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## (54) COMPACT HINGE DEVICE

(57) A compact hinge device comprises at least a body means (3) assigned to be fixed to a vertical member (6) of a frame, upright means, or furniture chassis (8), fittings, furnishings or any kind of works. The compact hinge device further comprises at least a plate means (5, 7) assigned to be fixed to a door means (10), to a panel, or to any kind of doors and windows and it comprises a rectilinear elongated shape pivot means (9) which end portions are assigned to engage respective first housing means (11) of the body means (3) and second housing means (13) of the plate means (5, 7) for the mutual rotation around the longitudinal geometric axis of such pivot means (9). The body means (3) is rectangular plate shaped and a side of in which (3) bears first fixing means (15) assigned to be fixed to the vertical member (6) and the opposite side bears the respective first housing means (11) for the pivot means (9) and bears a recess means (17), aligned to the first housing means (11) and assigned to house a barrel element (19) of the at least one plate means (5, 7) each one housing a respective second housing means (13). The at least one plate means (5, 7) is provided with a respective flat wing means (21) fixed tangentially and offset to the respective barrel element (19). Such flat wing means (21) bears second fixing means (23) for the fixing of the respective plate means (5, 7) to a side of the door (10) orthogonally with respect to the geometrical plane of such door means. In a closing condition (C), the flat wing means (21) is parallel and adjacent to the respective body means (3) keeping a side of the door (10) side by side to the respective body means (3) and keeping such door adjacent and perpendicular to such body means (3). In the opening conditions, the device allows the progressive removal of said side of the door (10) from the vertical member (6) of the fur-

niture (8) and the rotation of said door (10). Each main face of the body means (3) bears a concave seating means (25) and complementary shaped with respect to the flat wing means (21) of the respective plate means (5, 7) and assigned to house at least partially the latter (5, 7) in the respective closing condition. The two seating means (25) of a body means (3), are separated by a wall means (27) of the body means (3), the free edge (29) of said wall means (27) is parallel to the pivot means (9) and side by side to the recess means (17).

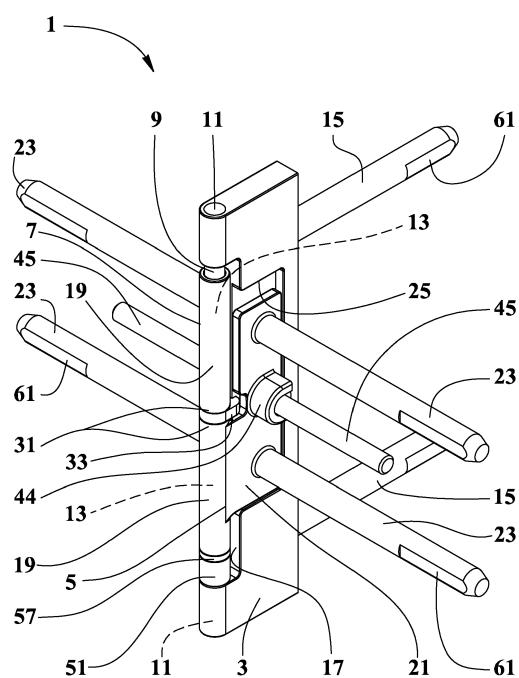


FIG.1

## Description

**[0001]** The present invention relates to the field concerning the furniture, furnishings and fixtures and the respective hardware and it relates to a compact hinge device, particularly suitable for shutters, doors, port, windows of furniture, fittings and building and furniture works.

**[0002]** There are known compact hinges consisting of a male element bearing a threaded stem and a pivot pin and of a female element carrying a respective threaded stem and a concave seat assigned to house in a freely rotatable manner the pivot pin. The threaded stems of such known hinges are assigned to be screwed one to a frame, or body and the other to one side of a door or port. These compact hinges have the drawbacks of being protruding, difficult to install and cumbersome for the adjustment of the door.

**[0003]** There are also known facilitate closing hinges where the edges in mutual sliding abutment of the male and female elements are provided with inclined planes for a door lifting in the passage of the same door from the extreme closing condition to opening conditions. Such known facilitated closing hinges have the drawbacks of being applicable only to a single door, of being completely external, protruding and cumbersome as well as being of difficult and of limited adjustment.

**[0004]** Finally, there are known adjustable hinges that allow adjusting the position and the orientation of the door in which they are applied. Such adjustable hinges have the drawback of being very bulky, of occupying and occluding part of the mouth and of the space volume of the work to which are associated preventing the use of the full width and/or of full depth drawers and the free positioning of shelves and they represent a risk to the hands of the users; furthermore the known hinges in object, for their assembly, require the execution of lateral right or left seats in the vertical elements of the furniture chassis, furnishings or works in which they must be installed forcing manufacturers and installers to keep in stock sides and uprights of different kinds causing increases in economic, logistic and organization costs.

**[0005]** Document FR1323744 discloses a hinge according to the preamble of claim 1.

**[0006]** One object of the present invention is to propose a compact hinge device extremely compact and that in the assembled operating condition it has very few exposed elements.

**[0007]** Other object is to propose a hinge device that allows easy and fast adjusting of shutters, doors and panels (hereinafter sometimes collectively indicated with the only term doors or shutters) to which it is associated.

**[0008]** Further object is to propose a hinge device with facilitated closing or rather able of impress to the shutter a closing force at least in the end portion of the closing rotation.

**[0009]** Other object is to propose a hinge device that requires a single arrangement of the sides independently

from the right, left or center placement of the latter and which allows the furniture manufacturer to reduce the stock of the sides and of the vertical baffles.

**[0010]** Further object is to propose a hinge device which allows inserting extractable frames without having to shim the guides.

**[0011]** Other object is to propose a hinge device which allows the free positioning, at any vertical position, of shelves and of horizontal elements of the structure.

**[0012]** Other object is to propose a hinge device that does not encumber in any way the internal volume of the furniture chassis, furnishings or works (hereinafter sometimes generally indicated with the only term furniture chassis) to which it is associated and which allows the free and the safe access the user's hands and arms into such internal volume without risk of collisions and wounds.

**[0013]** Further object is to propose an inexpensive, reliable and easy to assemble hinge device consisting of a small number of parts.

**[0014]** The characteristics of the compact hinge device of the invention are highlighted in the following with particular reference to the accompanying drawings in which:

- 25 - Figure 1 illustrates an axonometric view of a compact hinge device object of the present invention in an embodiment for two doors, shown in a closing condition and associated with two screw means for the horizontal adjustment of the respective shutters;
- 30 - Figures 2 and 3 illustrate axonometric views, from respective points of view, of the device of Figure 1 in a partially opening condition;
- Figure 4 shows an exploded and axonometric view of the hinge device of Figure 1;
- 35 - Figures 5 and 6 illustrate axonometric enlarged views respectively of a body means, and of a plate means of the device of Figure 1;
- Figures 7-10 show axonometric and enlarged views respectively, of an adjustable seat means, of an annular means, of an adjusting screw means and of a pin means of the device of Figure 1;
- Figures 11 and 12 show greatly enlarged and axonometric views with different points of view of a closing means of Figure 1;
- 40 - the figures 13 and 14 illustrate schematic, respectively front and from above, views of the device of Figure 1;
- Figure 15 illustrates a section view according to the plane XV - XV of Figure 13;
- 45 - Figure 16 shows a partial schematic and from the above view, of the hinge device of Figure 1 associated with the structure of a furniture chassis and with two doors of the same, in a closing condition;
- Figure 17 shows a schematic view of Figure 16 in 50 an opening condition of a doors.

