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(74) Representative: **Robba, Pierpaolo**
Interpatent
Via Caboto 35
10129 Torino (IT)

(54) **Concealed hinge**

(57) The present invention relates to a concealed hinge for enabling rotation of one part of a structure relative to another part according to a predetermined limit angle. The hinge (14) includes two opposite wings (41a, 41b) connectable to the respective parts of the structure in order to enable such rotation, and a plurality of levers (42) including a first lever set (421) and a second lever

set (422). The first set is pivotally connected to the second set so that the levers in the first set are arranged in mirrored manner with respect to the levers in the second set, and each wing (41a, 41b) has a pair of slots (43a, 43b) in which first ends (53) of said first lever set (421) can be pivotally mounted; and a pair of holes (44a, 44b) in which second ends (54) of said second lever set (422) can be pivotally mounted.



Description

Technical field

[0001] The present invention relates to a concealed hinge.

[0002] A concealed hinge is a hinge that is completely embedded into the structure of the piece of furniture or the door/window on which it is mounted and therefore, contrary to the conventional "visible" hinges, it cannot be seen from the outside and the inside of the structure on which it is mounted.

[0003] More particularly, the invention concerns a concealed hinge for iron or aluminium tubular members of the kind employed for making windows, doors and similar components.

[0004] Concealed hinges are employed when it is desired to avoid any additional bulk and when, for aesthetic reasons, it is preferred that the hinge cannot be seen with respect to the remaining parts of the structure on which it is mounted.

Prior art

[0005] Concealed hinges are generally known.

[0006] Such hinges are formed of two parts or wings, one of which is fastened to the door/window casing and the other is fastened to the door/window frame, so as to enable rotation of one wing relative to the other.

[0007] Patent publication EP 1538290 A in the name of the Applicant discloses a concealed hinge configured to limit the relative rotation of the wings to a predetermined angle.

[0008] The prior art hinge includes a curved guide in which a member connecting the wings slides. Thanks to such a configuration, the curved guide of the hinge, by limiting the sliding of the connecting member, is arranged to limit the rotation angle of the wings.

[0009] The Applicant has realised that the prior art hinge, while being effective in many applications, has the problem that it is difficult to be used in applications where the weight of the moving element is considerably high.

Description of the invention

[0010] It is an object of the present invention to solve the problems mentioned above of the

prior art.

[0011] The object is achieved by the concealed hinge as claimed herein.

[0012] The present invention also concerns a concealed hinge assembly, as well as a method of manufacturing a concealed hinge.

[0013] The claims are integral part of the technical teaching provided herein in respect of the invention.

[0014] In accordance with a preferred embodiment of

the concealed hinge according to the invention, the hinge includes a plurality of levers pivotally mounted so that they define a first and a second lever set, and a pair of wings each having a pair of slots and a pair of holes in which the first and second lever sets are alternately pivotally mounted.

[0015] In accordance with another feature of the present invention, the hinge slots are straight and allow the sliding of first ends of the first or the second lever set, which ends are suitably pivotally connected to one another and are retained in the slot.

[0016] In accordance with a further feature of the present invention, the hinge wings are configured so that they are removably connected to suitable wing-retaining shells.

Brief Description of the Figures

[0017] The above and other features of the present invention will become apparent from the following description of preferred embodiments, which description is made by way of non limiting example with reference to the accompanying drawings, in which elements denoted by a same or similar numerical reference correspond to components having the same or similar function and construction, and in which:

- Fig. 1 shows a perspective view of constructional elements of the concealed hinge according to the invention;
- Figs. 2a and 2b show a first embodiment of the hinge according to the invention; and
- Figs. 3a and 3b show a second embodiment of the hinge according to the invention.

Description of preferred embodiments

[0018] Referring to Fig. 1, a concealed hinge assembly 10 according to the present invention comprises a first and a second outer shell 12a and 12b, respectively, and a concealed hinge 14.

[0019] Outer shells 12a and 12b, respectively, are preferably identical to each other and are arranged to be secured, in known manner, to tubular members for door/window casings. For instance, the shells are secured to the tubular members by soldering, by means of fastening screws, rivets, etc.

[0020] In the preferred embodiment, each shell 12a and 12b has a prismatic shape, with rectangular cross section, and has a first, open end 21a and 21b, respectively, and a second end 22a and 22b, respectively, which for instance is partly closed by element bent to an L-shape.

