



(12)

EUROPEAN PATENT APPLICATION

(43)

Date of publication:
16.12.2015 Bulletin 2015/51

(51)

Int Cl.:
E05D 7/04 (2006.01)

(21)

Application number: 14172450.0

(22)

Date of filing: 13.06.2014

<div>(84)</div> <div>Designated Contracting States: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR Designated Extension States: BA ME</div>	<div>(72)</div> <div>Inventor: Dogan, Cavit 34610 Istanbul (TR)</div> <div>(74)</div> <div>Representative: Sevinç, Erkan Istanbul Patent A.S. Plaza-33, Büyükdere Cad. No: 33/16 Sisli 34381 Istanbul (TR)</div>
<div>(71)</div> <div>Applicant: KALE Kilit Dis ticaret A.S. 34610 Istanbul (TR)</div>	

(54)

A hinge having five degrees of freedom

(57)

The present invention relates to a hinge having five degrees of freedom for adjustment of a door leaf or a window leaf, said hinge allowing transitional movement in three axes (X,Y,Z) and rotational movement around two axes (X, Y). Said hinge comprises a first hinge element, a second hinge element, a hinge pin for connecting said hinge elements to each other, an adjustment plate attached to said first hinge element, a first channel on said first hinge, an asymmetric first adjustment element which is attached to said adjustment plate and which is guided in the first channel such that said asymmetric first adjustment element provides mobility in one axis (+/- Z) when rotated. Said hinge further comprises, an asymmetric second adjustment element provides transitional movement in one axis (+/- X) and rotational movement around one axis (Y) when rotated, at least one hole on said first hinge element, and at least one third adjustment element which is guided in said at least one hole and which provides transitional movement in one axis (+/- Y) and rotational movement around one axis (X) when rotated.

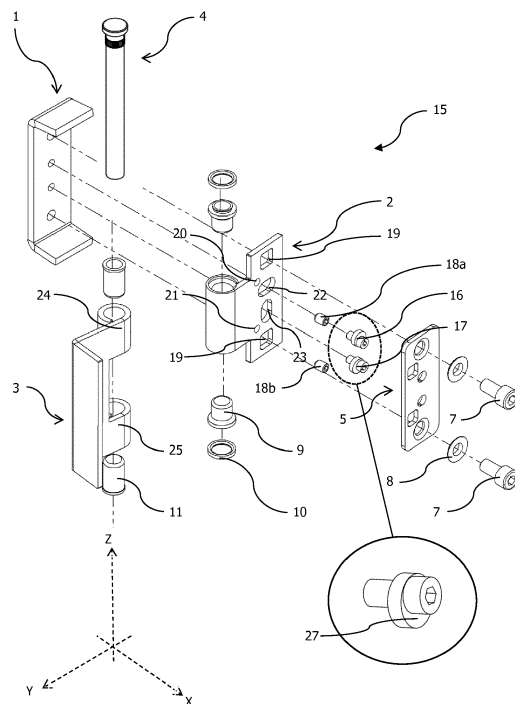


Fig. 1

Description

Technical Field of the Invention

[0001] The present invention relates to hinges used in doors or windows, and more particularly to a hinge assembly, by the virtue of which problems such as hanging, sticking, friction, being left half open and non-locking can be fixed easily with the adjustment elements and which provides the ability to move in five different axes.

Background of the Invention

[0002] Hinges provide the ability for the doors, windows, panels and covers -to which they are attached- to move. Common type hinges are generally composed of two main parts and are connected to each other by a pin for providing rotation around its axis.

[0003] A proper installation and functionality of a hinge is very important for proper opening and closing of a door or window. As a result of the structural defaults in hinges may result unwanted situations such as improper opening, sticking, hanging and even inability to lock the door to which the hinges are attached.

[0004] In order to solve the problems such as hanging, sticking, being left half open etc., the hinges should be re-adjusted; however, this requires the disassembly of a door. Readjustment or changing of the hinge due to malfunction requires labor and causes time loss. Especially, since the new buildings settle down in time, there may be structural deviations in the hinges and this may cause hanging of the door or other problems mentioned above may occur. As the structure settles down in time, only vertical and horizontal adjustments would not be sufficient for the structural defects formed on the hinges, additionally, angular adjustments may also be needed.

[0005] At least two persons are needed to fix the structural defaults formed on classic type hinges and to adjust the door's ideal position. One person must hold the door while the other one adjusts the hinge to its proper position. This situation causes problems in terms of a proper adjustment since the doors may be very heavy and it also causes problems for the person making the adjustments. Furthermore, hinge assemblies which provide limited axial movement are not sufficient in terms of bringing the door to the desired equilibrium position.

[0006] In prior art, there are hinge assemblies which provide mobility in different axes. A prior art publication in the technical field of the present invention may be referred to as US7552511 among others; said document discloses that the hinges can be adjusted in vertical and horizontal directions. This situation is not sufficient for structural deteriorations possible in different axial directions.

