

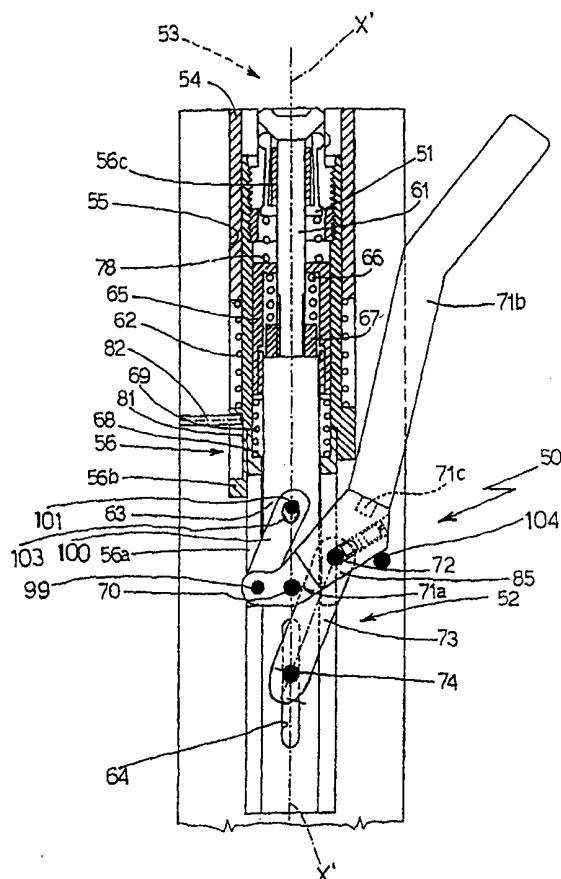


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : F16B 7/04	A1	(11) International Publication Number: WO 00/09894 (43) International Publication Date: 24 February 2000 (24.02.00)
(21) International Application Number: PCT/IT99/00264 (22) International Filing Date: 12 August 1999 (12.08.99) (30) Priority Data: BO98A000496 12 August 1998 (12.08.98) IT (71)(72) Applicant and Inventor: NETTIS, Francesco [IT/IT]; Via Bitritto, 131, I-70124 Bari (IT). (72) Inventors; and (75) Inventors/Applicants (for US only): FILIPPI, Francesco [IT/IT]; Via Capozzi, 50, I-48022 Lugo (IT). SANTARPIA, Carmine [IT/IT]; Via G. Mazzini, 25, I-70032 Bitonto (IT). CONSIGLIO, Giuseppe [IT/IT]; Via Benvenuto Cellini, 5, I-70021 Acquaviva delle Fonti (IT). (74) Agents: JORIO, Paolo et al.; Studio Torta S.r.l., Via Viotti, 9, I-10121 Torino (IT).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: REVERSIBLE FASTENING DEVICE**(57) Abstract**

A reversible fastening device (50) for reversibly fastening connecting means (51) connecting a first (52) and a second member (53); the connecting means (51) being housed entirely inside the first member (52); and the device (50) being characterized in that, at a first reversible stage, the connecting means (51) are moved from a withdrawn position to an extracted position projecting with respect to the first member (52); and in that the desired reversible fastening of the connecting means (51) connecting the first (52) and the second (53) member is achieved in the extracted position.



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REVERSIBLE FASTENING DEVICE

TECHNICAL FIELD

10 The present invention relates to a reversible fastening device for connecting means connecting a first and a second member; which members may form part of a lath structure, in particular a modular structure from which to also manufacture furniture.

15 BACKGROUND ART

 British Patent Application GB-A-2 119 054 (Exibelco) describes a reversible fastening device for fastening a cross member to an upright, both forming part of a modular structure. The device substantially
20 comprises a gripper-type member projecting with respect to the cross member; and a cam mechanism which is housed inside the cross member, is operated externally using an Allen wrench, and withdraws the gripper to part the two gripper arms and reversibly fasten the gripper inside a
25 cavity in the upright in which the gripper is inserted.

 A major drawback of the above device lies in the gripper projecting from the end of the cross member even

in the rest position, i.e. prior to assembly, whereas, for certain assembly jobs - e.g. when adding a new portion of a modular structure onto an already-assembled, functional portion (e.g. loaded with books) - it is
5 essential that the connecting means, such as the above grippers, be withdrawn and so prevented from interfering with fitment of the cross member to the upright. The same problem is also encountered, for example, when inserting a cross member between two fixed uprights separated by a
10 distance exactly equal to the length of the cross member.

For the reversible fastening device to function properly, therefore, it is essential that the device be housed entirely inside the cross member when fitting the end of the cross member to the lateral surface of the
15 upright, and that the device only projects from the end of the cross member to actually fasten the connecting means reversibly inside the cavity formed for the purpose inside the upright.

DISCLOSURE OF INVENTION

20 It is an object of the present invention to provide a straightforward, reliable solution to the above problem.

According to the present invention, there is provided a reversible fastening device as claimed in
25 Claim 1.

The reversible fastening device according to the present invention provides for highly reliable fitment of

a first body to a second body; and employing a lever mechanism ensures excellent retention of the connecting means inside the respective seats.

The fastening device according to the present invention advantageously comprises a piston and a draw rod connected to each other by elastic means enabling parting of the piston and the draw rod, so as to prevent excessive stress being applied by the user when inserting the device, and so as to enable the system to also withstand unexpected stress due, for example, to sharp changes in ambient temperature.

BRIEF DESCRIPTION OF THE DRAWINGS

A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows, in a first (withdrawn) position, a first embodiment of the reversible fastening device according to the present invention;

Figure 2 shows the Figure 1 device in a second (extracted) position in which the connecting member is extracted from the first member;

Figure 3 shows the Figure 1-2 device in a third (intermediate) position in which the connecting member engages the seats formed in the second member;

Figure 4 shows enlarged details of the movable assembly and the connecting member;

Figure 5 shows the regulating system for adjusting

the position of a pin connecting a connecting rod to a crank, both forming part of a movable assembly actuating mechanism;

Figure 6 shows a longitudinal section of the Figure
5 5 regulating system;

Figures 7-9 show a second embodiment of the device according to the present invention, in which the levers in the first embodiment are replaced by a cam assembly; in particular, Figures 7-9 show the second embodiment of
10 the device at an initial first stage, an intermediate second stage and a final third stage respectively.

BEST MODE FOR CARRYING OUT THE INVENTION

The first embodiment in Figure 1 shows a reversible fastening device 50 for fastening a connecting member 51
15 connecting a first member 52 and a second member 53. In the example shown, the first member 52 is a lath member, and the second member 53 is a cubic member used, together with first member 52, to form modular structures (not shown) in turn used, for example, for manufacturing
20 furniture.

First member 52 houses a main member 54 made of metal and inserted inside a hole 55; and a movable assembly 56, forming part of reversible fastening device 50 in every respect, slides inside main member 54 and
25 hole 55.

Movable assembly 56 comprises a series of components 56a, 56b, 56c connected to one another in

conventional manner.