**[0015]** With reference to Figures 1-17, numeral 1 indicates the compact hinge device object of the present

invention, comprising a body means 3, one or two plate means 5, 7, a pivot means 9 and other elements described below. Each compact hinge device 1 is assigned to the rotation of one or two doors 10, shutter, ports or shutters in general of a furniture chassis 8, fittings or work in general provided with vertical members 6 for example of a frame, or uprights, baffles, sides or furniture chassis 8 to which the device 1 is to be fixed.

**[0016]** Preferably, and to exploit all the functionality of the device, it is associated with doors or shutter 10 with vertical and lateral rotation axis.

The body means 3 and the plate means 5, 7 may be of bronze, brass, zamak, aluminum, steel or other metal alloys, or may also be in composite also synthetic materials, for example nylon, resin or plastic reinforced with fibers of glass, kevlar, carbon or other reinforcements.

**[0017]** Preferably, the pivot means 9 consists of an elongated rectilinear pin made of steel or other material resistant to stress and wear.

**[0018]** The body means 3 is approximately of an elongated rectangular plate shape and is assigned to be fixed to a vertical member 6 of a frame, to an upright, to a baffle, to a side or to a structure of a furniture chassis 8, furniture or work in general. The larger size of the body means 3 is of the order of centimeters or decimeters, the second dimension is approximately equal to or preferably slightly greater than the thickness of the door 10, shutter or fastenings in general and the thickness of the body means 3 is lower than the distance between two adjacent doors or to the width, left free from the closing door, of the upright or side.

**[0019]** Each plate means 5, 7 is assigned to be fixed to a lateral side of a respective door 10, shutter or fastenings in general.

**[0020]** Each plate means 5, 7 comprises a flat wing means 21, which in the operating condition is vertically oriented, and a barrel element 19 parallel to the flat wing means 21 and fixed to or formed in one piece with the latter.

**[0021]** Preferably the flat wing means 21 is axially offset or tangential with respect to the respective barrel element 19 and it is also longitudinally offset and it is longer than the respective barrel element 19.

**[0022]** Each barrel element 19 has a respective second housing means 13 consisting in a longitudinal axial hole, and passing through the entire longitudinal dimension of the corresponding barrel element 19. Obviously the barrel element 19 may take different shapes than that strictly cylindrical, for example the prismatic polygonal or curved section.

**[0023]** The two plate means 5, 7 of the device are equal, offset, opposite and have the respective second housing means 13 engaged by the vertical pivot means 9 in the operative condition.

**[0024]** In a closing condition C of a door 10, the respective flat wing means 21 is parallel and adjacent to the respective body means 3 keeping a lateral side of the door 10 side by side to the respective body means 3

and maintaining such door adjacent and perpendicular to such body means 3; in the opening conditions, the device allows the progressive rotation of said lateral side of the door 10 in respect to the vertical member 6 of the furniture chassis 8 and the rotation of said door 10.

**[0025]** Each main face of the body means 3 bears a concave seating means 25 and complementary shape in respect to the flat wing means 21 of the respective plate means 5, 7 and assigned to house at least partially the latter plate means 5, 7 in the respective closing condition. The possibility of housing the wing means, the seating means 25 and the position of the flat wing means 21 tangent to the corresponding barrel element 19 and therefore offset from the rotation axis, allow to obtain an extremely thin total thickness of the body means 3 and of the wing means in the closing condition and allows to minimize the distance between two adjacent doors connected to the device.

**[0026]** The two seating means 25 of a body means 3, 20 are mutually separated by one wall means 27 of the body means 3 where the wall means 27 has a shape of a thin rectangular plate. A free edge 29 of the wall means 27 is parallel to the pivot means 9 and it overlooks the recess means 17.

**[0027]** The facing ends of the barrel elements 19 of the plate means 5, 7 are provided with respective first screw portions 31 or of respective axial protrusions and the device 1 comprises a closing means 33 of tubular or annular shape, engaged in the pivot means 9, interposed between the first screw portions 31 of the barrel elements 19. The ends of the closing means 33 have respective second screw portions 35.

**[0028]** In an alternative embodiment not illustrated, the screw portions of the barrel elements 19 or of the closing means can be replaced by axial protrusions sliding on the facing screw portions.

**[0029]** Returning to the general embodiment, each first 31 or second 35 screw portion has an initial flat sector, i.e. perpendicular to the rotation axis, followed in sequence by an inclined and protruding portion and by a further flat portion that is parallel and offset with respect to the initial one.

**[0030]** It is provided that each end of the closing means 33 and the facing ends of the barrel elements 19 bears only a single screw portion; in alternative it is provided that said ends bear two screw portions, each of concordant inclination.

**[0031]** Such closing means 33 is also laterally provided with a concave slide seat 37 and it is slidably engaged onto the free edge 29 of the wall means 27 of the body means 3, preventing the rotation of said closing means 33 but allowing the vertical translation thereof; during the opening rotation of either door the sliding abutment of the corresponding first screw portion 31 or axial protrusion with the closing means 33 causes the lifting of the same door or of the other door so accumulating potential energy which, during the closing rotation, applies a closing force to the door.

**[0032]** Each flat wing means 21 comprises second fixing means 23 consisting of a pair of fixing pins, for example of elongated cylindrical shape, perpendicular to the geometric plane defined by the flat wing means 21; in the assembling condition such pins of the second fixing means 23 are housed in respective hollow seats made in the door starting from a vertical lateral side and extending parallel to the main door faces.

**[0033]** The face of the flat wing means 21 of each plate means 5, 7 opposite to that adjacent to the body means 3 in the closing condition C, or the face of the flat wing means 21 in abutment with the lateral side of the panel, is provided with a constraint seat 41 assigned to house, in a freely rotatable manner and with axial constraint, the head 43 of an adjustment screw means 45 parallel to the pins of the corresponding second fixing means 23.

**[0034]** The adjustment screw means 45 and each pin of the second fixing means 23 are assigned to be respectively screwed and inserted in the corresponding parallel seats made in the door 10.

**[0035]** The flat wing means 21 is provided with a pass-through hole 47 flowing into the center of the constraint seat 41 for the rotation of the adjustment screw 45 whose head 43 is housed in the constraint seat 41.

**[0036]** The free edges of the constraining seat 41 are folded inside to axially retain the head 43 and one side of such a constraining seat 41 is opened to allow the lateral insertion of said head.

**[0037]** The device 1 also comprises a vertical adjustment means 51 provided with a threaded portion 53 engaged in a female screw 54 made in the first housing means 11 of the body means 3 that is lower in the operating condition.

**[0038]** Alternatively, the threaded portion can consist of a threaded pin associated with the lower end of the vertical adjustment means 51 to translate it vertically also without twisting.

