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(54) Hinge

(57) To minimize the air gaps between the several leafs of furniture, it is proposed a hinge assembly capable of letting the leaf rotate from vertical to horizontal by a rotation of approximately 90 degrees to make it parallel to a stationary base (98) having a horizontal support surface, comprising

- a fixed member (80) to be mounted on the base;
- a movable member (60), to be fixed at the edge of the leaf, with a surface having an open cavity (66);
- a connecting arm (52) having one end integral with the fixed member and the other end arranged swingingly into the cavity (66),

wherein the movable member (60) is guided with respect to the arm (52) along a rotation of approximately 90 degrees by at least a pair of pins (72) integral with the arm (52), the pins (72) being, in use, with horizontal axis and slidingly inserted into two respective guide grooves (58a, 58b) made in the movable member, or in the arm, characterized in that

the hinge is configured in such a way that in the horizontal position the leaf has a horizontal surface in sight that lies in a plane parallel and offset with respect to that on which lies the support surface of the base.

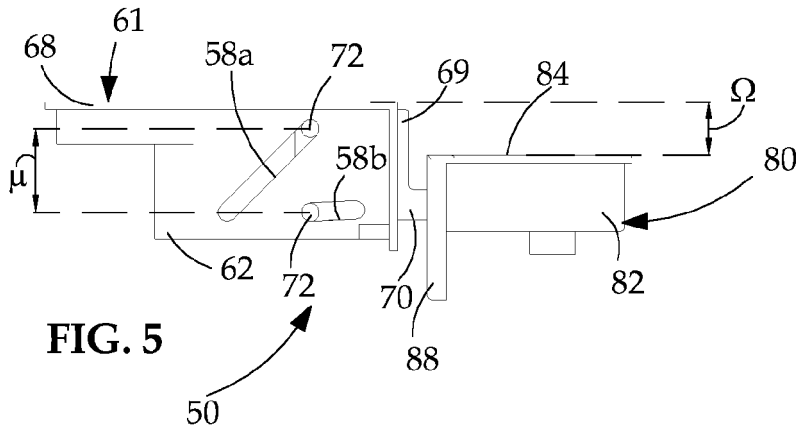

FIG. 5

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Description

[0001] The invention relates to a hinge assembly for the opening of (capsizing) drop-leaf doors, preferably with all the hinge body embedded in the furniture.

[0002] In the state of the art there are many items of furniture with leaf doors, wherein the hinges let the leaf move bringing it when it is closed (i.e. vertical) to a small distance from the others. For these hinges a basic problem is to reduce the distance (called air or capillary gap) between the various leafs when they are closed, because aesthetically the space between one and the other is not accepted. The reasons are also practical: the more the leafs are separated and the greater are the intrusion of dust (or little animals) and the accumulation of dirt. In sum, the air gap is a structural defect.

[0003] Some connecting-rod hinges, as in U.S. 6,332,660, reduce the air gap to 2.5 mm, but must be discarded for capsizing leafs because at the end of the opening movement the leaf is flush with the plane of the furniture and the connecting-rods come out from the plane. For example, for a leaf door that acts as a desk when opened, the protruding connecting-rods are unsightly and an obstacle to the writer.

[0004] Another commercially known type of hinge for furniture is shown in Figures 1-3. It consists of three pieces: a box 14 to be inserted inside a fixed plane 12; a box 34 to be inserted inside a leaf 32 and a connecting pin 36 mounted in the first two. By 46 are indicated in dashed line the edges of the necessary holes in the wood. The pin 36 is fixed in the box 14 by a screw, and comprises two pins 42, 44 sliding in guide grooves 40, 38 present in the box 34. The set of pins 42, 44 and grooves 40, 38 form an articulated quadrilateral, which allows the leaf 32 to rotate by 90 ° and come flush with the plane 12 when it is opened. Figure 3 shows in dashed lines the trajectories 48 of the outer edge of the leaf 32 in dependence of its thickness. E.g. to a thickness of 22 mm corresponds an air gap of 6.5 mm. These values, although accepted by the market, are too much for today's trends, and should be decreased to approach the ideal furniture with zero air gap between the closed leafs. Nevertheless, so far the hinges of the above type have never been able to retain below a certain minimum value the air gap, because of geometric constraints imposed by the topology of the hinge.

[0005] The invention proposes to solve this problem with a hinge that reduces the air gap between the leafs.

[0006] The solution is a hinge as defined in claim 1.

[0007] The technical effect of the hinge is a vertical offset of the leaf, which allows to recover in height part of the thickness of the leaf. Compared to Figures 1 ÷ 3, the hinge according to the invention is able to lift the leaf in the horizontal position with respect to the supporting surface of the shelf or base. The leaf's thickness recovered in height results in an equal reduction in the capillary gap. Note that the work-top of the open leaf is not invaded, because there are no parts of the hinge in relief, and the vertical offset is irrelevant to the user.