[0007] Additionally, since the plate -which is composed of a metal sheet with channels proper for adjustment elements used in traditional hinges- is present on the surface facing the profile that forms the door or window frame

on the hinges, problems such as the falling of the sheet iron into this profile structure may arise. In situations such like that, the disassembly of a whole frame may be necessary.

[0008] The present invention provides a variety of developments in order to solve such unwanted problems and the hinge structure, which will be described in detail below, has five degrees of freedom as proposed by the present invention.

Objects of the Invention

[0009] The main object of the present invention is to provide a hinge -which provides mobility in at least four different axes- that eliminates structural problems observed in the door leaf in time, such as hanging, squeezing, friction, being left half open and deformation.

[0010] Another object of the present invention is to provide a hinge which can be also be adjusted in a rotatable manner unlike the hinge assemblies which can be only adjusted in vertical and horizontal directions.

[0011] Another object of the present invention is to provide a practical hinge assembly by which the problems of the prior art can be fixed by a single person with a plurality of adjustment elements.

[0012] Another object of the present invention is to provide a hinge assembly whose equilibrium position, at which the door, window etc. stand in balance with their own weight, can be adjusted by the user easily.

[0013] Another object of the present invention is to provide a hinge assembly by which the sheet iron is transferred to the front area on the hinge in such a way that the dropping of sheet iron into frame profile is prevented and thus, unintended situations such as the disassembly of the frame due to the dropping sheet iron is prevented.

Summary of the Invention

[0014] The present invention relates to a hinge having five degrees of freedom for adjustment of a door leaf or a window leaf, said hinge allowing transitional movement in three axes (X,Y,Z) and rotational movement around two axes (X, Y). Said hinge comprises a first hinge element, a second hinge element, a hinge pin for connecting said hinge elements to each other, an adjustment plate attached to said first hinge element, a first channel on said first hinge, an asymmetric first adjustment element which is attached to said adjustment plate and which is guided in the first channel such that said asymmetric first adjustment element provides mobility in one axis (+/- Z) when rotated. Said hinge further comprises, an asymmetric second adjustment element provides transitional movement in one axis (+/- X) rotational movement around one axis (Y) when rotated, at least one hole on said first hinge element, and at least one third adjustment element which is guided in said at least one hole and which provides transitional movement in one axis (+/- Y) and rotational movement around one axis (X) when rotated. The

hinge further comprises,
 a region which is eccentric with said asymmetric second
 adjustment element and with said first adjustment ele-
 ment,
 at least one bearing placed at an inner portion of a first
 pin hole and a second pin hole,
 the adjustment elements having a hexagonal cross-sec-
 tion suitable for turning by an allen screw or another suit-
 able turning means,
 at least one connection element for fixing to a frame,
 a cover for covering the hinge when attached to a door
 or a window.

Brief Description of the Figures

[0015] Accompanying drawings are given solely for the
 purpose of exemplifying a hinge whose advantages over
 prior art were outlined above and will be explained in
 detail hereinafter:

Fig. 1 demonstrates an exploded view of the hinge
 according to the present invention.

Fig. 2 demonstrates a top view of the hinge according
 to the present invention.

Fig. 3 demonstrates a perspective view the hinge
 according to the present invention.

Fig. 4 demonstrates a rear view and an A-A cross
 section of this view according to the present inven-
 tion.

Fig. 5 demonstrates a perspective view of a first
 hinge element of the hinge according to the present
 invention.

Fig. 6a demonstrates a perspective view of the hinge
 attached to a door according to the present invention.

Fig. 6b, demonstrates a perspective view of the
 hinge attached to a door in closed state where the
 axis on which the hinge can move are shown accord-
 ing to the present invention.

Fig. 6c, demonstrates a side view of the hinge at-
 tached to a door where the axis on which the hinge
 can move are shown according to the present inven-
 tion.

Fig. 7a, demonstrates a partial perspective view of
 the hinge attached to a door according to the present
 invention.

Fig. 7b, demonstrates a partial perspective view of
 the hinge attached to a door with a cover according
 to the present invention.

Fig. 8 demonstrates a top view of the hinge attached
 to a door according to the present invention.

Fig. 9 demonstrates a graphic where the axes of a
 hinge on which can move are shown.

