (3, 4) are secured in the holder (6).

Fig.1



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Description

[0001] The invention relates to an electrical connector, particularly for motor vehicle applications, according to the precharacterizing clause of Patent Claim 1.

[0002] Such plug connectors are preferably used in poorly accessible areas of the motor vehicle. In this case, it is necessary for the plug connectors to be able to be mated easily without losing their reliability, i.e. the plug connector needs to be vibration-proof. Furthermore, on account of the poor accessibility, it should be possible for the plug connector to be operated or plugged in by the fitter using one hand.

[0003] Such a plug connector is known from the document EP 0 363 804 having the features of the precharacterizing clause of Patent Claim 1. In addition, the free end of the bent lever has a clip which extends at right angles to the said free end and has two arms extending in this direction. One of the arms is connected to the lever, the other is not. The freely movable arm also has a latching hook. To secure the plug connector, the lever needs to be pivoted a very long way. When the plug connector is closed, this latching hook moves underneath an integrally formed pin extending at the side of the connector, thus securing the lever against pivoting into the open position. A particular disadvantage here is that, in order to open the plug connector, the fitter needs to move the free arm against the secured arm, so that the latching hook is freed from the pin. Furthermore, the fitter has no means of support for moving the free arm, to make it easier to move the lever. In addition, production of a secured and an unsecured arm on one lever is expensive.

[0004] The object of the invention is to present a beneficial plug connector which can easily be opened using one hand.

[0005] The object of the invention is achieved by the features of Patent Claim 1.

[0006] The plug connector according to the invention comprises a housing which has a holder passing through the housing, a connector which can be inserted into the front of the holder, a complementary mating connector which can be inserted into the back of the holder, a secondary locking mechanism for securing at least one of the connectors, the locking mechanism being able to be moved into the holder transversely with respect to the plug-in direction, and a lever which is articulated on the side of the housing and whose pivot spindle runs at right angles to the plug-in direction and at right angles to the direction in which the secondary locking mechanism is moved. The secondary locking mechanism can have a latching arm which runs outwards transversely with respect to the plug-in direction and has a latching lug. The lever can have a cutout into which the latching lug latches when the secondary locking mechanism is pushed in and when the lever is pivoted into the closed position, with the result that the connectors are secured in the holder.

[0007] The invention affords the advantage that producing the individual parts is cheaper than the parts according to the prior art. In addition, opening the plug connector is simpler, since the fitter can, by way of example, apply his thumb to the latching arm and the rest of his fingers to the tip of the lever. The fitter need then merely move his thumb in the direction of his fingers so that the latching arm with the latching lug is raised. The fingers can ergonomically get a hold on the free end of the lever.

[0008] Further advantageous refinements of the invention are characterized in the dependent claims.

[0009] An illustrative embodiment of the invention is shown in the schematic drawing and is described in more detail below, where further special features and advantages of the invention become apparent. In the drawing:

Figure 1	shows an angled view of the front of the invention's plug connector in the unsecured state;
Figure 2	shows an angled view of the front of the invention's plug connector from Figure 1 in the secured state;
Figure 3	shows an angled view of the back of the invention's plug connector from Figure 2;
Figure 4	shows a section through the invention's plug connector along the plane I in Figure 3; and
Figures 5a and 5b	show an enlargement of a detail of the mechanical principle of the secondary locking mechanism in the unlocked and locked states.

[0010] Figure 1 and Figure 2 show an angled plan view of the front of the invention's plug connector 1 having an essentially cuboid housing 2, a cuboid connector 3, a likewise cuboid mating connector 4, a clip-like secondary locking mechanism 9 and a lever 5. The housing 2 has an essentially cuboid holder 6 passing through the housing 2. Integrally formed on each of the two opposite side walls 7 and 8 of the housing 2 are two latching hooks 13 and 14, which run in the plugging direction and project into the holder 6, for fixing the mating connector 4 inserted into the back 11. Guide grooves 15 and 16 for holding the secondary locking mechanism 9 are made in the side walls 7 and 8 of the housing 2 close to the front 12, said guide grooves being covered on the outside, on the one hand, and being open on the inside towards the holder 6, on the other hand. Above each of the guide grooves 15 and 16, two shafts 19, 20, 21, 22 extending inwards on the inner walls of the holder 6 in the plugging direction are made which are open towards the front 12 and open into the guide grooves 15 and 16.