[0008] There are several preferred embodiments for the invention.

[0009] The fixed and movable member can have any shape (spherical, prismatic, etc.), and various structures, being sufficient that it acts as anchoring to the base. Preferably the fixed member is embeddable in a blind hole of the shelf and/or has a part or upper side (e.g. flat or almost) which is flush with the shelf. The same applies to the movable member. For the movable or fixed member it is preferred that one or both have a flat or almost flat side to be placed flush with the respective base or leaf. In this case, when the hinge is opened (that is, when the leaf is horizontal and in the end position) the flat or almost flat side of the movable member lies in a plane parallel and offset with respect to that on which lies the flat or almost flat side of the fixed member.

[0010] The pins can be made either on the arm or on the movable member, and, correspondingly, the guiding grooves are on the movable member or the arm.

[0011] The grooves can have various lengths and shapes: both straight, one straight and one curved, both curved. Straight ones are preferred for simplicity of construction, but more complex shapes allow more efficient leaf movements and air gaps. An embodiment which proved simple, reliable and without jamming is defined in claim 3. Despite the hinge can obtain said offset in height by varying one or more of its constructive parameters (e.g. shape, position and length of the grooves, shape of the arm, form of the fixed or movable element, spacing of the pins) it is preferred for simplicity to act on the position of the pins, by placing them as defined in claim 4. Another possibility is referred to in claim 5.

[0012] Another design variable, to be exploited independently of the others to obtain the offset, is, as mentioned, the shape of the arm. Preferably it is produced as defined in claim 6. The straight segment can be blocked or even integral in one-piece to the fixed element. The development of the head carrying the pins in the direction opposite to the body of the fixed member allows to adjust the final position in vertical of the open leaf.

[0013] To maximize the concealment of the parts in view in the furniture the movable member can comprise the elements defined in claim 7. So the arm can be inserted therein and be moved by embedding the movable member into the leaf. To minimize the holes on the leaf the movable member preferably has only one edge, opposite to the open side, which extends to form a lip, e.g. drilled for a fixing screw. Again, for reasons of minimum interference in the furniture, the fixed member preferably comprises the elements defined in claim 8. Thus the joint takes place on an edge, and is easy to do. To improve the fastening to the shelf, the fixed member can have a flange which extends around the open

side perpendicular to the upper part (e.g. flat) and preferably has through-holes for a screw.

[0014] To facilitate the movement of the leaf, the flange - or in general a portion of the fixed member - can comprise a recess as defined in claim 8. Basically the profile of the shelf "seen" by the leaf is carved or recessed, thereby increasing the movement trajectories of the leaf. This is very important in the search for movements to move the leaf between the two open/closed end-positions inside increasingly small spaces (the air gap between the leafs which one wants to minimize).

[0015] The invention also proposes a mounting and/or guiding method of a leaf, as in Claim 10. The structure of a hinge as in figures 1-3 is used, modifying it so as to obtain said already described vertical offset for the leaf in the end position.

[0016] The advantages of a hinge according to the invention will be more apparent from the following description of a preferred embodiment, having reference to the attached drawing in which

Figure 1 shows a cross-section view of a known hinge according to the plane II;
Figure 2 shows the known hinge in plan view;
Figure 3 shows a cross-section view of the known hinge when in use on a furniture;
Figure 4 shows a side view of a hinge according to the invention when disassembled;
Figure 5 shows a side view of the hinge of fig. 4 when assembled;
Figure 6 shows in perspective view the hinge of fig. 4 when disassembled;
Figures 7 to 10 show the hinge of fig. 4 in an opening sequence of the leaf.

[0017] A hinge 50 is formed by three components: a fixed member 80, a movable element 60 and a separable connecting arm 52. In the drawings they are shown with the orientation that they assume during use. The fixed member 80 is to be inserted into a blind hole of a shelf or base 98, and comprises a body 82 in the form of a small basin or box. The body 82 has the upper part 84 which is flat, and an opening 86 on one side adapted to receive one end of the arm 52. From the open side a fixing flange 88, which has through holes 89 for a screw, extends perpendicularly to the upper part 84. The flange 88 comprises two recesses 87 at the sides of the opening 86. The upper part 84 is to be mounted flush with the shelf 98, while the flange 88 is arranged on its edge.

[0018] The movable member 60, which in turn is embeddable in a blind hole made in the edge of a leaf 96, comprises a body 62 shaped like a small basin or box with a flat upper surface 61. The body 62 has an open cavity 66 which renders it open on two adjacent sides, while on the opposite side it has an edge which extends to form a fastening lip 68, in which a hole 56 for a screw is present.