[0021] Shells 12a and 12b are arranged to house the concealed hinge 14 according to the invention and they have, associated with their second end, a securing member 25a and 25b (Figs. 1, 2a, 2b, 3a, 3b), respectively, for instance a threaded member configured to allow hinge

14 to be secured to the shells by means of suitable removable means 35a and 35b, respectively, for instance screws.

[0022] In the preferred embodiment, hinge 14 includes a first and a second end member 41a and 41b, respectively, which are preferably identical to each other and are shaped and sized so that they can be inserted into the respective shells 12a and 12b.

[0023] More particularly, end members or inner shells 41a and 41b, respectively, are for instance substantially U-shaped and, in use, they are inserted in mirror-like manner in the respective outer shells and are connected to each other by means of levers 42. As it will be disclosed in detail below, the levers are arranged to build hinge 14 in combination with the first end member (first U-shaped member) 41a and the second end member (second U-shaped member) 41b.

[0024] In the preferred embodiment, each U-shaped member 41a or 41b forms a wing of the hinge and has:

- two slots 43a or 43b, respectively, which are located opposite to each other on opposite faces of the arms of the U-shaped member 41a or 41b and are arranged to receive a first pivot pin 53a or 53b, respectively; slots 43a or 43b are preferably straight and are arranged to allow the first pivot pin 53a or 53b to slide during hinge operation, as it will be disclosed in detail below:
- two holes 44a or 44b, respectively, which are located opposite to each other on opposite faces of the arms of the U-shaped member and are arranged to receive a second pivot pin 54a or 54b, respectively; and
- preferably, a throughhole 45a or 45b, which is located on an end wall of the U-shaped member and is arranged to allow the passage of securing screw 35a or 35b, respectively, and to allow securing each U-shaped member to the respective shell 12a or 12b by means of screws 35a and 35b, respectively; as the skilled in the art will readily appreciate, such a configuration allows mounting and removing the concealed hinge simply by means for instance of a screw, without need of removing members welded or riveted to a frame.

[0025] In the preferred embodiment, levers 42 have a leaf structure, with predetermined thickness; they are arranged, in use, to allow one lever to slide relative to another one, are identical to each other and have each three holes.

[0026] More particularly, levers 42 have:

- a central hole 45 arranged to allow insertion of a central pivot pin 55; in use, central pin 55 joins all levers 42 in the hinge and acts as the central pivot for concealed hinge 14;
- two holes 43 and 44, respectively, located at respective ends 53 and 54 of the levers and arranged to

allow insertion of the first pins 53a or 53b and the second pins 54a or 54b, as it will be disclosed in detail below.

[0027] More particularly, in the preferred embodiment, in a first lever set 421, including e.g. three levers as shown in Fig. 1, holes 43 of the first lever ends are pivotally mounted on the first pin 53a of the first U-shaped member 41a, and holes 44 of the second lever ends are pivotally mounted on the second pin 53b of the second U-shaped member 41b. Moreover, in accordance with such an embodiment, levers 42 in the first set are kept separate from one another in correspondence of the pins by means of suitable washers 49 having a thickness corresponding to that of levers 42.

[0028] Also in accordance with such an embodiment, a second lever set 422, including e.g. three levers as shown in Fig. 1, is arranged in mirrored manner with respect to the first lever set and so that holes 43 of the first ends 53 are pivotally mounted on the second pin 54a of the second U-shaped member 41b, and holes 44 of the second ends are pivotally mounted on the second pin 54a of the first U-shaped member 41a. Moreover, in accordance with such an embodiment, levers 42 in the second set are kept separate from one another in correspondence of the pins by means of suitable washers 49 having a thickness corresponding to that of levers 42.

[0029] Both lever sets are pivotally connected to each other by means of central pin 55 thereby forming a lever pack.

[0030] As the skilled in the art will readily appreciate, the shape of the levers determines the rotation angle of the hinge wings, which angle, in accordance with the present exemplary embodiment, may take any value in the range 0° to 180°.

[0031] More particularly, levers 42 are substantially C-shaped, with predetermined outer and inner profiles 42a and 42b.

[0032] As the skilled in the art will readily appreciate, outer profile 42a has such a size that it does not interfere with the sizes of shells 12a and 12b.