[0011] The clip-like secondary locking mechanism 9 has two parallel arms 25 and 26 and a base 27 which

runs transversely with respect to the latter and has a latching arm 28 which runs parallel to the arms but extends in the other direction. In each arm there are two slide grooves 31 and 32 which run at an angle, whose end 33 runs parallel to the arms and whose start opens into the top edge of the arms such that, when the arms 25 and 26 are inserted into the guide grooves 15 and 16, the shafts 19 to 22 are aligned with the starts 34 of the slide grooves 31, 32 (as shown in Figure 5a).

[0012] Running in the plugging direction, the connector 3 has, amongst other things, a multiplicity of chambers and four of the outwardly pointing sliding blocks 37, which can be inserted into their corresponding shafts 19 to 22 when the connector 3 is inserted into the front 12 of the holder 6.

[0013] Figure 2 and Figure 4 will be used to explain the design of the lever 5 more precisely. The housing 2 has a pivot spindle 40 which is at right angles to the guide grooves 15 and 16 and to the plug-in direction, so that the lever 5 can be articulated on said pivot spindle. The lever 5 comprises two parallel side walls 41 and 42, each having a rotary pin (not shown), which is inserted into the pivot spindle 40, and each having an elongate opening 43 for holding pins 17 and 18 integrally formed outwards on the arms 25 and 26. The side walls 41 and 42 of the lever 5 are connected to a main wall 44 which runs transversely with respect to them, is curved at the free end and has a cutout 45 for holding the latching arm 28. This cutout 45 is framed by two V-shaped covering walls 47 and 48 which are arranged at the sides and run parallel to the side walls 41 and 42.

[0014] Figures 5a and 5b and Figures 1 and 2 are used to give a brief explanation below of the way in which the plug connector works.

[0015] Figures 5a and 5b show a partial detail of the plug connector without the cover 70. First, the mating connector is inserted into the holder 6 from the back 11, so that the latching hooks 13 and 14 lock said mating connector accordingly. Next, the secondary locking mechanism 9 is pulled out such that the start 34 of the slide groove 32 is aligned with the corresponding shaft 22. It should be noted that the lever 5 is actually pivoted into the open position to pull out the secondary locking mechanism 9 from the guide grooves 15 and 16, since the pins 17 on the secondary locking mechanism 9 are situated in the elongate openings 43 in the lever. Once the slide groove 32 has been aligned with the shaft 22, the sliding block 37 on the mating connector 3 can now be inserted at that point. Next, the lever 5 is pivoted about the rotary spindle 40 into the closed position. The pins 17 situated in the elongate openings 43 cause the arms 25 and 26 to move deeper into the guide grooves 15 and 16. The rightward movement accordingly causes the angled slide groove 32 to move to the right as well. Since the connector 3 can be moved only in the vertical direction, i.e. in the plugging direction, it can only be moved deeper. Accordingly, the angled slide groove 32 presses on the sliding block 37, so that a downwardly directed movement is produced until the sliding block reaches the end 33 of the slide groove 32 and the latching arm 28 of the secondary locking mechanism 9 then enters the cutout 45 and engages there with its latching lug 24, as can be seen in Figures 2, 3, 4 and 5b. The connector is thus inserted into the mating connector and the secondary locking mechanism 9 is secured by the lever 5.

[0016] To open this plug connector, the fitter need merely apply his fingers to the curvature of the lever 5 and place his thumb on the latching arm 28. The thumb then raises the latching arm 28 and at the same time the fitter's fingers pivot the lever towards him, so that the latching arm 28 leaves the cutout 45. Pivoting the lever further into the open position brings the secondary locking mechanism out of the guide grooves 15 and 16, which causes the connector 3 to be pulled out, accordingly breaking the electrical connection between the connector and the mating connector.

[0017] The description above should be taken as being merely illustrative and not restrictive.