[0019] The flat surface 61 is disposed flush with the plane of the leaf 96, and the lip 68 is screwed at it. The side walls of the cavity 66 each comprise two rectilinear guiding grooves 58a, 58b. The grooves 58a, 58b have a respective axis M1, M2 (see Figure 4 and 7) inclined with respect to the plane passing through the surface 61, respectively of about 45° and 3°.

[0020] The arm 52 comprises a forked end 54, destined to be made integral to the fixed member 80 via a screw, an intermediate rectilinear segment 70 and another end 66 comprising a head 69 e.g. having a cubic shape. The head 69 is used to have an upwards development orthogonal to the segment 70 and to carry in integral manner (e.g. in one-piece) four pins 72, two on one side and two on the opposite side. The pins 72 have a horizontal axis and are two by two coaxial. In substance, the arm 52 has a symmetrical structure along a vertical median plane.

[0021] With the assembled hinge the head 69 is arranged in an oscillating manner and with little play in the cavity 66, so that the pins 72 are inserted and can slide in the respective grooves 58a, 58b (see e.g. Fig. 5 showing the hinge 50 in the open configuration). The elastic deformation of the cavity 66 is enough for the insertion of the pins 72, or they may be separate elements and inserted when needed in holes of the head 69.

[0022] From Fig. 5 it can be noted that the pins 72 have axes aligned vertically with each other, and the two upper pins, coaxial, are at a height Δ greater than the lying plane of the upper part 84, and therefore also than the flat surface of the shelf 98.

[0023] The following table refers to the dimensions shown in Figure 7 and shows preferred values, which experimentally were more favorable:

VARIABLE	RANGE	PREFERRED
α	about 45°	45°
ß	about 35° to about 45° (or 44 °)	42°
Δ	about 3.5 to 6, 5 mm	5 mm
μ	about 7 mm to 12 mm	10 mm,

wherein

α is the angle (acute) that the axis M1 forms with the plane passing through the surface 61;
β is the angle (acute) that the axis M2 forms with the plane passing through the surface 61;
Δ is the distance between the upper pin 72 and the surface 84, and μ is axis spacing of the pins 72.

[0024] The advantage of these values is the obtainment of a minimum air gap between the leafs, down up to 3 mm for leafs thick 20 to 25 mm. Although for different leaf and shelf thicknesses from time to time it is better to calibrate the hinge on a precise value, which ensures minimum air gap and no contact between the stacked leafs, it was found that the optimum values are always in the ranges mentioned above, which therefore are "golden" intervals and mutually independent between each other. By looking at Figures 7 to 10, one can understand the operation of the hinge 50. As the leaf 96 is lowered, the pins 72 move inside the guides 58a, 58b, whose geometry ensures for the leaf 96 a movement outgoing from the furniture inside the micro air gap without impacts with other leafs 99 (in dashed lines in fig. 8). For some combination of values or thicknesses, the innermost edge of the movable member 60 could get stuck on the flange 88. The presence of the recess 87, totally optional, eliminates this drawback, allowing the transit of the edge and the adoption of more complex trajectories for the leaf 96. At end position, see figure 10, the leaf 96 becomes parallel to the shelf 98. Thanks to the fundamental characteristic of the hinge 50 to be configured so that in this position the surface 61 is at a vertical height greater than that in which the surface 84 lies, the leaf 96 is also offset in height with respect to the shelf 98. The offset is indicated by Ω, and is, for example. 8 mm

Claims

1. Hinge assembly for a drop leaf (96) capable of letting the leaf rotate from vertical to horizontal by a rotation of approximately 90 degrees to make it parallel to a stationary base (98) having a horizontal support surface, comprising

   - a fixed member (80) to be mounted on the base;
   - a movable member (60), to be fixed at the edge of the leaf, with a surface having an open cavity (66);
   - a connecting arm (52) having one end integral with the fixed member and the other end arranged swingingly into the cavity,

   wherein the movable member is guided with respect to the arm along a rotation of approximately 90 degrees by at least a pair of pins (72) integral with the arm, the pins being, in use, with horizontal axis and slidingly inserted into two respective guide grooves (58a, 58b) made in the movable member, or in the arm, **characterized in that**
   the hinge is configured in such a way that in the horizontal position the leaf has a horizontal surface in sight that lies in a plane parallel and offset with respect to that on which lies the support surface of the base.

2. Hinge assembly according to claim 1, wherein

   - the fixed member has a flat or almost flat side (84) to be placed flush with the base;
   - the movable member has a flat or almost flat side (61) to be placed flush with the leaf, and

   the hinge, when is opened, is configured so that the flat or almost flat side of the movable member lies on a plane parallel and offset with respect to that on which lies the flat or almost flat side of the fixed member.