[0033] Inner profile 42b has such a size that it limits the maximum rotation angle of the wings or U-shaped members associated with hinge shells 12a and 12b: actually, as shown in Figs. 2a and 2b, showing a hinge with a maximum opening of 180°, and in Figs. 3a and 3b, showing a hinge with a maximum opening of 90°, the inner profile is configured to abut against the second pins 54a and/or 54b in fully opened conditions.

[0034] As far as the materials used for manufacturing concealed hinge assembly 10 according to the present invention is concerned, iron-based materials are preferably used.

[0035] For instance, outer and inner shells can be made of iron plate, steel plate and so on. The levers, as well as the pins, can be made for instance of steel, stainless steel or other materials with high stiffness. The washers can be made of iron plate, steel plate and so on.

[0036] As the skilled in the art will readily appreciate, assembling hinge 14 and hinge assembly 10 includes for instance the following steps:

- fastening the first lever set to the second lever set by inserting central pin 55 into central hole 45 of the levers, thereby obtaining a lever pack; such step preferably includes alternately arranging the levers, with the ends facing in mirrored manner;
- inserting the first ends 53 of the first lever set into the first U-shaped member and inserting, through slot pair 43a, the first pin 53a into holes 43; preferably, washers 49 are also arranged between levers 42;
- inserting the second ends 54 of the second lever set into the first U-shaped member and inserting, through hole pair 44a, the second pin 54a into holes 44a and holes 44 provided in the second ends 54 of the second lever set; preferably, washers 49 are also arranged between levers 42;
- inserting the first U-shaped member (first inner shell) 41a into outer shell 12a and securing the inner shell to the outer shell by means of screw 35a and threaded member 25a.

[0037] Once such operations have been completed, corresponding operations are performed for the second inner shell 41b, and this shell too is secured to outer shell 12b by means of screw 35b and threaded member 25b.

[0038] Once such operations have been completed, the concealed hinge is wholly assembled and inserted into the shells.

[0039] The operation of the concealed hinge described above is as follows.

[0040] Moving one of wings 41a and/or 41b of hinge 14 results in the first lever set rotating relative to the second lever set as long as the inner profiles of both lever sets, or the inner profile of at least one set, abut(s) against one of the second pivot pins 54a and/or 54b.

[0041] During rotation, the first pivot pins 53a and 53b slide in the respective slot pair 43a and 43b thereby enabling the levers to come out from the shells.

[0042] As the skilled in the art will readily appreciate, the concealed hinge according to the invention is very solid and robust, since it comprises a plurality of levers arranged in facing relationship and mutually cooperating.

[0043] In this manner, the load that can be supported depends to a great extent on the number and the size the levers mutually cooperating in the hinge.

[0044] For instance, depending on the load, the first and/or the second lever sets may comprise at least two levers, and preferably the first set comprises as many levers as the second set.

[0045] Obvious changes and modifications can be made to the above description in respect of sizes, shapes, materials, components, as well as in respect of the details of the illustrated construction and operating method, without departing from the spirit of the invention

as set forth in the following claims.

Claims

1. A concealed hinge enabling rotation of one part of a structure relative to another part according to a predetermined limit angle, said hinge (14) including two opposite wings (41a, 41b) connectable to the respective parts of the structure in order to enable such rotation, the hinge being **characterised by**:
 - a plurality of levers (42) including a first lever set (421) and a second lever set (422), said first set being pivotally connected to the second set so that the levers in the first set are arranged in mirrored manner with respect to the levers in the second set, and being **characterised in that** each said wing (41a, 41b) has:
 - a pair of slots (43a, 43b) in which first ends (53) of said first lever set (421) can be pivotally mounted; and
 - a pair of holes (44a, 44b) in which second ends (54) of said second lever set (422) can be pivotally mounted.
2. The hinge as claimed in claim 1, **characterised in that** said slots (43a, 43b) are straight slots.
3. The hinge as claimed in claim 1 or 2, **characterised in that** said first lever set is pivotally connected to the second set so that the levers in the first set are arranged alternate with the levers in the second set.
4. The hinge as claimed in any of claims 1 to 3, **characterised in that** separating washers (49) are provided for the pivotal mounting of said first ends (53) of said first lever set (421) into said pair of slots (43a, 43b) and/or of said second ends (54) of said second lever set (422) into said pair of holes (44a, 44b).
5. The hinge as claimed in any of claims 1 to 4, **characterised in that** said levers (42) are substantially C-shaped and have an inner profile (42b) configured so as to determine the predetermined limit angle of the rotation of said wings (41a, 41b).
6. The hinge as claimed in any of claims 1 to 4, **characterised in that** said levers (42) have a leaf structure.
7. A concealed hinge assembly configured to enable rotation of one part of a structure relative to another part according to a predetermined limit angle, the assembly being **characterised in that** it comprises a concealed hinge (14) as claimed in claims 1 to 6, and a first and a second shell (12a, 12b) arranged

to house the wings of said concealed hinge (14).