As shown in Figure 4b, component 56c is defined by an outer main body 57 having a series of slots 58a-58d from which project prongs 59a-59d of connecting member 51, which, in the example shown, is defined by an elastic gripper (Figure 4c). Component 56c also comprises a bush 60 coaxial with outer main body 57 and inside which the rod of a piston 61 (Figure 4a) slides freely both ways in a vertical direction coincident with the axis X'-X' of symmetry of device 50 as a whole. As explained in detail later on, piston 61 provides for deforming prongs 59a-59d of connecting member 51 (Figure 4c) elastically outwards.

Between movable assembly 56 as a whole and main member 54, provision may advantageously be made for a return spring 62, which is compressed by the upward movement of movable assembly 56, as shown in Figures 2, 3. The outer surface of component 56b has a groove 81, the length of which that can be travelled by a pin 82 integral with first member 52 equals the length by which movable assembly 56 projects when extracted (see below). That is, pin 82 acts as a limit stop for movable assembly 56 for the reason explained in more detail later on.

Movable assembly 56 houses a draw rod 63 having a slot 64 and a threaded top end for connection to a draw bush 65 housing a draw spring 66; one end of draw spring 66 rests on the bottom of draw bush 65, while the other end presses on a ring nut 67 screwed to a threaded end of

the rod of piston 61, so that the top end of draw rod 63 and the bottom ends of piston 61 and ring nut 67 are freely partible when reversible fastening device 50 is in the work position shown in Figure 3. This makes for a considerable improvement with respect to conventional devices, by the force fastening the two members 52, 53 being dissociated from the actual force applied, for example, by the user, thus preventing deformation of the seats 79 caused by the gripping means of connecting member 51 (Figures 2, 3).

In other words, draw spring 66, interposed as stated between piston 61 and draw rod 63, creates a sort of "elastic buffer" between the draw means operated directly by the user and piston 61, which acts on connecting member 51 to deform it elastically outwards. Once set to the work position, therefore, the system may safely withstand any axial variation in stress caused by swelling or shrinking of the two members 52, 53 as a result, for example, of a significant change in ambient temperature. This is a problem encountered frequently when first member 52 and/or second member 53 are made of wood; in which case, the size of members 52, 53 varies three-dimensionally with time. In particular, a reduction in humidity results in three-dimensional shrinkage, and an increase in humidity in three-dimensional swelling of members 52, 53.

A reloading spring 69 presses at a first end on an

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inner shoulder 68 of component 56a, rests at a second end on the bottom surface of draw bush 65, and provides for elastically connecting components 56a-56c to the rest of movable assembly 56, i.e. piston 61 as a whole, draw bush
5 65, spring 66, ring nut 67 and draw rod 63.

As shown in Figures 1-3, a connecting rod 100 has a first pin 101 which slides freely inside a slot 103 formed in component 56a of movable assembly 56 and in draw rod 63; and a second pin 99 about which connecting
10 rod 100 and a connecting rod 71a pivot with respect to each other. Connecting rod 71a also has a third pin 72, about which rotates a crank 73, and also pivots about a fourth pin 70 fixed with respect to first member 52. At the opposite end to that hinged to pin 72, crank 73
15 comprises a fifth pin 74 which slides freely inside a slot 64 formed in draw rod 63.

As shown in Figures 1-3 and 5, connecting rod 71a is operated from the outside by means of a lever 71b which is connected to connecting rod 71a by means, for
20 example, of a pair of pins 71c inserted inside a corresponding pair of seats 71d on connecting rod 71a. The importance of pins 71c will be explained in detail later on with reference to the assembly of device 50 as a whole.

25 A threaded shaft 71e screws inside a threaded hole 83 formed in a bush 84 housed inside a portion 85 of connecting rod 71a. Bush 84 carries, integrally with its

outer surface, two pins 72a, 72b which together form pin 72 shown in Figures 1-3, and which slide inside respective slots 85a, 85b formed in portion 85 of connecting rod 71a. Consequently, when a screwdriver (not shown) inserted in head 71f of threaded shaft 71e is turned in the direction of arrow F_1 about an axis $X''-X''$, threaded shaft 71e is rotated and, engaging threaded hole 83, translates bush 84 along axis $X'''-X'''$. Rotation of threaded shaft 71e in the direction of arrow F_1 is therefore converted into translation of bush 84, and hence of one end of crank 73, by virtue of pins 72a, 72b sliding inside respective slots 85a, 85b.

Any give in the elastic members of the system may be compensated by the user by adjusting the position of pin 72 to adjust the overall length of connecting rod 71a and crank 73.

As shown in Figures 1-3, the base of connecting member 51 is subjected to the action of a spring 78 which pushes the base against the cylindrical bush 60 (Figure 4b) in which, as stated, the rod of piston 61 slides. The purpose of spring 78 is to keep connecting member 51 on a level with seats 79, formed in a socket 80 (Figures 2, 3) integral with second member 53, when piston 61 is lowered, thus preventing connecting member 51 from being drawn downwards, and so making connecting member 51 independent of piston 61 both during assembly and disassembly.

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As shown in Figure 4a, piston 61 comprises a number of teeth 61a-61d which, after assembly, correspond with prongs 59a-59d of connecting member 51 and with slots 58a-58d of component 56c, so that a downward movement of piston 61 produced by a downward movement of draw rod 63 causes teeth 61a-61d to rest against corresponding prongs 59a-59d of connecting member 51; and, continuing the downward movement along axis X'-X', prongs 59a-59d are deformed elastically outwards, so that the appropriately shaped heads of the prongs engage seats 79 (Figures 2, 3) formed on the inner walls of socket 80.

Obviously, if connecting member 51 is inserted inside any cavity in a second member 53, the elastic outward deformation of prongs 59a-59d of connecting member 51 provides for reversibly fastening first member 52 with respect to second member 53.

Releasable fastening device 50 is assembled inside first member 52 as follows:

(a) main member 54 and the other components of device 50, with the exception of lever 71b (Figure 3), are inserted inside longitudinal hole 55 in first member 52 by means of a first machine (not shown);

(b) a second machine (not shown) raises and opens the lever mechanism defined by connecting rod 71a and crank 73 into the Figure 2 configuration; lever 71b is then connected to connecting rod 71a by inserting the two pins 71c into respective seats 71d; and, at the same

time, fixed pin 70 is inserted inside first member 52;

(c) rotation of lever 71b into the Figure 3 position completes the assembly process, and device 50, combined with respective first member 52, is ready for
5 sale.

Operation of the first embodiment of reversible fastening device 50 according to the present invention will be described with reference to Figures 1-3.

(A) As stated, Figure 1 shows movable assembly 56
10 in the withdrawn position, i.e. housed entirely inside first member 52, so that the user first rotates lever 71b anticlockwise from the Figure 3 to the Figure 1 position.

(B) After placing the end - with no projecting parts - of first member 52 against second member 53, the
15 user rotates lever 71b clockwise to raise pin 99 which, being integral with movable assembly 56 by means of connecting rod 100 and pin 101, also raises movable assembly 56.

(C) By means of reloading spring 69, the upward
20 movement of components 56a-56c is also transmitted to draw bush 65 and therefore also to draw rod 63 screwed to draw bush 65.

(D) The upward movement of draw bush 65 produces an upward translation of spring 78 which, however, is not
25 compressed on account of component 56c, integral with the other two components 56a, 56b, having already been raised.