**[0039]** The upper portion of the vertical adjustment means 51 is provided with an abutment means 55 assigned to abut the lower end of the barrel element 19 of the lower plate means 5 and the device comprises a washer means 57 interposed between said lower end of the barrel element 19 of the lower plate means 5 and the abutment means 55.

**[0040]** The abutment means 55 is hollow to form a seat able to house the lower end of the pivot means 9.

**[0041]** The lower end of the pivot means 9 and the vertical adjustment means 51 having the threaded portion 53 in single body can be provided with anti-rotation means for mutual constraint of rotation and the upper end of the pivot means 9 can be provided with a connection for a rotation tool so as to be able to adjust the height by acting from above.

**[0042]** The lower end of the threaded portion 53 integrated or associated to the vertical adjustment means 51 can be provided with a connection for a rotation tool and for the height adjustment from below.

**[0043]** The length of the free portion of the pivot means

9 between the first seat means 11 that is the length of the vertical dimension of the recess means 17 is at least equal to the sum of the vertical lengths of the portion of the vertical adjustment means 51 in the condition of minimum protruding in the recess means 17, of the adjustment stroke of the vertical adjustment means 51, the thickness of the washer means 57, of the vertical development of the barrel elements 19 and of the closing means 33 and of the vertical development of the respective screw portions 31, 35 and/or axial protrusions. In this way, the raising of a door is allowed during an opening even when the vertical adjustment is at its maximum height.

**[0044]** The portions of the free ends of the first fixing means 15 and of the second fixing means 23 bear respective levelling or matching 61 assigned to the abutment with threaded grain block means 63 assigned to be tightened against such levelling or matching 61 to lock the sliding of the first 15 and second 23 fixing means at the end of the adjustment.

**[0045]** It is important to observe that the device 1 allows all the possible adjustments of the of known hinges for modular furniture, such as kitchen; whereas each door is provided with at least two devices, it will be possible to adjust the horizontal and vertical positions and the inclination of such door on his geometric plane and the verticality of such plan.

**[0046]** In case the weight of a door is not sufficient to facilitate the end closing, it is possible to install helical spring acting between the first upper housing means 11 of the body means 3 and the upper end of the upper barrel element 19.

**[0047]** In case of device 1 for only one door thus provided with a single plate means 5, 7, it is provided that the first screw portion 31 is placed below and above the closing means 33, or that the first screw portion 31 is upper and that the closing means 33 is placed above of it 31 and that is subjected to an elastic force of an overlooking compressed spring.

**[0048]** The operability of the device for two doors provides the raising of the upper door at the opening of any of the two doors and the transmission of the upper door weight force and the conversion of such force in closing force during the last portion of the door closing rotation.

## Claims

1. Compact hinge device comprising at least a body means (3) assigned to be fixed to a vertical member (6) of a frame, upright means, or furniture chassis (8), fittings, furnishings or any kind of works and at least a plate means (5, 7) assigned to be fixed to a door means (10), to a panel, or to any kind of doors and windows and comprising a pivot means (9), of rectilinear elongated shape, which end portions are assigned to engage respective first housing means (11) of the body means (3) and second housing

means (13) of the plate means (5, 7) for the mutual rotation around the longitudinal geometric axis of such pivot means (9); the body means (3) is rectangular plate shaped in which a side bears first fixing means (15) assigned to be fixed to the vertical member (6) and the opposite side bears the respective first housing means (11) for the pivot means (9) and bears a recess means (17), aligned to the first housing means (11) and assigned to house a barrel element (19) of the at least one plate means (5, 7) each one housing a respective second housing means (13), where the at least one plate means (5, 7) is provided with a respective flat wing means (21) fixed tangentially and offset to the respective barrel element (19), such flat wing means (21) bears second fixing means (23) for the fixing of the respective plate means (5, 7) to a side of the door means (10) orthogonally with respect to the geometrical plane of such door means; in a closing condition (C), the flat wing means (21) is parallel and adjacent to the respective body means (3) keeping a side of the door means (10) side by side to the respective body means (3) and keeping such door means adjacent and perpendicular to such body means (3), in the opening conditions, the device allows the progressive removal of said side of the door means (10) from the vertical member (6) of the furniture (8) and the rotation of said door means (10); each main face of the body means (3) bears a concave seating means (25) and of complementary shape with respect to the flat wing means (21) of the respective plate means (5, 7) and assigned to house at least partially the latter (5, 7) in the respective closing condition; said device being **characterized in that** the two seating means (25) of a body means (3), are separated by a wall means (27) of the body means (3), the free edge (29) of said wall means (27) is parallel to the pivot means (9) and side by side to the recess means (17).

2. Device according to claim 1 **characterized in that** it comprises two plate means (5, 7) equal, staggered, opposed and having their respective second housing means (13) engaged from the vertical pivot means (9) in the operative condition. 40

3. Device according to claim 2 **characterized in that** the facing ends of the barrel elements (19) of the two plate means (5, 7) are shaped as respective first screw portion (31) or as respective axial protrusion and **in that** it comprises a closing means (33) of tubular or annular shape, engaged in the pivot means (9), interposed between the first screw portion (31) of the two barrel elements (19) and bearing at its (33) ends respective second screw portions (35) or respective axial protrusions; such closing means (33) is further laterally provided with a concave slide seat (37) slidably engaged onto the free edge (29) of the wall means (27) of the body means (3) preventing 50

5. the rotation of such closing means (33); during the opening rotation of any door means the sliding abutment of the corresponding first screw portion (31) or axial protrusion with the closing means (33) causes the lifting of the door means itself or of the other door means accumulating potential energy that, during the closing rotation, provides a closing force to the door means.

10 4. Device according to any of the previous claims **characterized in that** the face of the flat wing means (21) of each plate means (5, 7) opposite to the corresponding face adjacent to the body means (3) in the closing condition (C) is provided with a constraint seat (41) to house in freely rotating way and with axial constraint on head (43) of an adjustment screw means (45) parallel to the corresponding second fixing means (23) each consisting in a fixing pin, where the adjustment screw means (45) and each of the second fixing means (23) are assigned to be respectively screwed and inserted in corresponding seats carried out in the edge of the corresponding door means (10); the flat wing means (21) is provided with a pass-through hole (47) opened on the centre of the constraint seat (41) for the rotation of the adjustment screw means (45) which head (43) is housed in the constraint seat (41).