Detailed Description of the Invention

[0016] In this part, the invention will be described in
 detail with reference to the figures given in the annex of
 the description. The reference list used in the figures is
 herein below:

1. Adjustment plate
2. First hinge element
3. Second hinge element
4. Hinge pin
5. Plate
7. Connection element
8. Washer
9. Second hinge element bearing
10. Bearing element
11. Bearing
15. Hinge
16. First adjustment element
17. Second adjustment element
- 18a. Third adjustment element
- 18b. Fourth adjustment element
19. Connection hole
20. First hole
21. Second hole
22. First channel
23. Second channel
24. First pin hole
25. Second pin hole
26. Cover
27. Eccentric region
28. Leaf

[0017] According to the present invention, a hinge (15)
 is basically composed of a first hinge element (2), a sec-
 ond hinge element (3) and a hinge pin (4) which enables
 these hinge elements to rotate around said pin. Said sec-
 ond hinge element (3) is fixed to a door or a window leaf
 (28), the first hinge element (2) is fixed to a door or window
 frame by usually welding and the hinge pin (4) passes
 through the mutual area where these hinge elements
 come together, eventually forming a conventional hinge
 assembly. Said second hinge element (3) is generally L
 shaped and comprises first pin hole (24) and a second
 pin hole (25) into which the hinge pin (4) is seated. This
 hinge pin (4) passes through the holes; bearings (11) are
 placed between the pin (4) and the holes both for power
 transmission and for absorbing the instant movements
 and vibrations. These bearings (11) are located between
 the hinge pin (4) and the said pin holes.

[0018] In order to provide the movement of adjustable
 hinge (15) in different axes, primarily an adjustment plate

(1), first hinge element (2), plurality of channels on this first hinge element (2), a plate (5) and a plurality of adjustment element located in these channels, are provided. As the adjustment elements used in an hinge (15), may be adjusted in the same direction or in the reverse direction of another hinge holding a door leaf, the door leaf can move transitionally and also make an angular displacement. In figure 9, axis of movement with reference to the frame is shown and hereinafter, this graphic will be taken as a basis for axial definitions.

[0019] A third adjustment element (18a) and a fourth adjustment element (18b) match with a first hole (20) and a second hole (21) on the first hinge element (2). With the rotation of the third adjustment element (18a) and the fourth adjustment element (18b), the movement of the door leaf to which it is connected is provided in +Y, -Y directions with reference to the door frame shown in figure 6b. It should be kept in mind that, said movement in +Y, -Y directions is defined according to the door frame. Namely, the axes shown in figure 6b and 6c show the axes in which the door or window frame can move as a result of the changes made on the adjustment element. The axes where the leaf can move by the virtue of said adjustable hinge (15), can be summarized as follows: transitional movement in the vertical direction (Z) of the frame as a first axis, transitional movement in the horizontal direction (Y) of the frame as a second axis, transitional movement through the depth (X) of door as a third axis, rotational movement around the horizontal axis of the frame as a fourth axis and rotational movement around the axis forming the depth (X) of the frame as a fifth axis. Thus, said adjustable hinge (15) has five degrees of freedom which can be summarized as three transitional and two rotational freedom of movements.

[0020] By adjusting the third adjustment element (18a) and the fourth adjustment element (18b) in such a way that they will be at varying amounts or in opposite directions in two hinges (15) of a door, the door leaf can rotate through the X axis. For example, by further tightening the third adjustment element (18a) and the fourth adjustment element (18b) present on an upper hinge and at the same time, by loosening the third adjustment element (18a) and the fourth adjustment element (18b), rotational movement of the door in X axis (θ_x) is provided. For example on a door which is mounted with two hinges (15), by tightening the third and the fourth adjustment elements (18a, 18b) of one of the two hinges (15) more than the third and the fourth adjustment elements (18a, 18b) the other hinge, the door leaf moves in +Y or -Y direction such that the rotation of the door wing or leaf is provided. The adjustment is completed by bringing the leaf of the door to the desired position. To sum up, by adjusting the adjustment elements present on two hinges mounted on a door, the door leaf can move rotatably on its plane.

[0021] On the first hinge element (2), in the first channel (22) which is in the form of an ellipse whose horizontal length is longer than its vertical length, a first adjustment element (16) is placed as an eccentric pin as shown in

Figure 1. By rotating the eccentric pin - having an eccentric region- within the hole by a suitable tightening tool (e.g. allen key), the leaf moves through the vertical Z axis. Since the first adjustment element (16) is connected to the adjustment plate (1) by riveting, when rotated, the eccentric region (27) is forced to displace in vertical direction (z), and thus, the second hinge element (3) attached to the door's leaf also forces the door's leaf to move displace in vertical direction.

[0022] Conversely, by rotating this first adjustment element (16) at the reverse direction, a vertical movement is provided again, but in reverse direction this time. It is impossible for the first adjustment element (16) to operate in vertical direction. Hence, it is impossible to pull the door both upward and downward at the same time. Therefore, the first adjustment element (16) is used only in one of the two hinges (15) mounted to the door.