8. A concealed hinge assembly, **characterised in that** removable securing means (35a, 35b) are provided in order to secure the wings of said concealed hinge (14) to said shells (12a, 12b). 5
9. A method of manufacturing a concealed hinge (14) enabling rotation of one part of a structure relative another part, said hinge including two wings (41a, 41b) each having a pair of slots (43a, 43b) and a pair of holes (44a, 44b), the method comprising the steps of: 10
- pivotally connecting a first and a second lever set so that the levers in the first set are arranged in mirrored manner with respect to the levers in the second set; 15
 - pivotally mounting first ends of said first lever set into a pair of slots in one of said wings; 20
 - pivotally mounting second ends of said second lever set into a pair of holes in said one wing.

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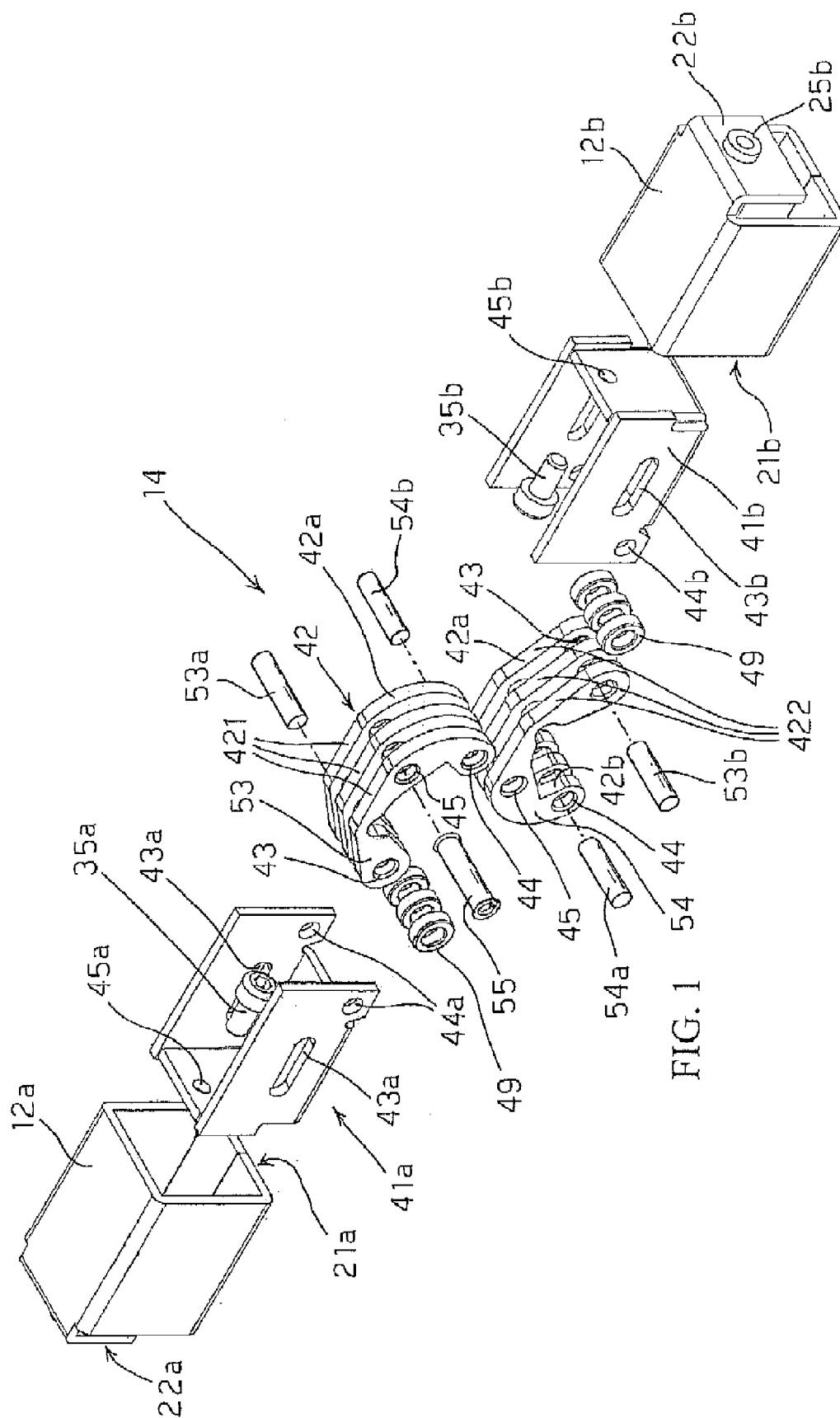
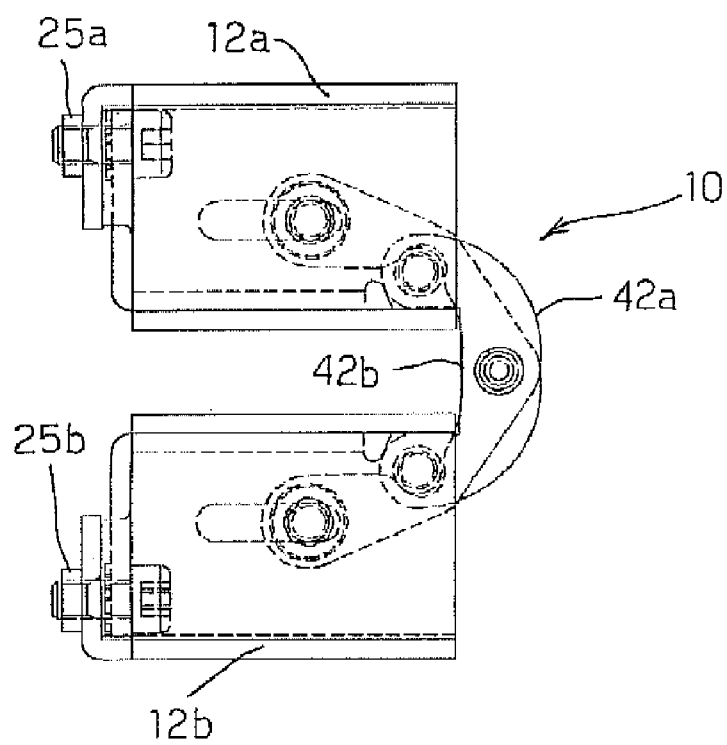
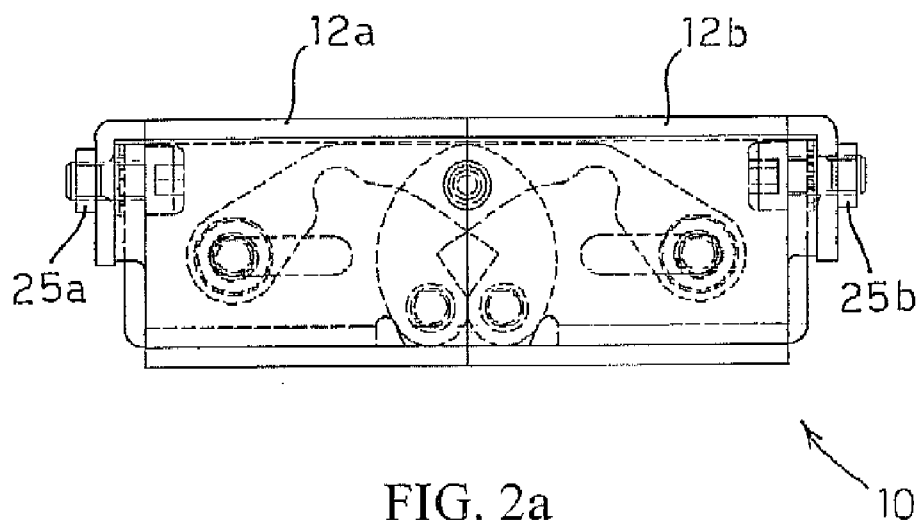