Claims

1. Electrical plug connector having

- a housing (2) which has a holder (6) passing through the housing (2),
- a connector (3) which can be inserted into the front (12) of the holder (6),
- a complementary mating connector (4) which can be inserted into the back (11) of the holder (6),
- a secondary locking mechanism (9) for securing at least one of the connectors (3, 4), the locking mechanism (9) being able to be moved into the holder (6) transversely with respect to the plug-in direction, and
- a lever (5) which is articulated on the side of the housing (2) and whose pivot spindle (40) runs at right angles to the plug-in direction and at right angles to the direction in which the secondary locking mechanism (9) is moved,

characterized in that

the secondary locking mechanism (9) has a latching arm (28) which runs outwards transversely with respect to the plug-in direction and has a latching lug (24), and in that the lever (5) has a cutout (45) into which the latching lug (24) latches when the secondary locking mechanism (9) is pushed in and when the lever (5) is pivoted into the closed position, with the result that the connectors (3, 4) are secured in the holder (6).

2. Electrical plug connector according to Claim 1, characterized in that the secondary locking mechanism (9) is a clip having two arms (25, 26) and a

base (27) which runs transversely with respect to the latter and has the latching arm (28) running transversely with respect to the plug-in direction, the arms (25, 26) which project into the holder (6) being able to be moved laterally on the connector (3) situated in the holder (6).

3. Electrical plug connector according to Claim 2, characterized in that at least one arm (25, 26) has at least one slide groove (31, 32) which runs at an angle to the plug-in direction and whose end (33) runs parallel to the arm (25, 26), and in that the connector (3) has at least one sliding block (37) which projects outwards and fits into the slide groove (31, 32), so that the connector (3) situated in the holder (6) can be moved towards the mating connector (4) when the clip (9) is closed.

4. Electrical plug connector according to at least one of the preceding claims, characterized in that the lever (5) has at least one elongate opening (43) which runs radially with respect to the pivot spindle (40), and in that at least one of the arms (25, 26) has a pin (17) which projects outwards and fits into the opening (43), so that the clip (9) is closed when the lever (5) is pivoted into the closed position.

5. Electrical plug connector according to Claim 4, characterized in that the lever (5) comprises two mutually parallel side walls (41, 42) and a main wall (44) which runs transversely with respect to said side walls, connects them to one another and has the cutout (45), the side walls (41, 42) each having the elongate opening (43) and being articulated on the outside of the opposite sides of the housing (2).

6. Electrical plug connector according to at least one of the preceding claims, characterized in that the housing (2) is essentially cuboid, has at least one latching hook (13, 14), projecting into the essentially rectangular holder (6), for primary locking of the mating connector (4), has guide grooves (15, 16) for holding the arms (25, 26) and, in the side of the holder (6) and opening into the front (12), has at least one shaft (19, 20, 21, 22), running parallel to the plug-in direction, for at least one sliding block (37), the shaft (19, 20; 21, 22) opening into the guide groove (15; 16).