(E) The system at this point is therefore in the extracted position shown in Figure 2, in which some of the components, such as connecting member 51, components 56b, 56c and piston 61, project with respect to the end
5 of first member 52. To lock lever 71b in the Figure 2 position, member 52 may be provided with an integral device 104, which may advantageously be defined by a ball (not shown) stressed by elastic means (not shown) which push the ball inside a seat (not shown) formed in a
10 lateral wall of lever 71b, so that, by switching the system from the Figure 1 to the Figure 2 configuration, the user locks lever 71b and the projecting components in the Figure 2 configuration, and may, for example, let go of lever 71b temporarily to insert the projecting
15 components more easily inside socket 80 using both hands.

(F) The projecting components, such as connecting member 51, components 56b, 56c and piston 61, may therefore be inserted inside a socket 80 integral with second member 53.

20 (G) In the course of all the above operations, the pin 74, about which crank 73 pivots, has moved slightly downwards (Figure 2), thanks also to the resistance produced by limit-stop pin 82 on components 56b, 56a by means of groove 81.

25 (H) As connecting lever 71b is rotated further clockwise, pin 74, also integral with crank 73, begins pushing against the bottom wall of slot 64 in draw rod

63. It should be noted that, in the Figure 3 system configuration, connecting rod 71a has assumed a "negative" inclination with respect to axis X'-X'.

(I) Draw rod 63 is therefore drawn downwards, thus
5 drawing downwards draw bush 65 which compresses draw spring 66; ring nut 67 and, consequently, piston 61 are lowered via the interposition of draw spring 66; and the bottom surfaces of teeth 61a-61d press against corresponding prongs 59a-59d of connecting member 51 to
10 deform the prongs elastically outwards and insert the heads of prongs 59a-59d inside the corresponding seats 79 on the inside of socket 80 integral with second member 53 and by which first member 52 is fastened to second member 53.

15 (L) It should be noted that, as shown in Figure 3, when lowering draw rod 63, the bottom end of piston 61 and the bottom surface of ring nut 67 are detached from the top end of draw rod 63 so as to compress draw spring 66; and the mechanism is locked by connecting rod 71a
20 forming a "negative" angle with the axis X'-X' of symmetry of the system.

(M) To restore the system to the Figure 1 configuration to detach first member 52 from second member 53, lever 71b is simply turned in the opposite,
25 i.e. anticlockwise, direction to restore the various components to their original positions by means of springs 62, 66, 69.

The above operations provide for a highly effective reversible fastening device 50 capable of exerting considerable fastening force between the two members 52, 53.

5 In the second embodiment shown in Figure 7-9, any similar or identical parts are indicated using the same reference numbers as for the first embodiment in Figures 1-6.

10 In the second embodiment, movable assembly 56 is again housed inside substantially cylindrical main member 54, in turn housed inside hole 55 formed in member 52.

15 In addition to connecting member 51, components 56b, 56c and piston 61, movable assembly 56 also comprises a stylus 105 screwed to piston 61; and component 56b in the second embodiment is in the form of a substantially tubular sleeve enclosing the other components of movable assembly 56.

20 As described in detail later on, stylus 105 may be activated by a cam assembly 106 also housed inside member 52.

25 Component 56b of movable assembly 56 comprises a top plug 107, an intermediate plug 108, and a bottom plug 109; stylus 105 comprises a bracket 110; the two ends of a helical load spring 111 rest on respective brackets 110, 112; top plug 107 has a through hole 107a in which the rod of piston 61 slides; intermediate plug 108 has a similar through hole 108a fitted through with stylus 105

which, as stated, is integral with piston 61; through hole 107a also houses a spring 78, the top end of which contacts appendixes 51a of prongs 59a-59d of connecting member 51, and the bottom end of which rests on bracket
5 112 which has a through hole 112a fitted through with the rod of piston 61; and prongs 59a-59d of connecting member 51 are hinged by pins 51b to component 56b, so that the action of spring 78 on prongs 59a-59d produces a slight outward movement of prongs 59a-59d to click the heads of
10 prongs 59a-59d slightly inside seats 79 on the inside of socket 80 (see below).

Cam assembly 106 comprises a pin 113 having a seat 113a for receiving an Allen wrench 114. Pin 113 is fitted with a central cam 115 which, in contact with stylus 105,
15 raises the whole of movable assembly 56 during the first 90° rotation of wrench 114 (Figure 8) in the direction of arrow R, i.e. clockwise in the example shown. Pin 113 is also fitted with two cams 116 on either side of central cam 115, and which contact bottom plug 109 and provide
20 for raising movable assembly 56 together with connecting member 51 with no variation in the length of load spring 111 (Figures 7, 8).

When wrench 114 is rotated a further 90° in the direction of arrow R (Figure 9), once connecting member
25 51 is inserted inside socket 80 of second member 53, the reduction in the radius of central cam 115 clicks down piston 61 and stylus 105 connected integrally to the

piston. The downward movement of piston 61 is achieved by virtue of the action of spring 111 on bracket 110 - which, as stated, is integral with piston 61 - and produces a further outward movement of prongs 59a-59d, the free ends of which are inserted inside respective
5 seats 79 inside socket 80 in the same way as in the first embodiment in Figures 1-6.

In the Figure 9 configuration, piston 61 is suspended from spring 111 with the maximum preload to
10 which spring 111 is set at the assembly stage.

As shown in Figure 9, the bottom end of stylus 105 is detached from and separated by a distance, for example, of 1.3 mm from the surface of cam 115.

Rotation in the opposite direction to arrow R, i.e.
15 anticlockwise in the example shown, switches the system from the Figure 9 to the Figure 7 configuration to disconnect first member 52 from second member 53.

The main advantages of the fastening device according to the present invention are as follows:

20 (a') possibility of inserting a cross member between two uprights separated by a fixed distance;

(b') formation of an "elastic buffer" between the draw means operated directly by the user and the piston which acts on the connecting member to deform it
25 elastically outwards;

(c') miniaturization of the movable assembly actuating mechanism by employing a connecting rod-crank

mechanism;

(d') troublefree assembly of practically the whole of the fastening device through a single longitudinal hole, and easy insertion of the actuating lever; and

5 (e') possibility of adjusting the overall length of the connecting rod-crank actuating mechanism of the movable assembly to compensate for any yield of the elastic elements.

The second embodiment in Figures 7-9, in
10 particular, provides for simplifying the actuating mechanisms of movable assembly 56.

CLAIMS

1) A reversible fastening device (50) for reversibly fastening connecting means (51) connecting a first (52) and a second (53) member; said connecting means (51) being housed inside said first member (52); and the fastening device (50) being characterized in that, at a first reversible stage, said connecting means (51) are moved from a withdrawn position to an extracted position projecting with respect to said first member (52); and in that the desired reversible fastening of said connecting means (51) connecting said first (52) and said second (53) member is achieved in said extracted position.

2) A fastening device (50) as claimed in Claim 1, characterized by comprising a movable assembly (56) for transporting and activating said connecting means (51); and a mechanism (70-75; 106) for moving and activating said movable assembly (56).