[0023] Similarly, the second adjustment element (17) -in which an eccentric pin is used again-is located in a second channel (23) on the first hinge element (2) which is in the form of ellipse whose vertical length is longer than its horizontal length. In addition, by the rotation of this second adjustment element (17), the door's leaf moves transversely, in the +X or -X directions which are the axes of depth of the frame shown in figure 6c. By adjusting the second adjustment element (17) placed in more than one hinges used in the assembly of the doors, in such a way that they will be in the opposite directions within the second channel (23), the door is rotated. In other words, by adjusting the second adjustment elements (17) of the two hinges in varying amounts or in opposite directions, the door leaf is rotated around the Y axis shown in figure 6c. To sum up, by rotating the third adjustment element (18a) and the fourth adjustment element (18b) equally within the first hole (20) and the second hole (21), the door is moved in +Y or contrarily in -Y axis with respect to the frame. And by rotating or tightening the third adjustment element (18a) and the fourth adjustment element (18b) in a second hinge, in an opposite direction with respect to the previous hinge, the door's leaf is rotated around the X axis (θ_x) as it is shown in figure 6b. Furthermore, by rotating the first adjustment element (16) preferably in the form of an eccentric pin/screw, the door's leaf moves in vertical axis (+Z, -Z) with respect to the frame. Lastly, by rotating the second adjustment element (17) -which is in the form of an eccentric pin/screw- in the same direction in all hinges, the door's leaf moves in +X or -X direction with respect to the frame.

[0024] During the mounting of said adjustable hinge (15) especially to the door's frame, a connection element (7) is used on the first hinge element (2) in such a way that it will pass through from at least one connection hole (19). Said connection element (7) is used with a suitable washer (8). The hinge is mounted to the door's frame firmly by the connection elements (7) passing through the connection holes (19) which are preferably located reciprocally. Additionally, the planes in which the hinge

(15) can move are shown in figure 8. The rotation of the hinge (15) with respect to the "Y" axis is carried out on the XY plane, and its movement with respect to the "X" axis is carried out on XY plane. The movement in vertical direction is carried out on ZY plane.

[0025] In both the upper region and the lower region, the second hinge element bearing (9) is placed through which the second hinge element (3) of the hinge pin (4) passes. Said second hinge element bearing (9) fits in the suitable hole with a circular shaped bearing element (10) which is used as bearing hole. By the virtue of this second hinge element bearing (9), it is aimed to decrease the frictions causing unwanted sounds like rasping which may occur in the doors. After gathering all the elements forming the hinge, also a plate (5) is placed onto the first hinge element (1).

[0026] The plate (5) which is placed on the surfaces facing the frame to which it will be connected and which has channels suitable for adjustment elements is located on the first adjustment plate (2) within the scope of the present invention. Thus, especially during the adjustment, for example during the removal of connection elements (7), problems such as the dropping of said plate (5) into the door or window frame are eliminated. The connection of said plate (5) onto the first adjustment element (2) via two connection elements (7) is shown in figure 3.

[0027] After the mounting of said hinge (15), a cover (26) is used to cover especially the first hinge element (2) in order to provide a decorative view. Said cover hides the exposed region of the hinge assembly as it can be seen in figure 7b. It is obvious that, alterations can be made in the position and number of the channels and holes of the first hinge element (2) by a person skilled in the art. The hinge (15) can also be used in fences, covers or in other different fields. Although mostly two hinges (15) are used in the doors, the number of the hinges may be increased if so desired.

Claims

1. A hinge (15) having five degrees of freedom for adjustment of a door leaf or a window leaf, said hinge allowing transitional movement in three axes (X,Y, Z) and rotational movement around two axes (X, Y), said hinge (15) comprising,

- a first hinge element (2) for mounting to the leaf,
- a second hinge element (3) for mounting to a frame,
- a hinge pin (4) for connecting said hinge elements (2, 3) to each other,
- an adjustment plate (1) attached to said first hinge element (2),
- a first channel (22) on said first hinge element (2) whose horizontal (Y) length is longer than its vertical (Z) length,

- an asymmetric first adjustment element (16) which is attached to said adjustment plate (1) and which is guided in the first channel (22) such that said asymmetric first adjustment element (16) provides mobility in one axis (+/- Z) when rotated, **characterized in that**, said hinge (15) further comprises,

- a second channel (23) on said first hinge element (2) whose vertical (Z) length is longer than its horizontal (Y) length,
- an asymmetric second adjustment element (17) which is connected to said adjustment plate (1) and which is guided in the second channel (23) such that said asymmetric second adjustment element (17) provides transitional movement in one axis (+/- X) and rotational movement around one axis (Y) when rotated,
- at least one hole (20, 21) on said first hinge element (2), and
- at least one third adjustment element (18a, 18b) which is guided in said at least one hole (20, 21) and which provides transitional movement in one axis (+/- Y) and rotational movement around one axis (X) when rotated.