FIG. 1



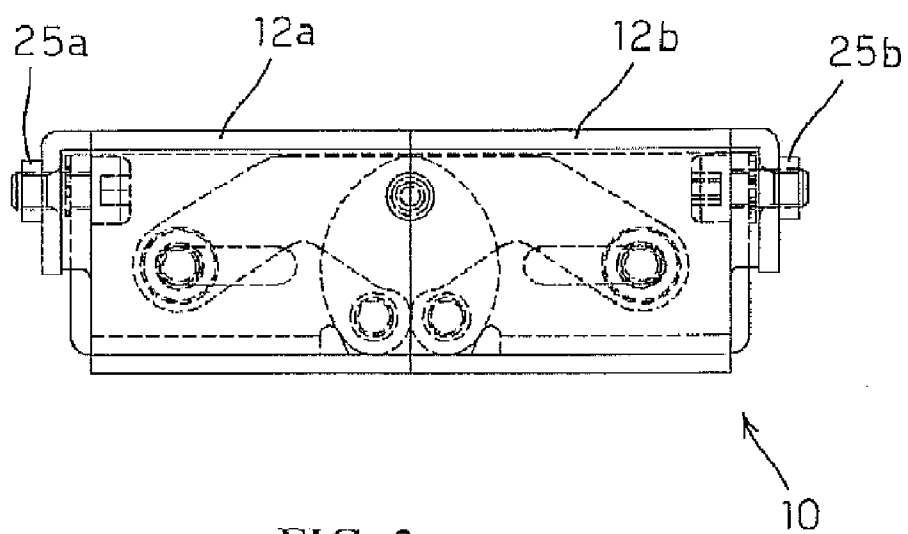


FIG. 3a

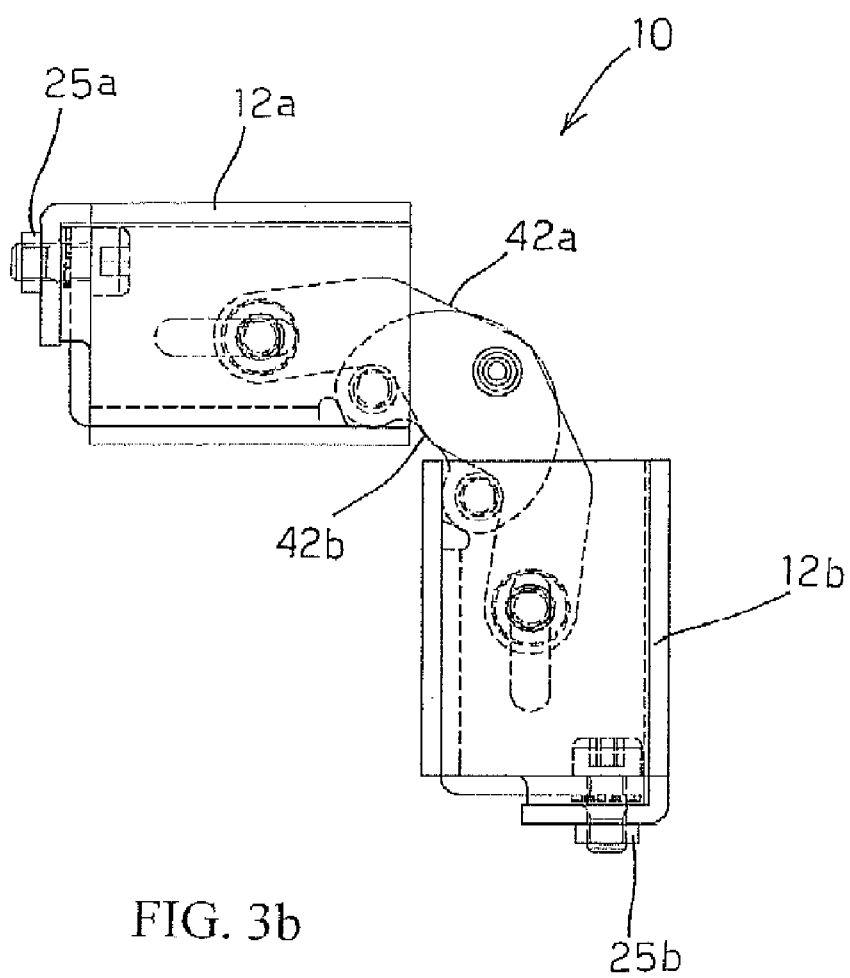


FIG. 3b

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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