3) A fastening device (50) as claimed in Claim 2, characterized in that the desired reversible fastening of said connecting means (51) connecting said first (52) and said second (53) member is achieved at a second stage, subsequent to said first stage, wherein at least some members (61, 63, 65, 66, 67) defining said movable assembly (56) are moved from said extracted position to an intermediate position between said extracted position

and said withdrawn position, so as to cause said connecting means (51) to engage at least one seat (79) on said second member (53).

4) A fastening device (50) as claimed in Claim 3,
5 characterized in that, in moving said some members (61, 63, 65, 66, 67) defining said movable assembly (56), said connecting means (51) are deformed elastically so as to cause said connecting means (51) to engage said at least one seat (79) on said second member (53).

10 5) A fastening device (50) as claimed in Claim 3 or 4, characterized in that said connecting means (51) are inserted inside a socket (80) formed for the purpose on said second member (53); said socket (80) comprising said at least one seat (79) engaged by said connecting means
15 (51).

6) A fastening device (50) as claimed in any one of Claims 3 to 5, characterized in that said movable assembly (56) comprises a piston (61) coaxial with and inside said connecting means (51), so that the movement
20 of said piston (61) from said extracted position to said intermediate position causes elastic deformation of said connecting means (51) to cause said connecting means (51) to engage said at least one seat (79) on said second member (53).

25 7) A fastening device (50) as claimed in Claim 6, characterized in that said movable assembly (56) also comprises a draw rod (63) connected to said piston (61)

by elastic means (66).

8) A fastening device (50) as claimed in Claim 7, characterized in that said elastic means (66) permit detachment of said draw rod (63) from said piston (61) to
5 form an elastic buffer between the draw means activated directly by the user and said piston (61) which acts on said connecting means (51) to deform the connecting means elastically outwards.

9) A fastening device (50) as claimed in any one of
10 Claims 2 to 8, characterized in that said movable assembly (56), when moved from said withdrawn position to said extracted position and vice versa, is subjected to the action of elastic means (62).

10) A fastening device (50) as claimed in any one
15 of Claims 2 to 9, characterized in that said mechanism (70-75) comprises a user-operated connecting rod (71a) and a crank (73) hinged to each other by a pin (72).

11) A fastening device (50) as claimed in Claim 10, characterized in that said connecting rod (71a) is
20 activated by means of a lever (71b) connectable to said connecting rod (71a) by means of a reversible connection (71c, 71d).

12) A fastening device (50) as claimed in Claim 11, characterized in that said connecting rod (71a) comprises
25 a pin (99) and a small connecting rod (100) with a pin (101) to connect said mechanism (70-75) to a first portion of said movable assembly (56); and said crank

(73) comprises a further pin (74) to connect said mechanism (70-75) to a second portion of said movable assembly (56); said connecting rod (71a) also comprising a pin (70) for its own connection in fixed manner to said
5 first member (52).

13) A fastening device (50) as claimed in Claim 12, characterized in that said pin (74) slides in a slot (64) formed in said draw rod (63).

14) A fastening device (50) as claimed in Claim 13,
10 characterized in that said pin (72) is defined by two small pins (72a, 72b); and in that said two small pins (72a, 72b) each slide in a respective slot (85a, 85b) formed in said connecting rod (71a), so as to vary, via rotation of a screw member (71e), the overall length of
15 said connecting rod (71a) and said crank (73).

15) A fastening device (50) as claimed in any one of Claims 2 to 14, characterized in that said movable assembly (56) moves from said withdrawn position to said extracted position and vice versa exclusively along an
20 axis coincident with or parallel to the resultant of the fastening forces between said first member (52) and said second member (53).

16) A fastening device (50) as claimed in any one of the foregoing Claims, characterized in that said
25 connecting means (51) are moved and fastened reversibly by means of a user-operated lever (71b).

17) A fastening device (50) as claimed in Claim 11

or 16, characterized in that said first member (52) is provided with lock means (104) for so locking said lever (71b) that said connecting means (51) are set to said extracted position.

5 18) A fastening device (50) as claimed in any one of the foregoing Claims, wherein at least one of said first and second members (52, 53) is made of wood.

19) A fastening device (50) as claimed in any one of Claims 1 to 6, wherein said mechanism (70-75; 106) for
10 moving and activating said movable assembly (56) is a cam assembly (106) in contact with a stylus (105).

20) A fastening device (50) as claimed in Claim 19, wherein said cam assembly (106) comprises a pin (113) fitted with a central cam (115) and two lateral cams
15 (116) on either side of the central cam.

21) A fastening device (50) as claimed in Claim 19 or 20, wherein said stylus (105) is integral with a piston (61) for activating said connecting means (51).

22) A fastening device (50) as claimed in any one
20 of Claims 19 to 21, wherein said cam assembly (106) is activated manually by means of an Allen wrench (104).

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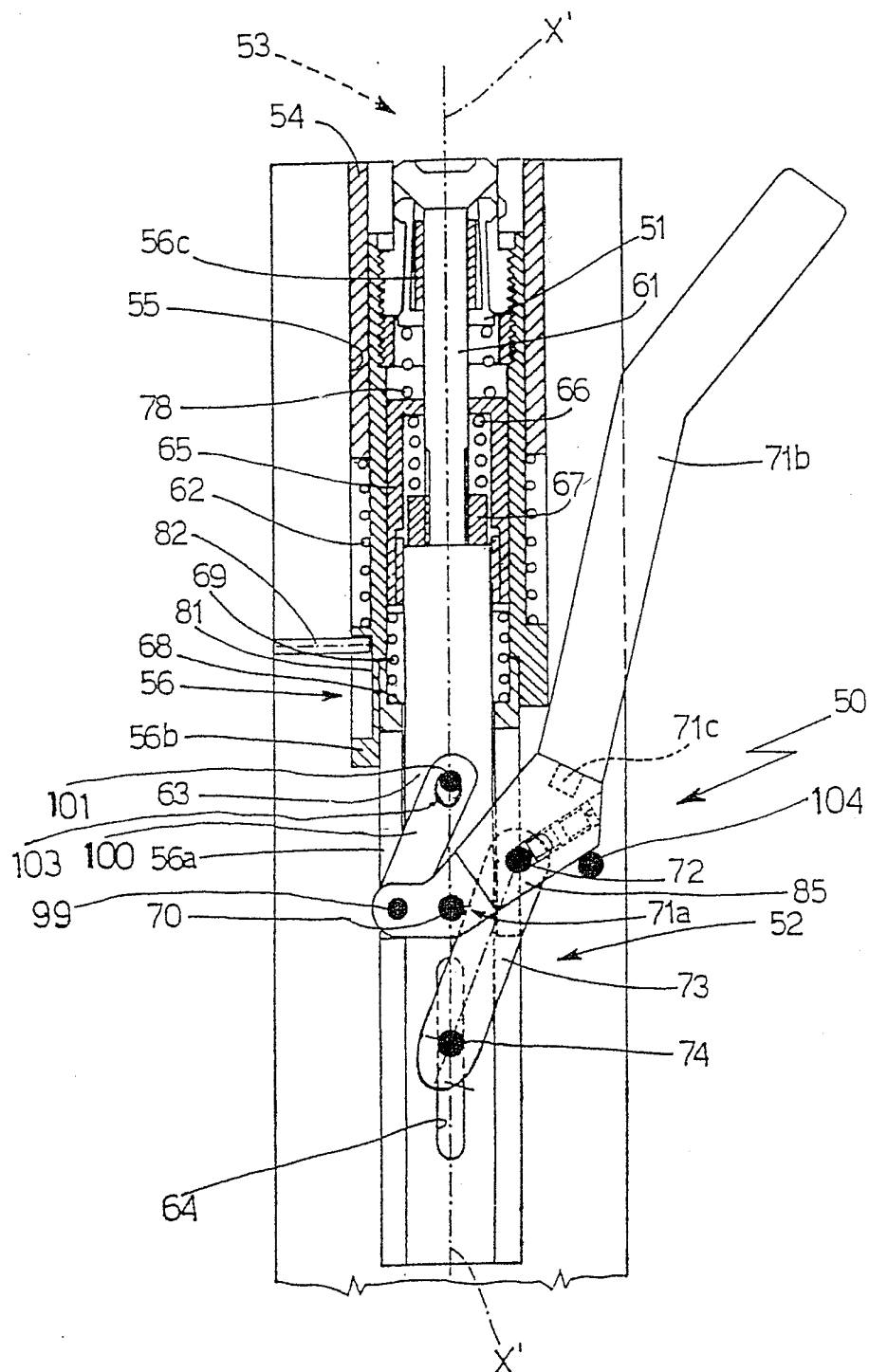