15 5. Device according to any of the previous claims **characterized in that** it (1) comprises a vertical adjustment means (51) provided with a threaded portion (53), or associated to it, engaged into a female screw (54) made in the first housing means (11) of the body means (3) that is lower in the operative condition and provided with an abutment means (55) for the lower end of the barrel element (19) of the at least one lower plate means (5) and **in that** it (1) comprises a washer means (57) placed in abutment with said lower end of the barrel element (19) of the at least one lower plate means (5). 30

20 6. Device according to claim 5 **characterized in that** the vertical adjustment means (51), bears a seat or an abutment for the lower end of the pivot means (9); where such lower end of the pivot means (9) and the vertical adjustment means (51) can be provided with anti-rotation means for the mutual rotation constraint and the upper end of the pivot means (9) is provided with a connection for a rotation tool and/or the lower end of the threaded portion associated or fixed to the vertical adjustment means (51) is provided with a connection for a rotation tool. 35

25 7. Device according to claim 5 or 6 **characterized in that** the length of the median free portion of the pivot means (9) between the two first housing means (11) or rather the length of the vertical dimension of the recess means (17) is equal to at least the sum of the 40

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vertical lengths of the portion of the vertical adjustment means (51) protruding in the recess means (17), of the adjustment stroke of the vertical adjustment means (51), of the thickness of the washer means (57), of the vertical development of the barrel elements (19) and of the closing means (33) and of the vertical development of the respective screw portions (31, 35) and/or axial protrusion. 5

8. Device according to any of the previous claims characterized in that the portions of the free ends of the first fixing means (15) and of the second fixing means (23) bear respective leveling or matching (61) assigned to the abut with threaded grain block means (63) assigned to be tighten against such leveling or matching (61) to lock the sliding of the first (15) and second (23) fixing means at the end of the adjustment. 10 15