Fig.1

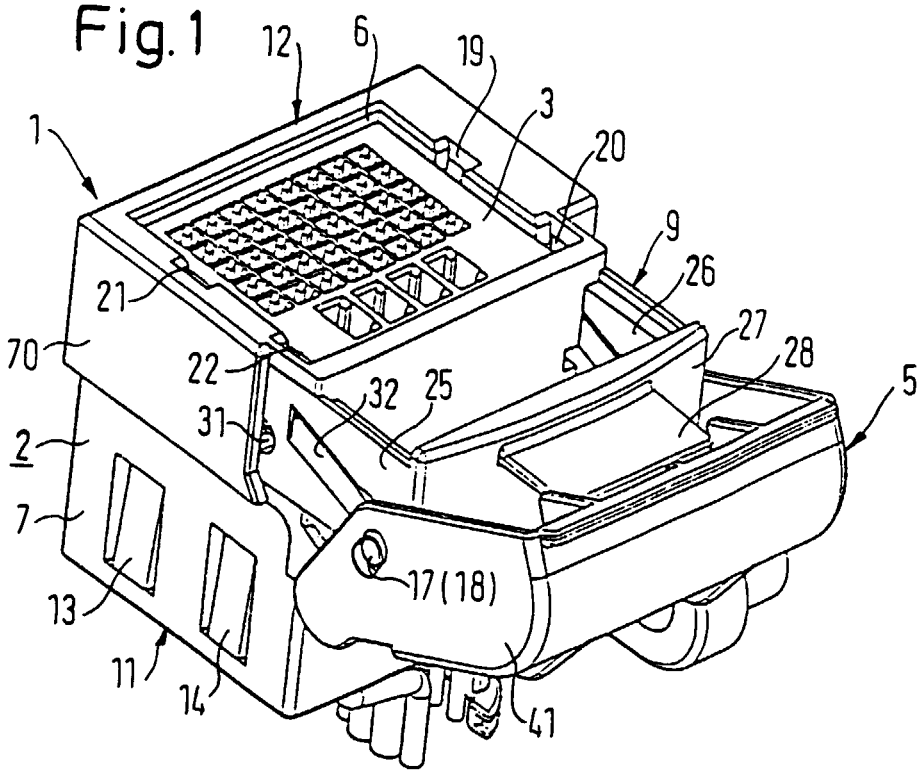

12
6
19
3
20
1
9
26
21
27
28
70
22
32
25
5
31
2
7
17 (18)
13
11
14
41

Fig. 2

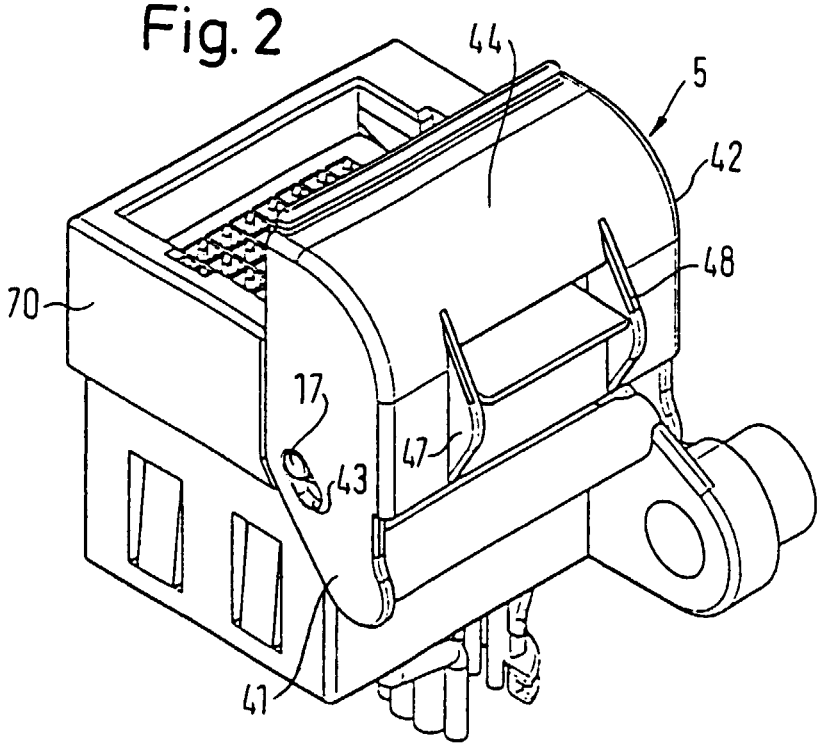

44
5
42
48
70
17
47
43
41

Fig. 3