Fig.1

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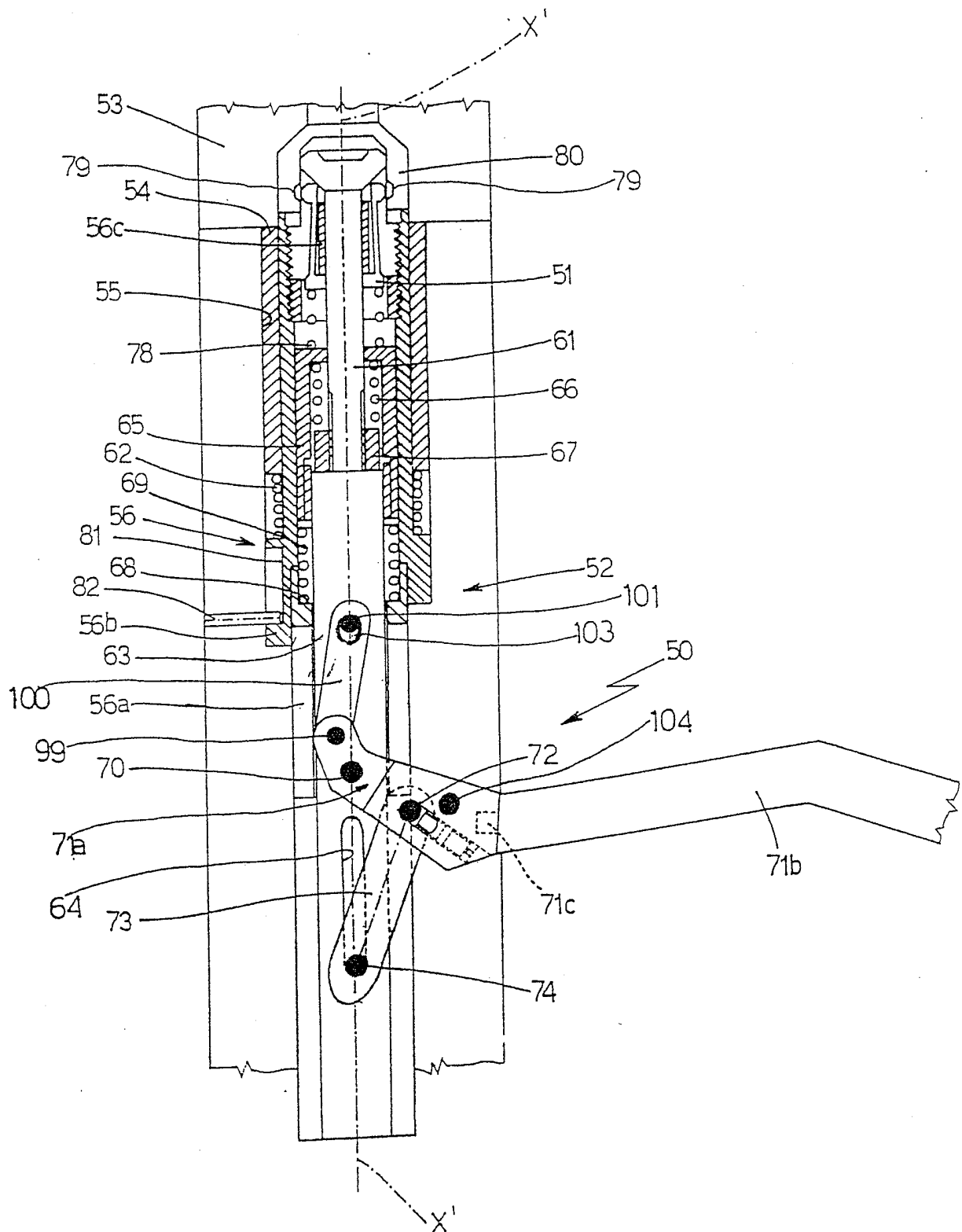
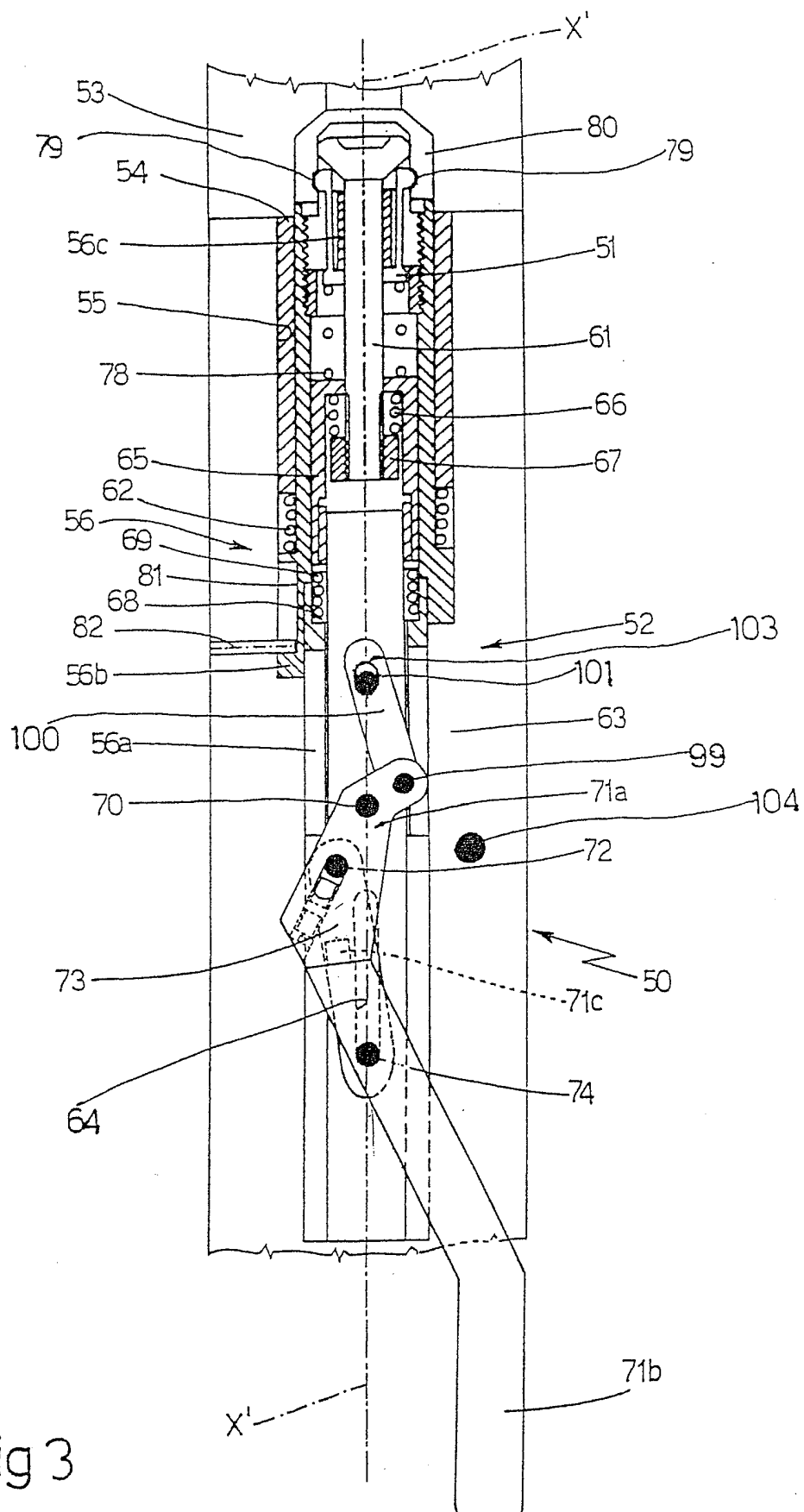