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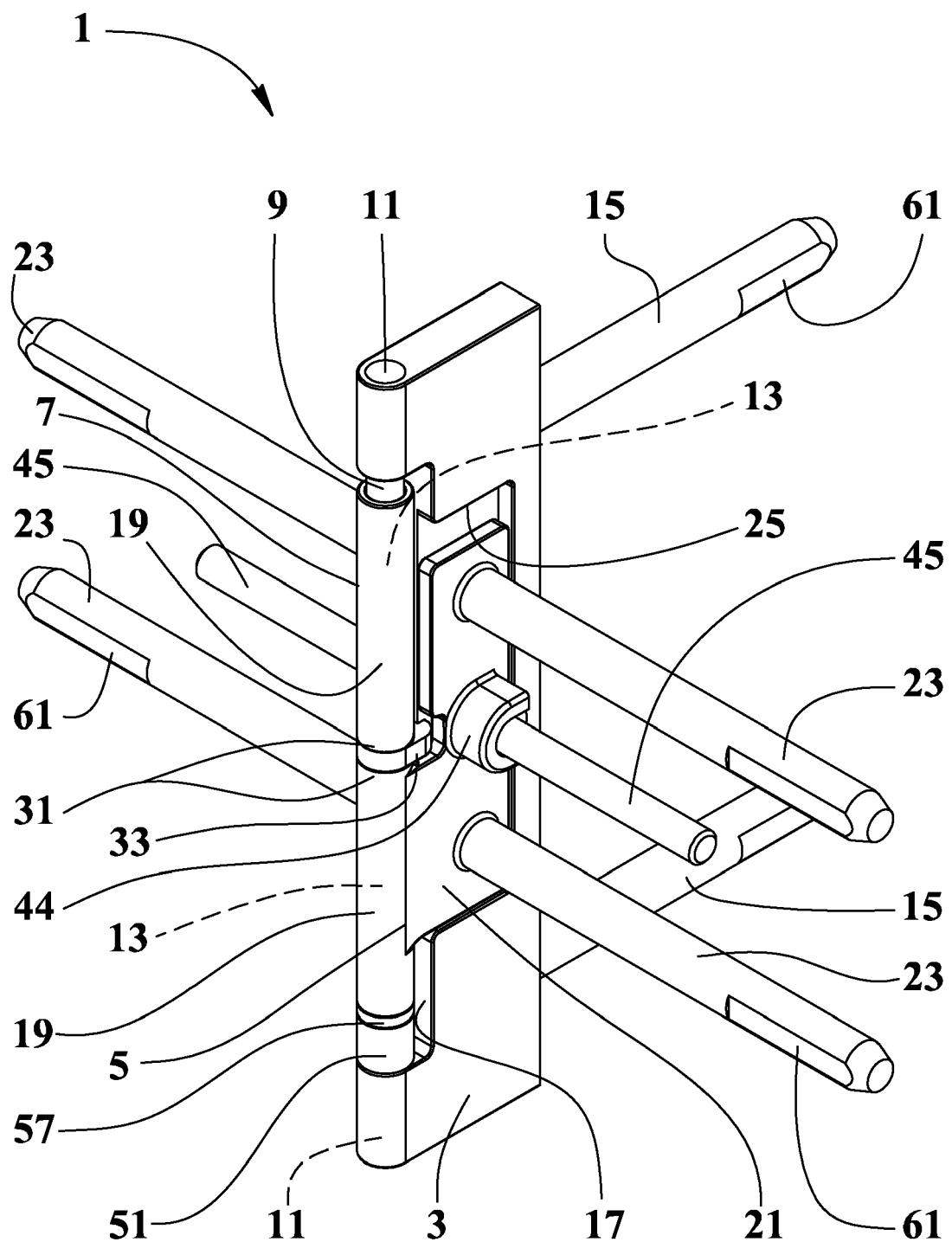
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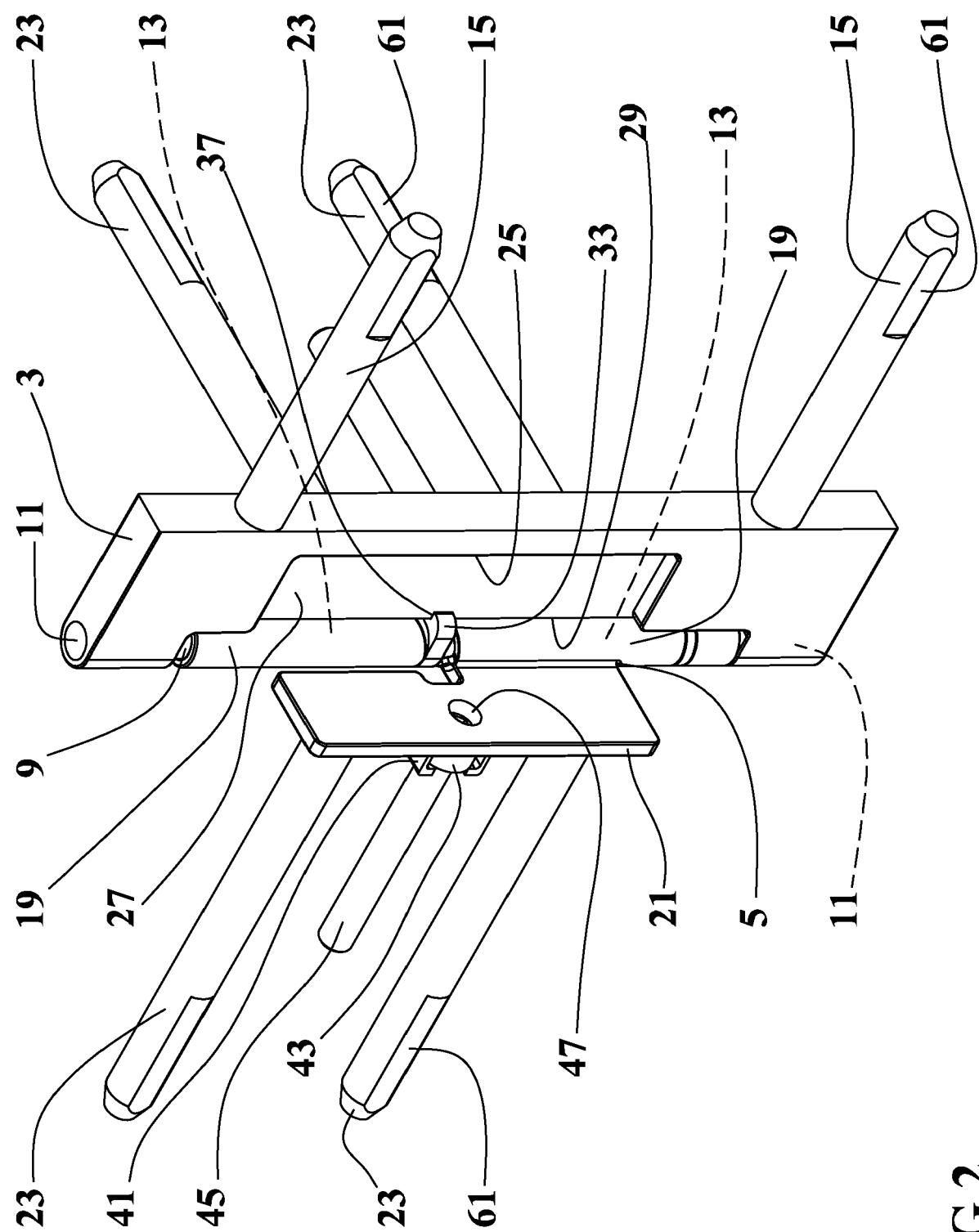