2. A hinge (15) as in Claim 1, wherein the asymmetric second adjustment element (17) and first adjustment element (16) comprise an eccentric region (27).
3. A hinge (15) as in Claim 1, wherein the second hinge element (3) comprises a first pin hole (24) and a second pin hole (25).
4. A hinge (15) as in Claim 3, wherein at least one bearing (11) is placed at the inner portion of the first pin hole (24) and the second pin hole (25).
5. A hinge (15) as in Claim 1, wherein said adjustment elements (16, 17, 18a, 18b) has a hexagonal cross-section suitable for turning by an allen screw or another adjustment means.
6. A hinge (15) as in Claim 1, wherein the hinge (15) comprises at least one connection element (7) for fixing to a frame.
7. A hinge (15) as in Claim 1, wherein the hinge (15) comprises a plate (5) which has channels for engagement with adjustment elements (16, 17, 18a, 18b) and which is located on said second hinge element (3) such that the possibility to drop into the profile structure forming the frame is prevented.
8. A hinge (15) as in Claim 1, wherein the hinge (15) comprises a cover (26) for covering apparent region of the hinge when attached to a door or window.
9. A hinge (15) as in Claim 1, wherein the first channel

(22) and the second channel (23) are in the form of ellipse.

10. A hinge (15) as in Claim 1, wherein the second hinge element (3) is in the form of L for mounting to the frame. 5
11. A hinge (15) as in Claim 1, wherein the first adjustment element (16) and the second adjustment element (17) are attached to the adjustment plate (1) by riveting. 10
12. A door or window comprising a hinge according to any of the preceding claims. 15