Fig.2

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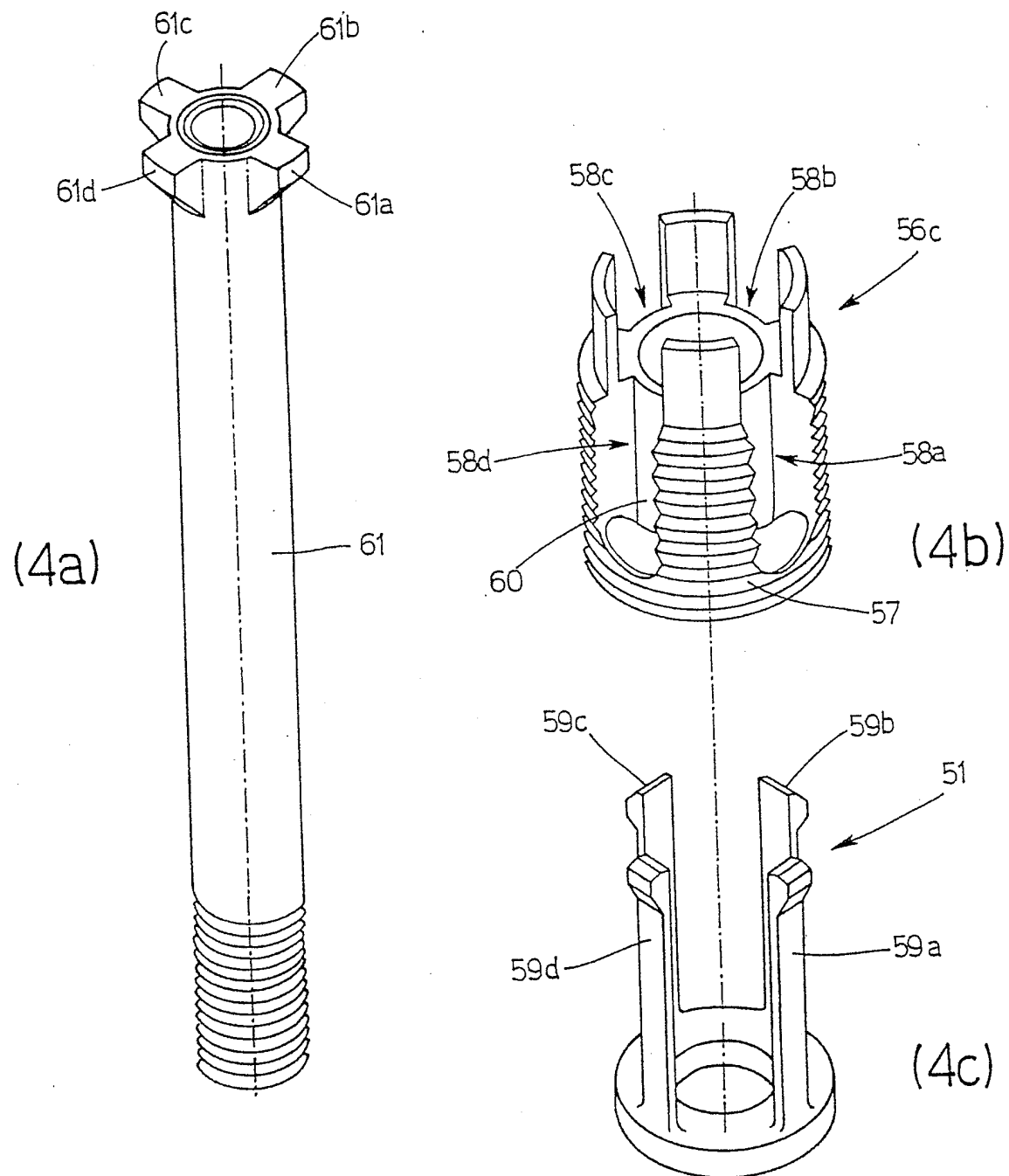


Fig.4

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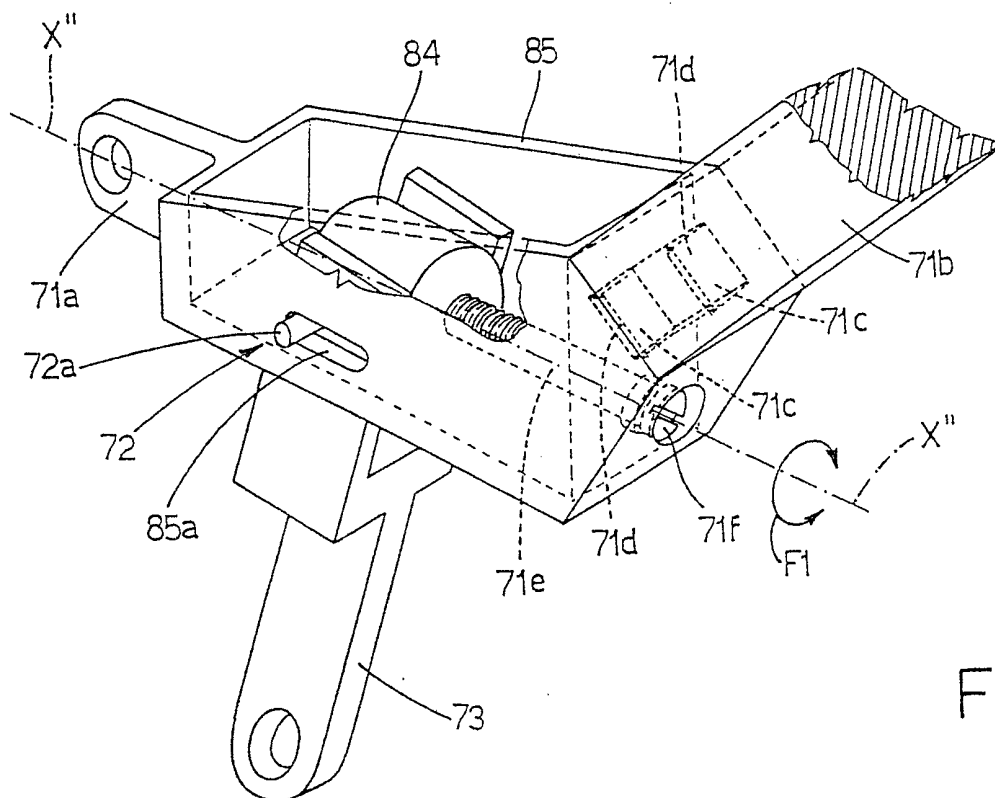