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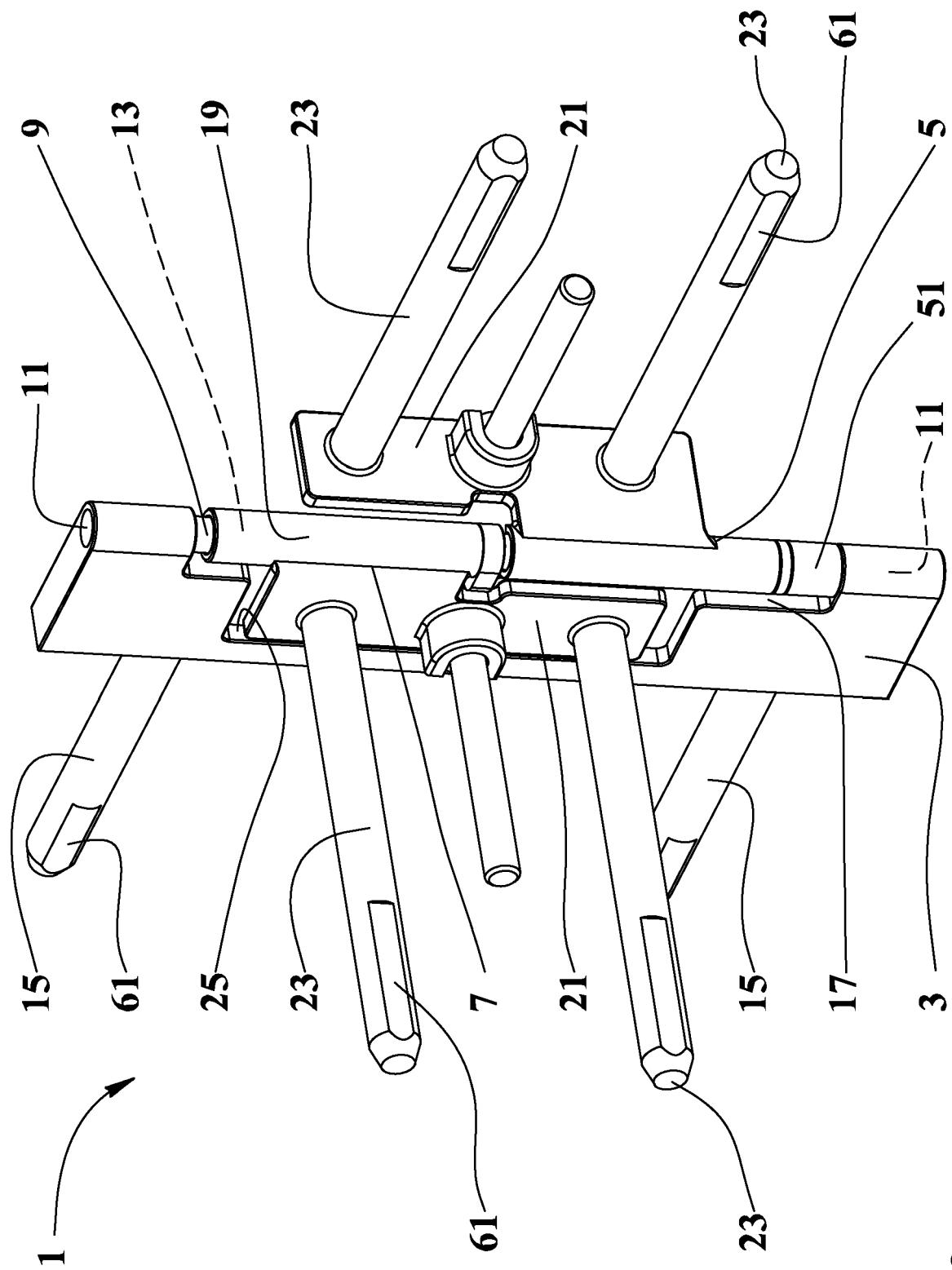
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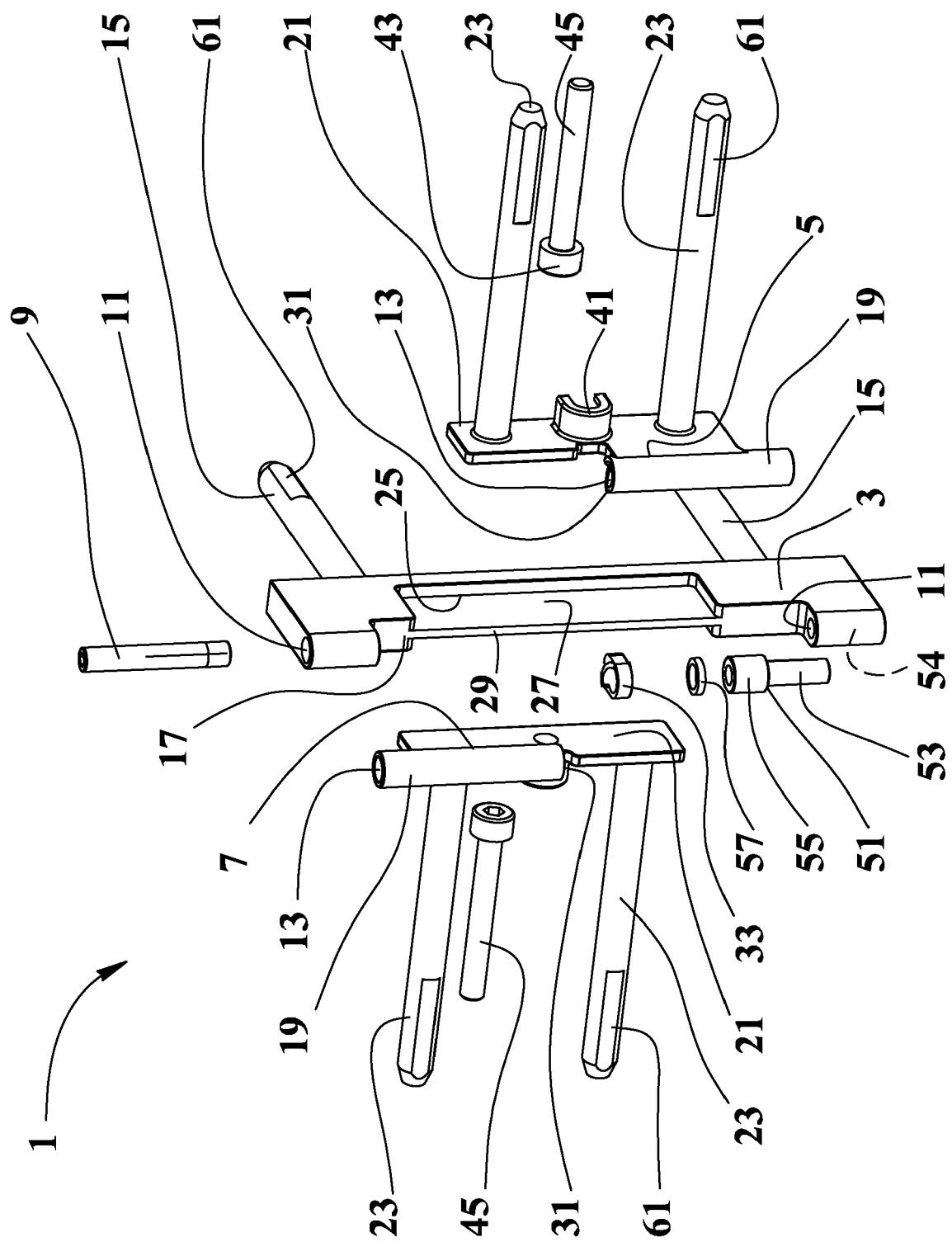
**FIG.1**