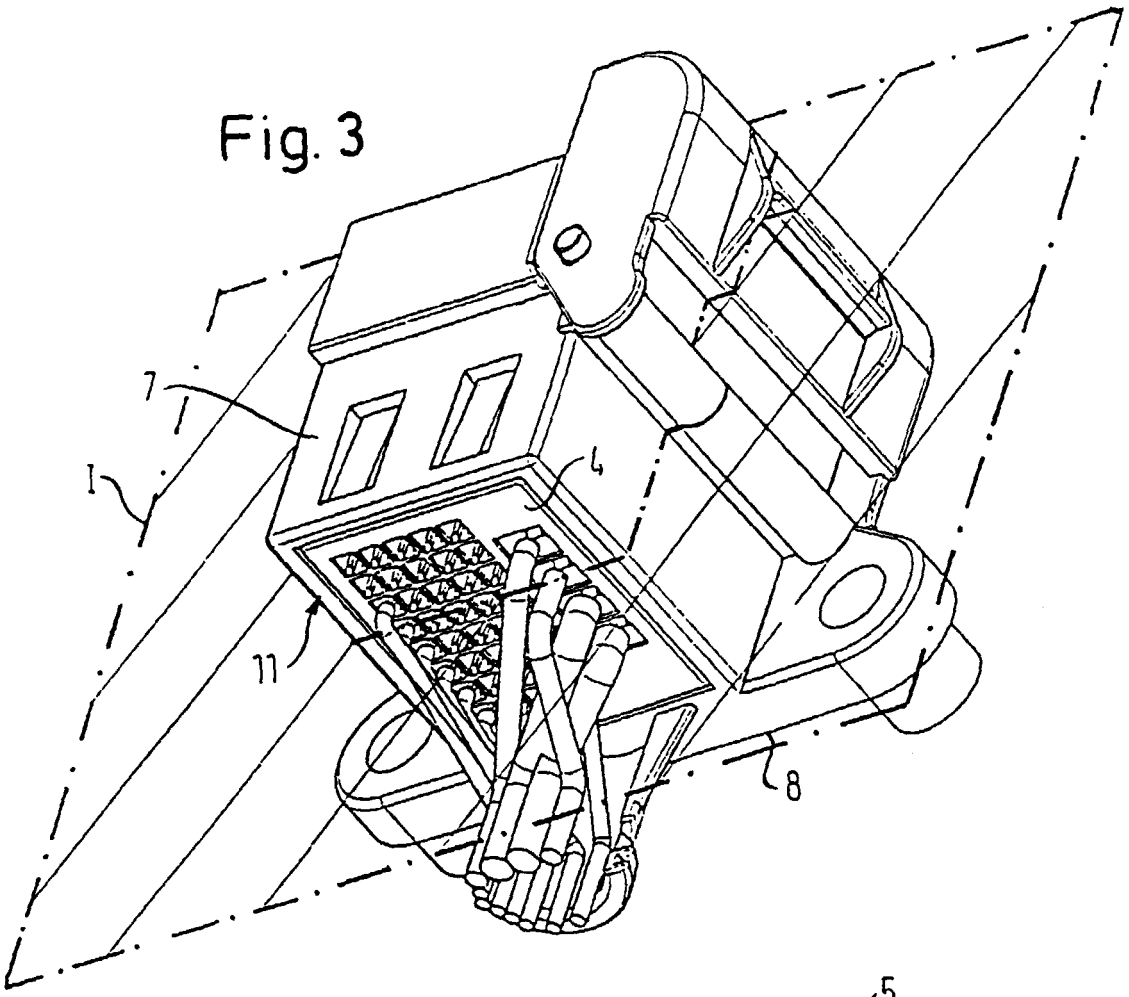


Fig. 4

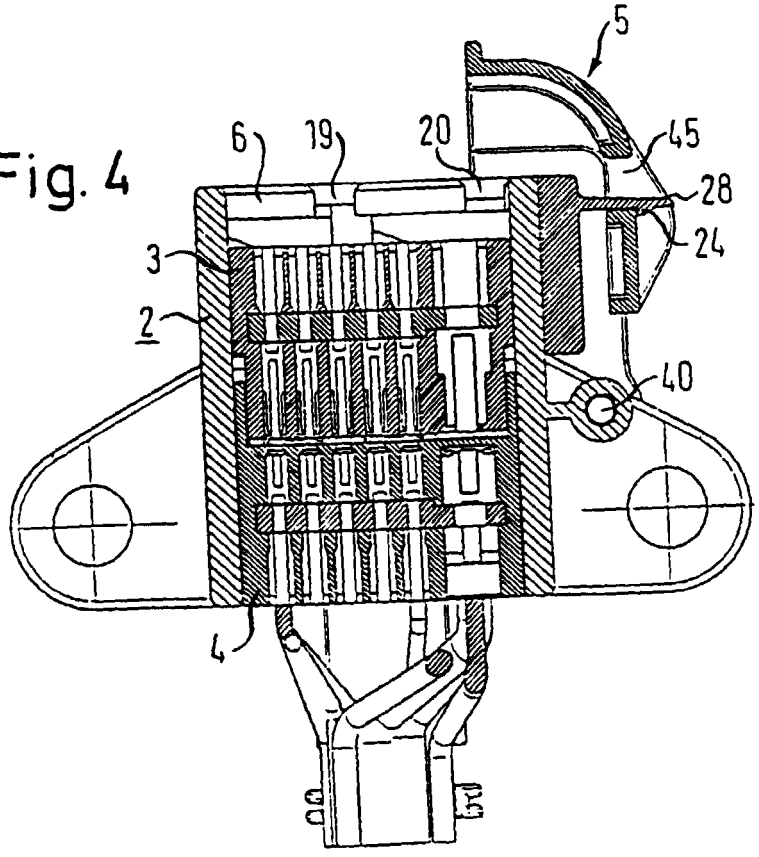


Fig. 5a

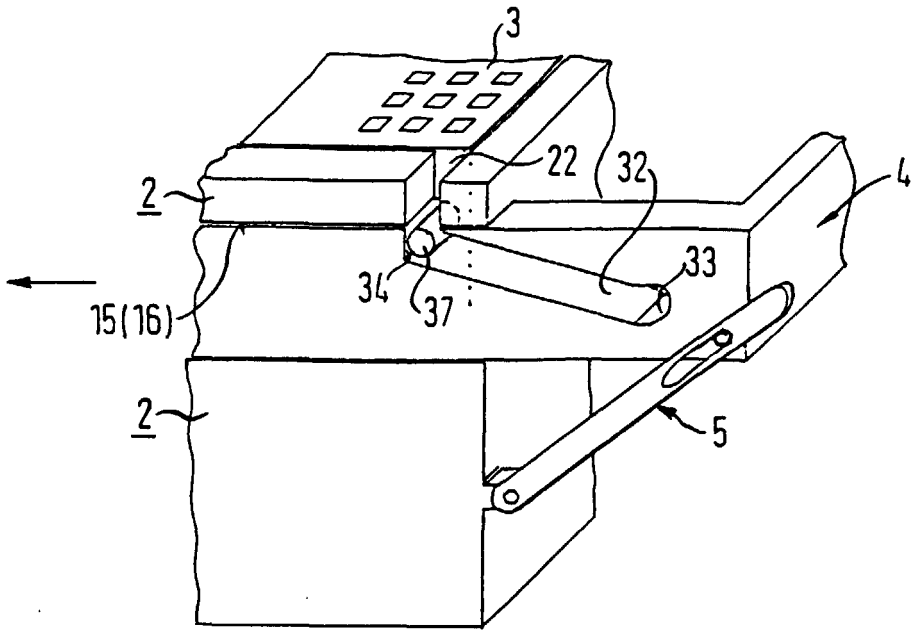
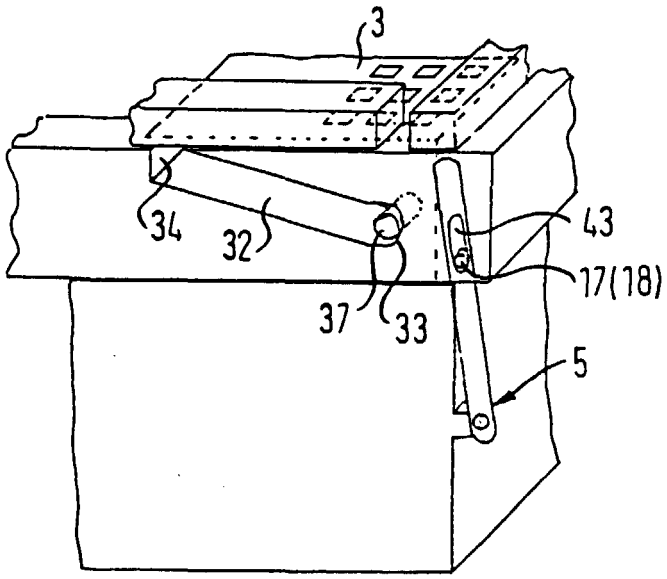


Fig. 5b



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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 6231

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 November 2000	Waern, G

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