Fig.5

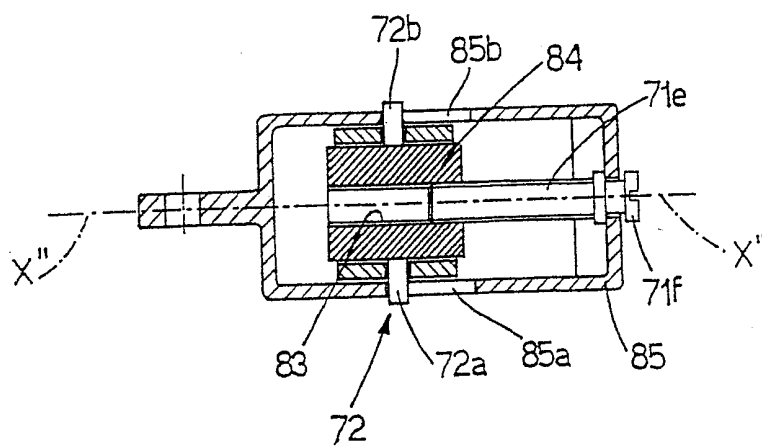


Fig.6

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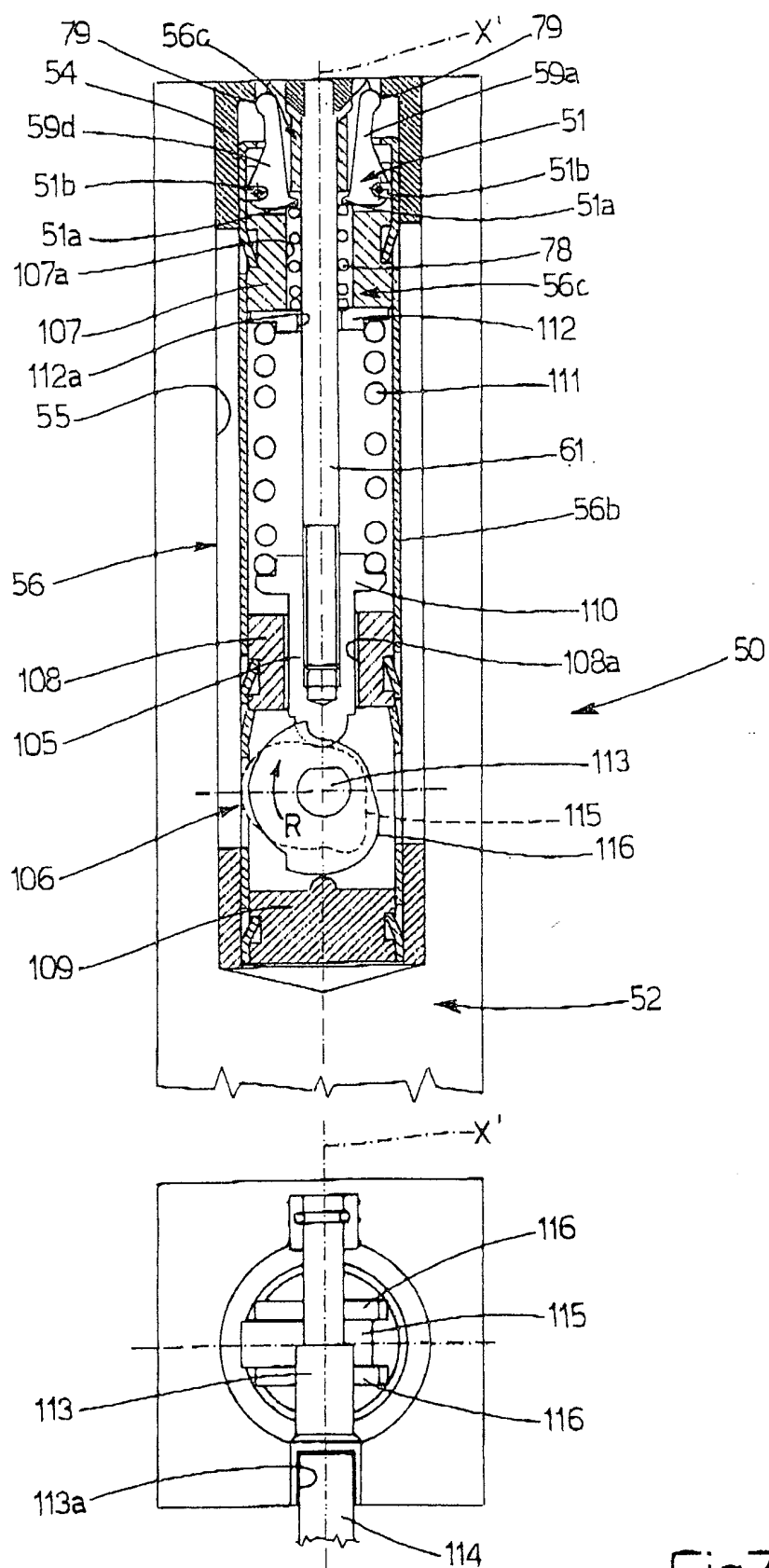