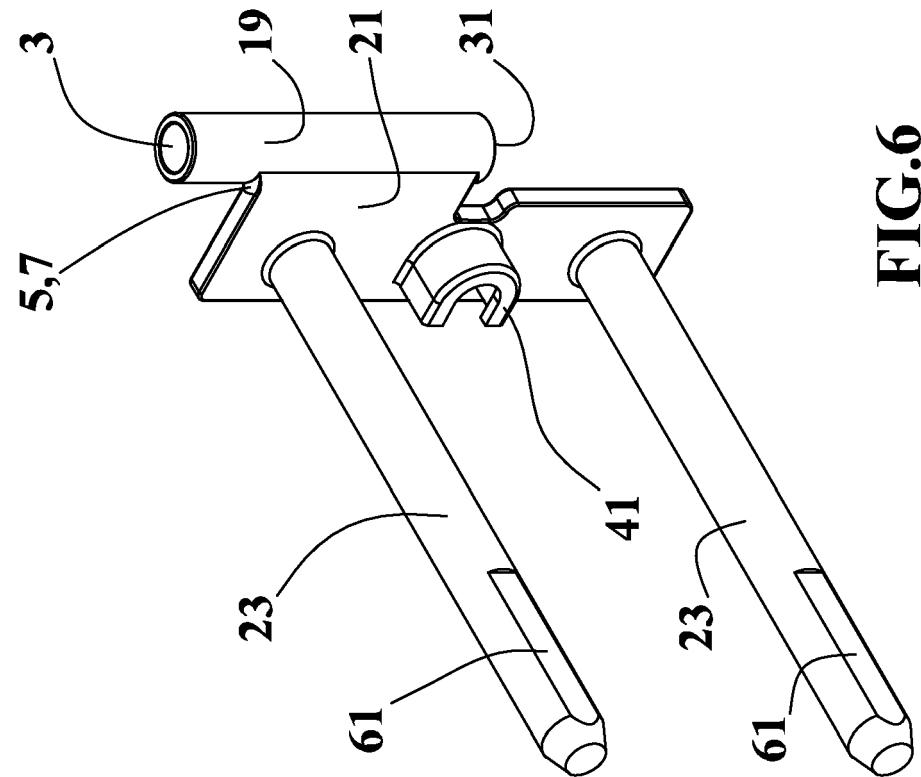
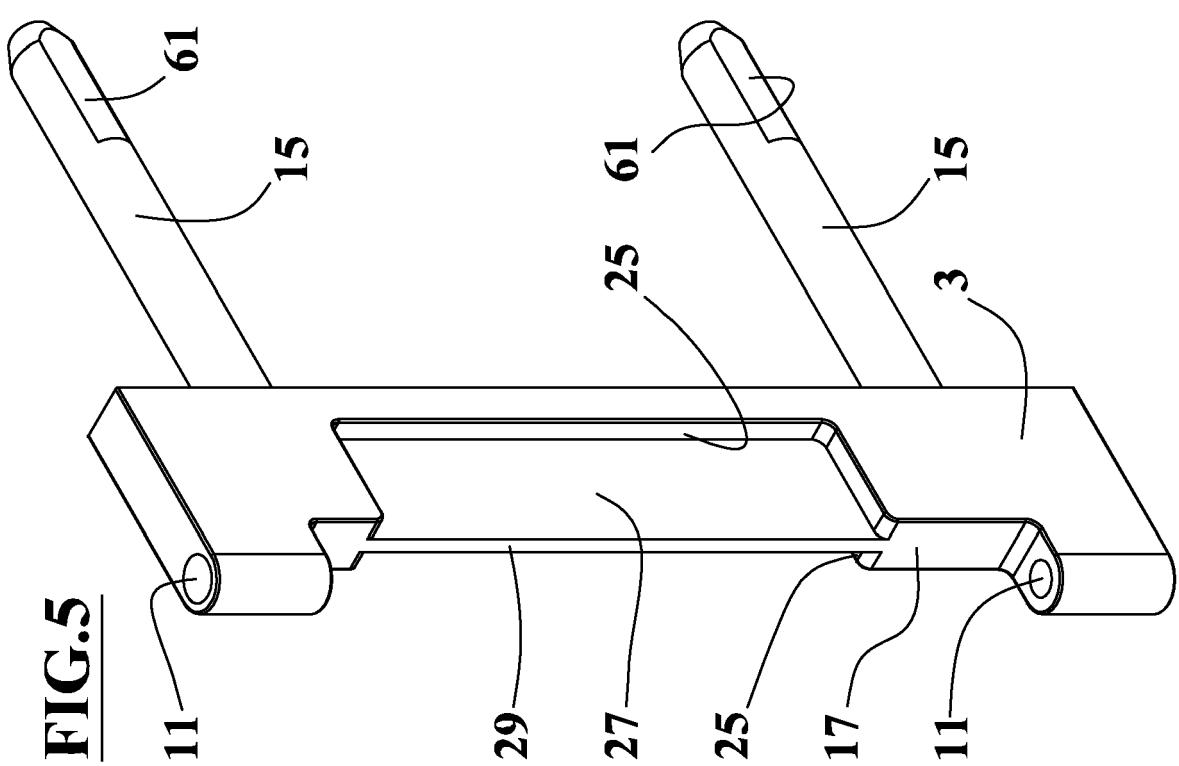
**FIG.2**