20

25

30

35

40

45

50

55

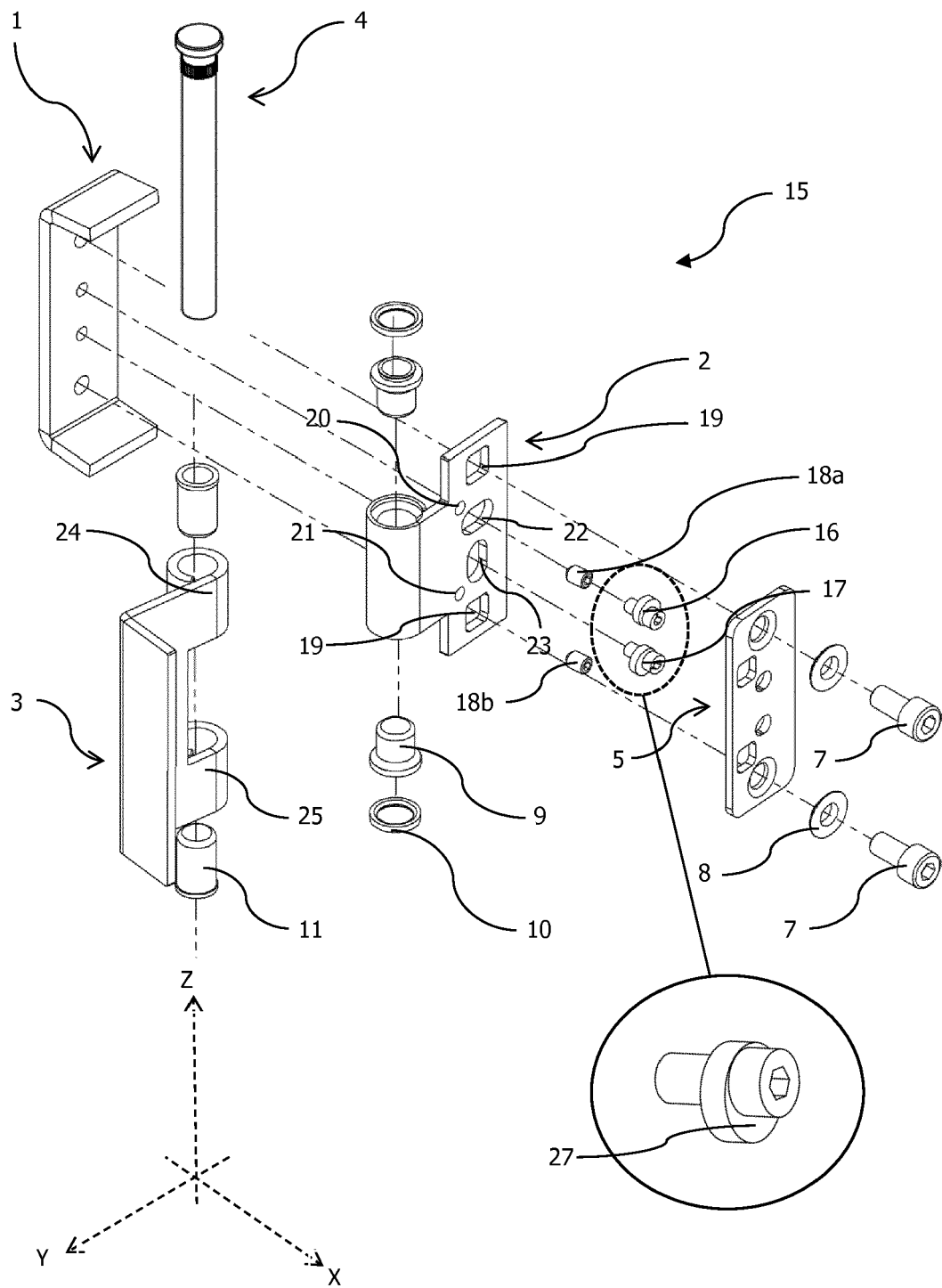


Fig. 1

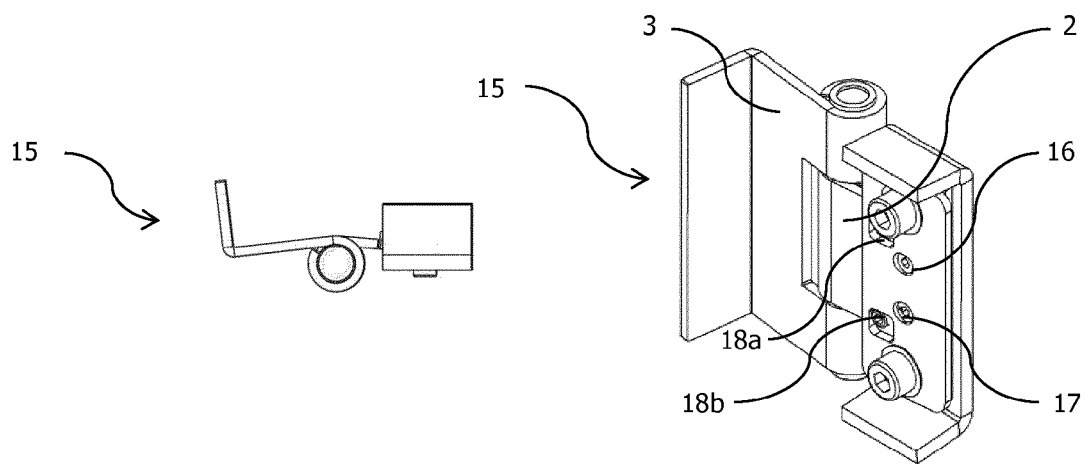


Fig. 2

Fig. 3

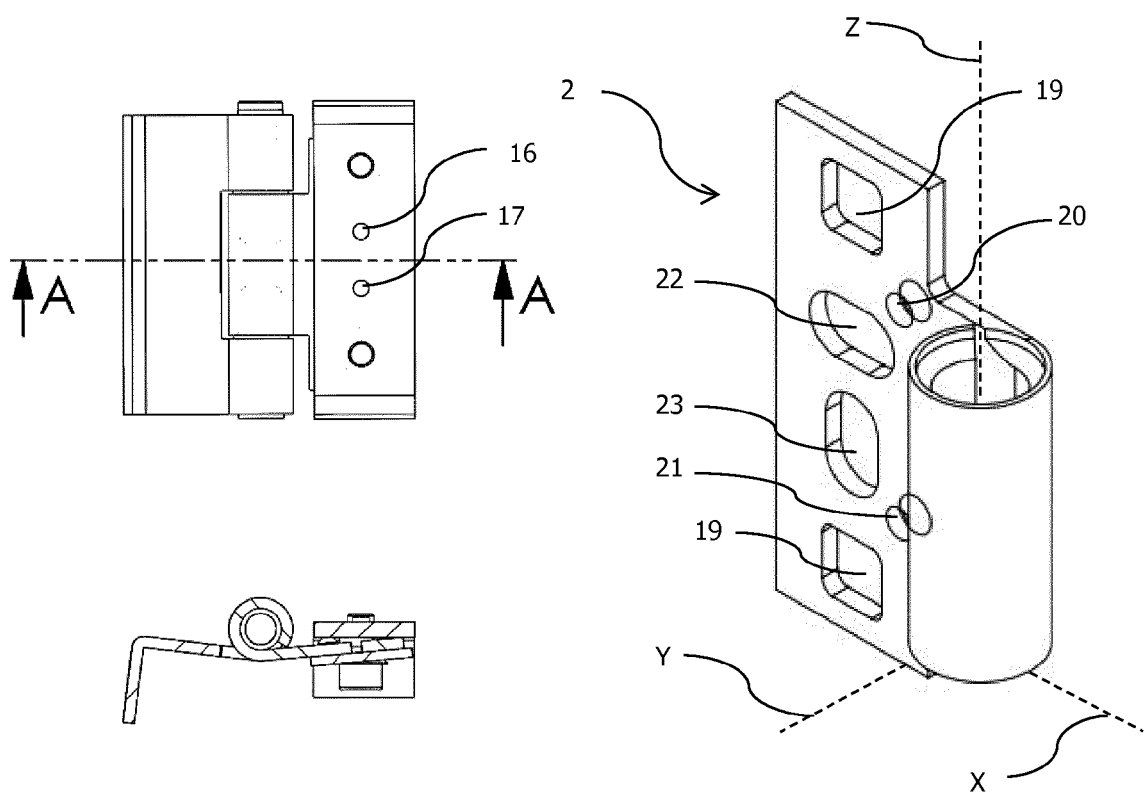


Fig. 4

Fig. 5

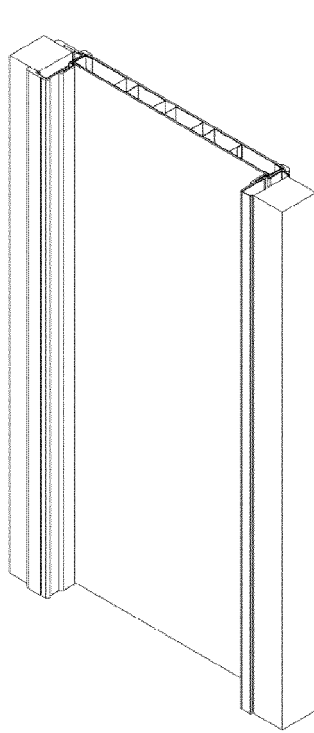


Fig. 6a

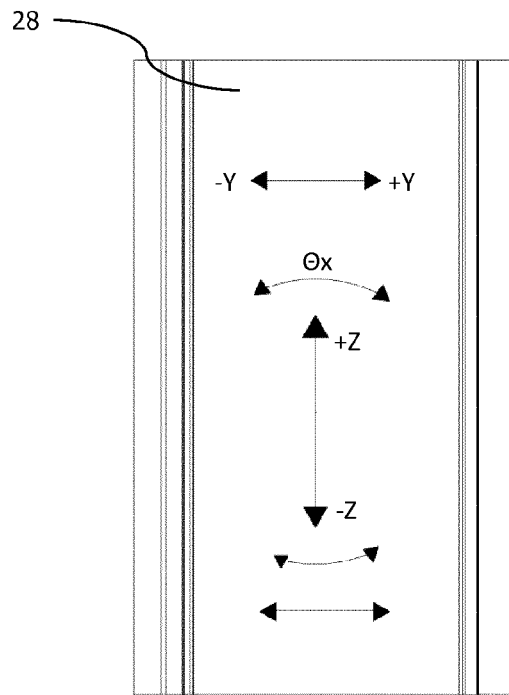


Fig. 6b

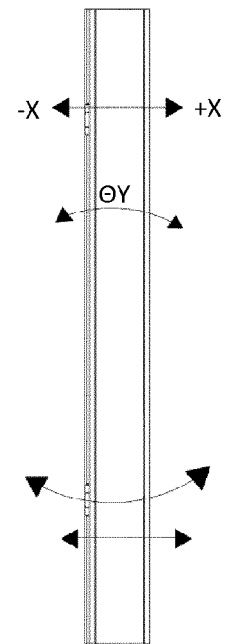


Fig. 6c

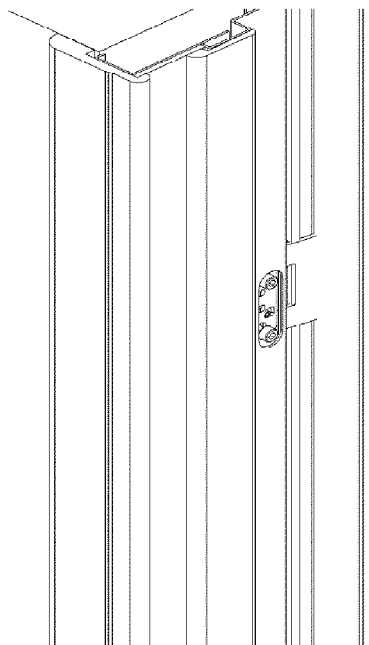


Fig. 7a

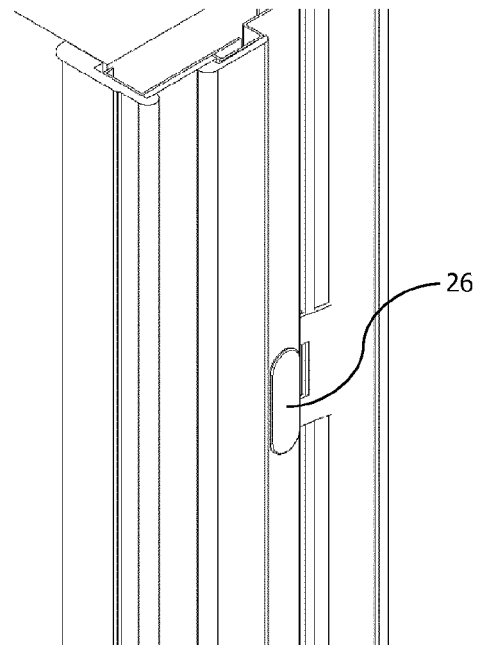


Fig. 7b

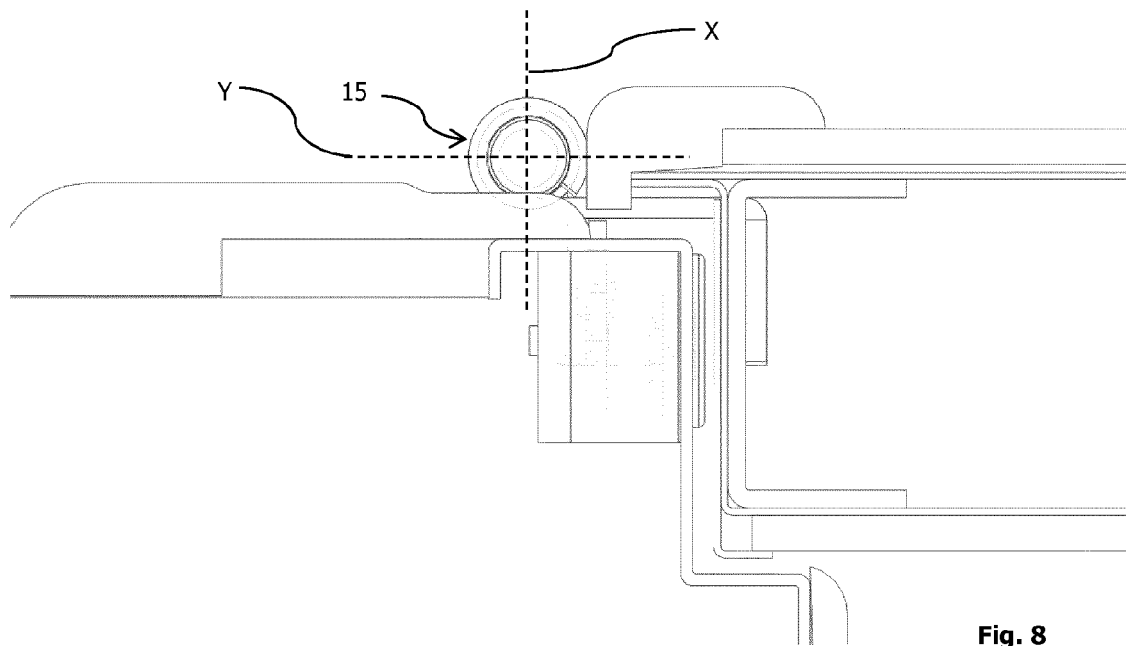


Fig. 8

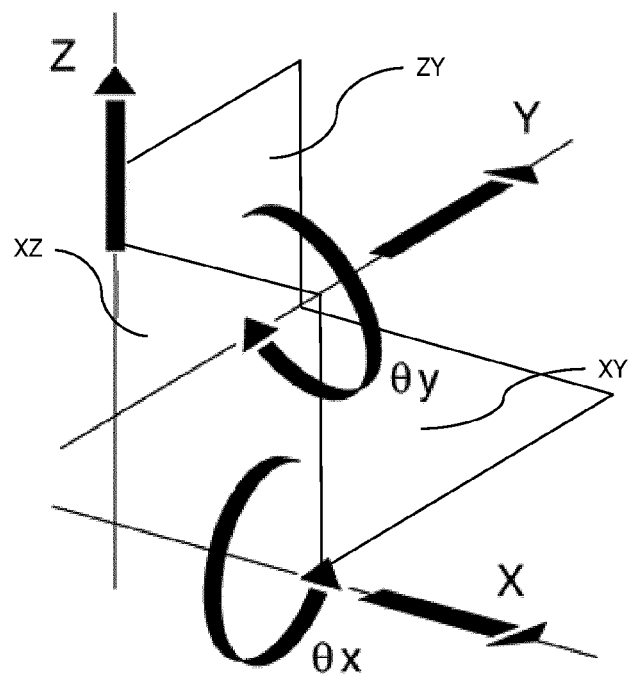


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 14 17 2450

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GB 2 507 326 A (WINDOW FAB & FIXING SUPPLIES [GB]) 30 April 2014 (2014-04-30) * claims 1-2; figures *	1-12	INV. E05D7/04
Y	JP H09 100670 A (SHINKANSAI BEARING KK) 15 April 1997 (1997-04-15) * abstract; figures 1-2,8 *	1-12	
A	GB 2 490 343 A (GROUPTHOMESAFE LTD [GB]) 31 October 2012 (2012-10-31) * abstract; figures *	1-12	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E05D
Place of search		Date of completion of the search	Examiner
The Hague		14 November 2014	Witasse-Moreau, C
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			

 1
EPO FORM 1503 03.82 (P04C01)

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

EP 14 17 2450

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.

14-11-2014

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2507326 A	30-04-2014	EP 2725175 A2	30-04-2014
		GB 2507326 A	30-04-2014
JP H09100670 A	15-04-1997	NONE	
GB 2490343 A	31-10-2012	CN 102758573 A	31-10-2012
		CN 202520125 U	07-11-2012
		GB 2490343 A	31-10-2012

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 7552511 B [0006]