Fig.7

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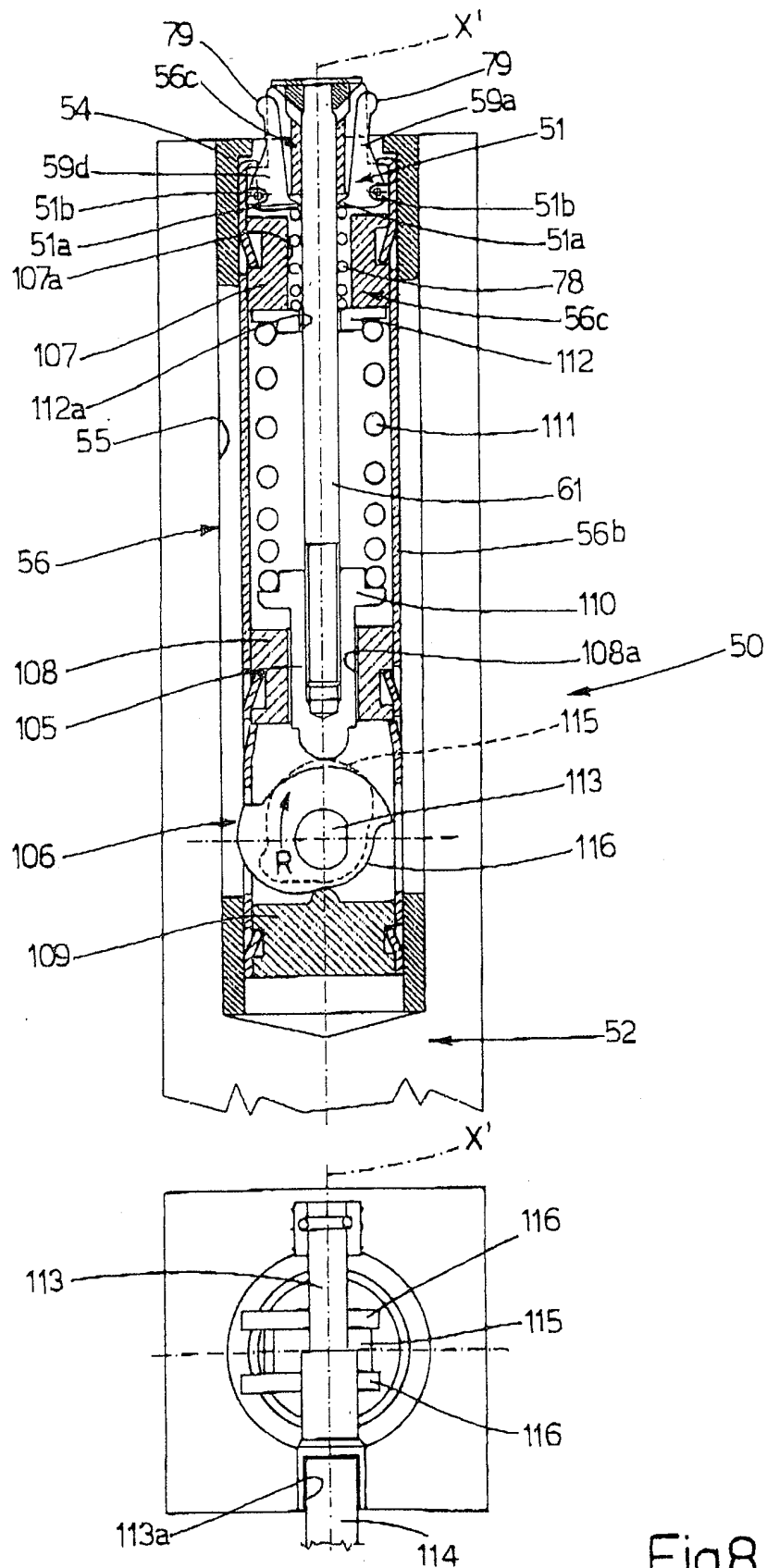


Fig.8

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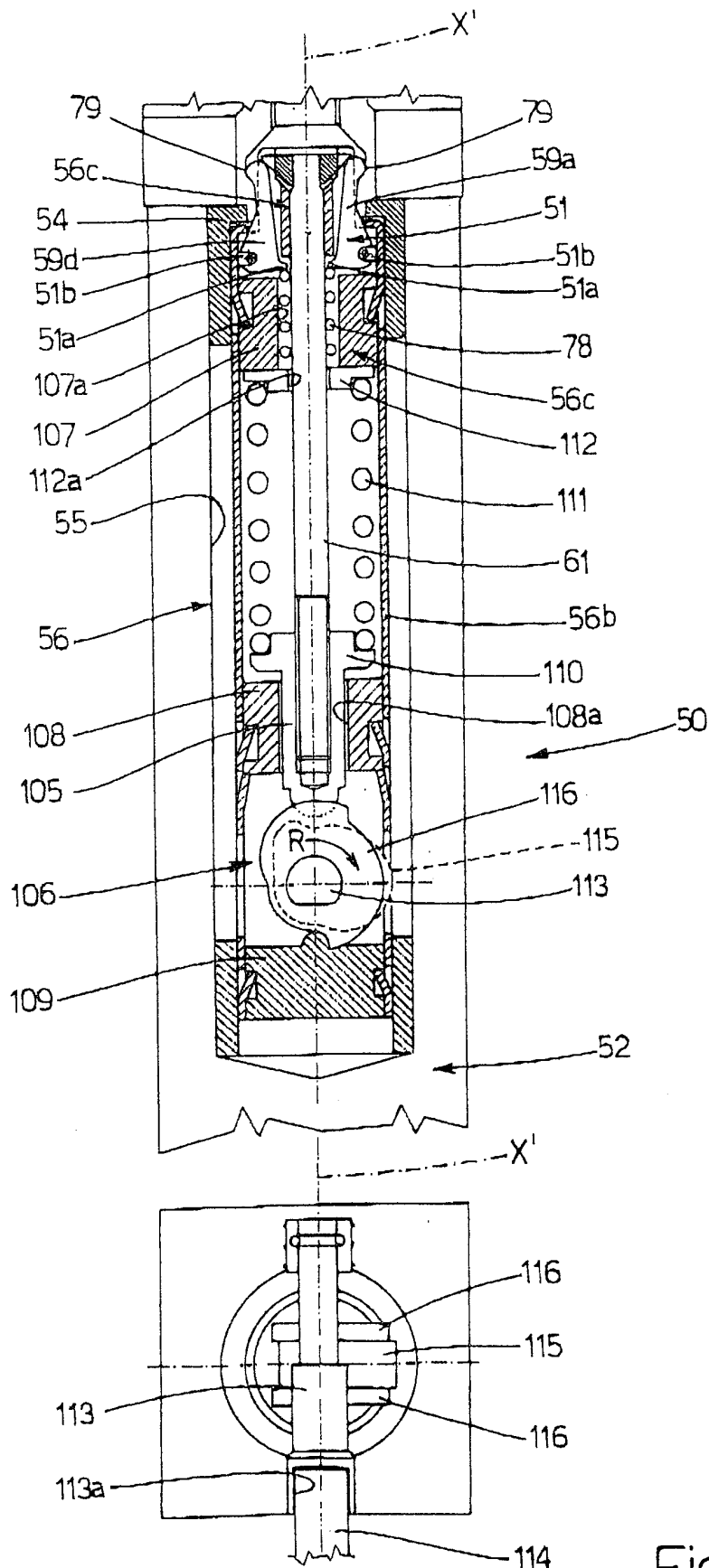


Fig.9

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IT 99/00264

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F16B7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F16B E06B E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 434 748 A (LEURENT GHISLAIN) 25 March 1969 (1969-03-25) column 3, line 3 - line 59; figures 1-12 ---	1-6, 9, 15, 16
X	DE 38 12 179 A (HOFFEINS WOLFGANG) 26 October 1989 (1989-10-26) column 2, line 13 - column 3, line 63; figures 1-4 -----	1, 2, 9, 15

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

17 January 2000

Date of mailing of the international search report

21/01/2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 99/00264

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