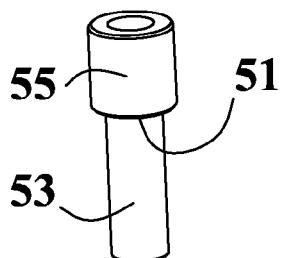
**FIG.3**



**FIG.4**



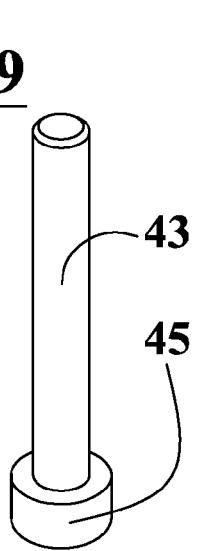
**FIG.7**



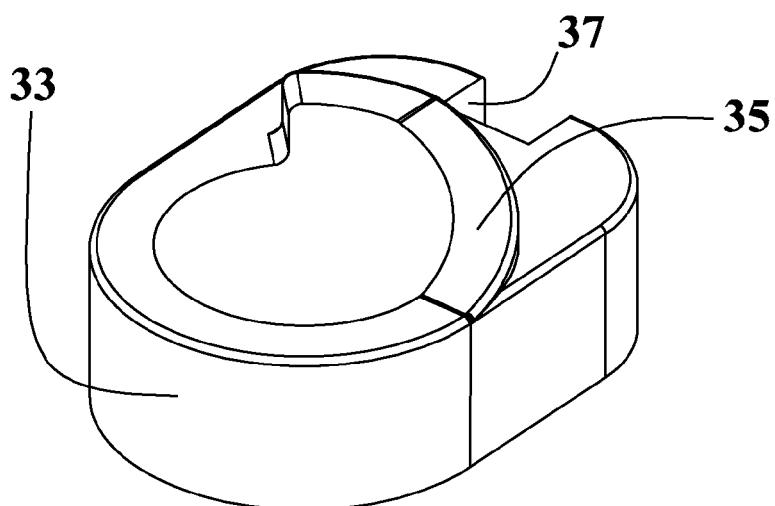
**FIG.8**



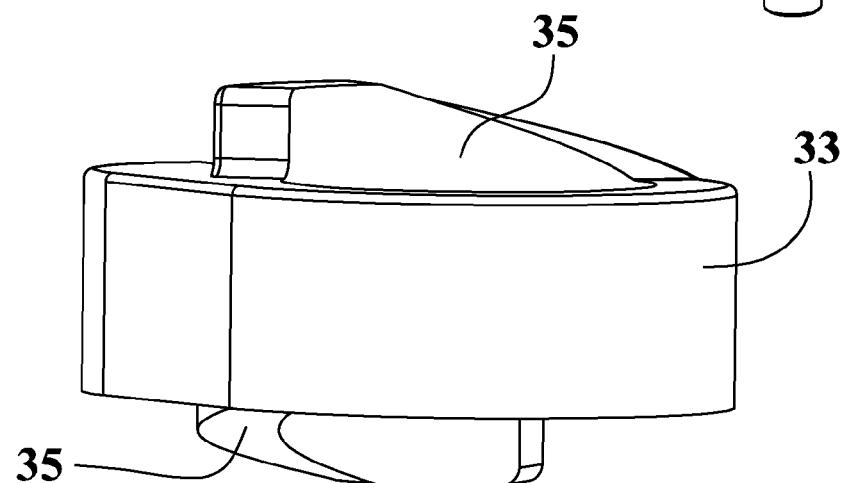
**FIG.9**



**FIG.10**

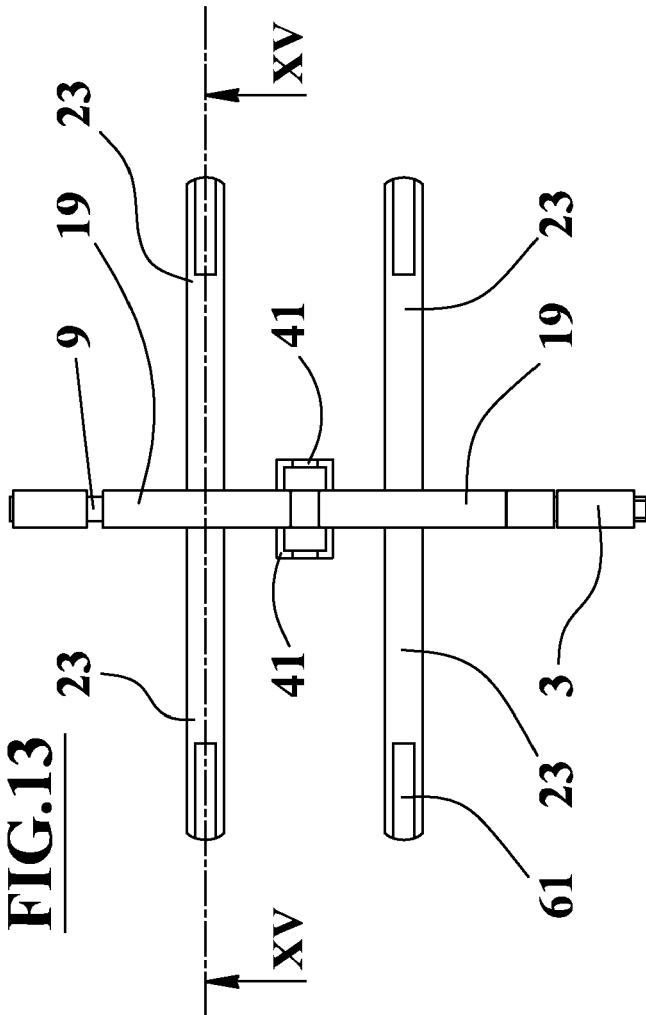


**FIG.11**

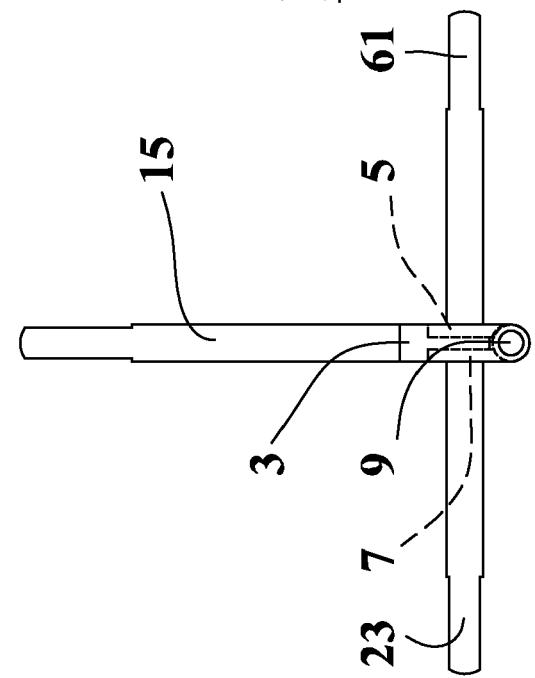


**FIG.12**

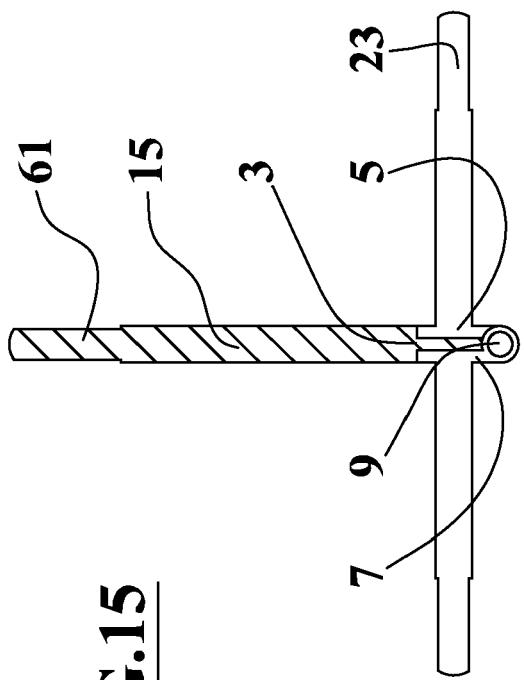
**FIG.13**



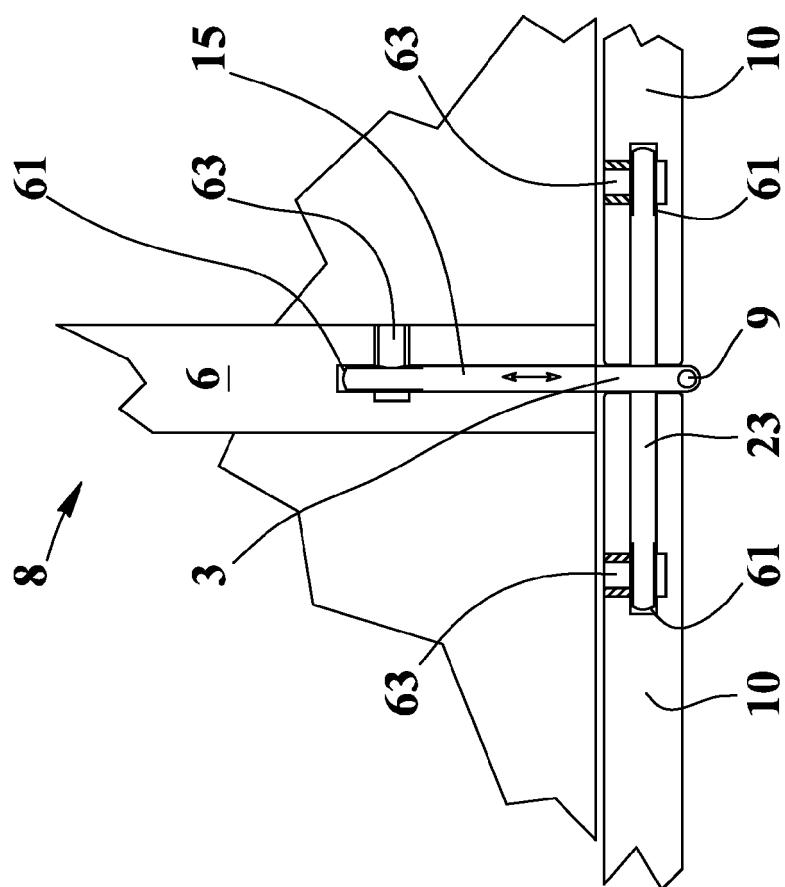
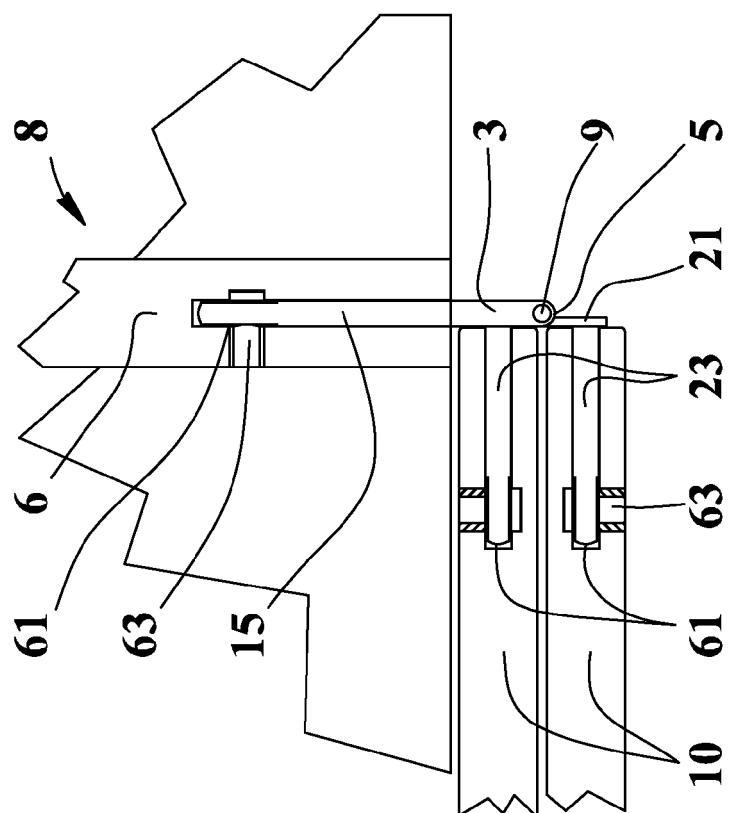
**FIG.14**



**FIG.15**



**FIG.17**



**FIG.16**



## EUROPEAN SEARCH REPORT

Application Number

EP 16 15 5941

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
10 X	FR 1 323 744 A (JEAN JACQUES HELIES; HENRI GRIFFON) 12 April 1963 (1963-04-12) * column 2, line 5 - line 22 * * figures 1-3 *	1 2-8	INV. E05D3/04 E05D7/00 E05D7/02
15 A	EP 1 571 280 A2 (PADDOCK FABRICATIONS LTD [GB]) 7 September 2005 (2005-09-07) * paragraph [0011] - paragraph [0014] * * figures 1-6 *	1-8	
20			
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50 1	The present search report has been drawn up for all claims		
55	Place of search The Hague	Date of completion of the search 20 June 2016	Examiner Prieto, Daniel
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-06-2016

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	FR 1323744	A 12-04-1963	NONE	
15	EP 1571280	A2 07-09-2005	NONE	
20				
25				
30				
35				
40				
45				
50				
55				

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**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- FR 1323744 [0005]