3. Hinge assembly according to claim 1 or 2, wherein the grooves are straight and each have a longitudinal axis (M1, M2) that, when the leaf is in the end-of-travel position, is inclined with respect to a horizontal plane about 45 degrees and the other about 1 degree to 10 degrees, preferably 3 degrees.

4. Hinge assembly according to claim 2 or according to claim 2 and 3, wherein the pins have axes two by two coinciding, parallel to the plane that contains said side of the fixed member and lying on a plane perpendicular to said side, the axis of at least one pin being (i) at a distance from said plane containing said side and (ii) on the opposite side to the fixed member.

5. Hinge assembly according to claim 4, wherein said distance (Δ) from said plane ranges from 3.5 mm to 6.5 mm, and the distance (μ) between the pins ranges from 7 mm to 12 mm, preferably 10 mm.

6. Hinge assembly according to any one of the preceding claims, wherein the arm comprises a straight segment (70), which extends from the fixed member and ends with a head (69) that develops orthogonally to the straight segment in direction toward said side of the fixed element, the head carrying the pins.

7. Hinge assembly according to any one of the preceding claims, wherein the movable member comprises a box-like

or bowl-like shaped body, with the top part substantially flat (61), the body having a cavity (66) which renders it open on two adjacent sides and having on the opposite side an edge that extends to form a fastening lip (68).

8. Hinge assembly according to any one of the preceding claims, wherein the fixed member comprises

- a body shaped like a bowl or box (82), with the top (84) part essentially flat and open on one side to receive the connecting arm, and
- a mounting flange (88) that extends around the open side perpendicularly to the surface of the fixed member.

9. Hinge assembly according to any one of the preceding claims, wherein the fixed member comprises a recess (87) in which an edge of the movable member can pass during its rotation with the leaf.

10. Method for guiding a drop leaf (96), with respect to a stationary and horizontal base member (98), from vertical to an opening end-of-travel horizontal position in which it is rotated about 90 degrees and has an upper surface parallel to a flat surface of the base, **characterized by**
mounting and/or making a hinge as defined in the pre-characterizing part of claim 1 so that in the open end-position the upper surface of the leaf remains at a level higher than the flat surface of the base.

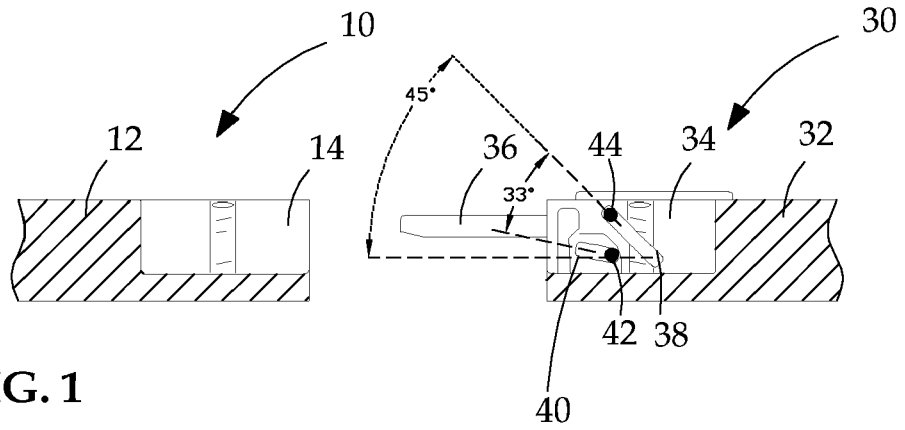


FIG. 1

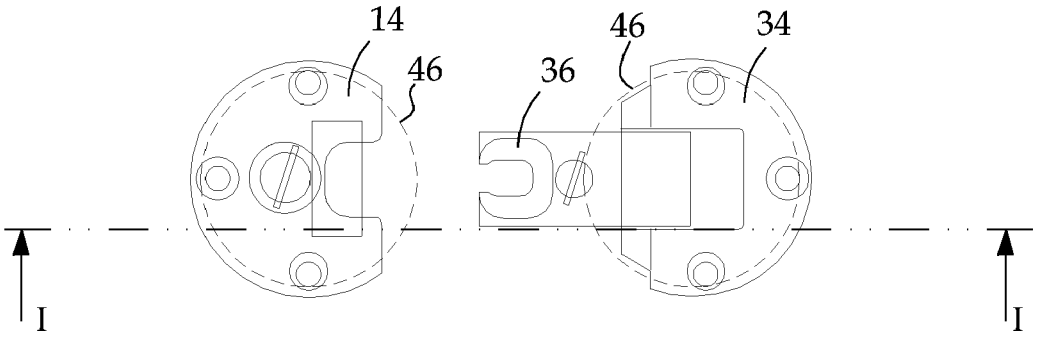


FIG. 2

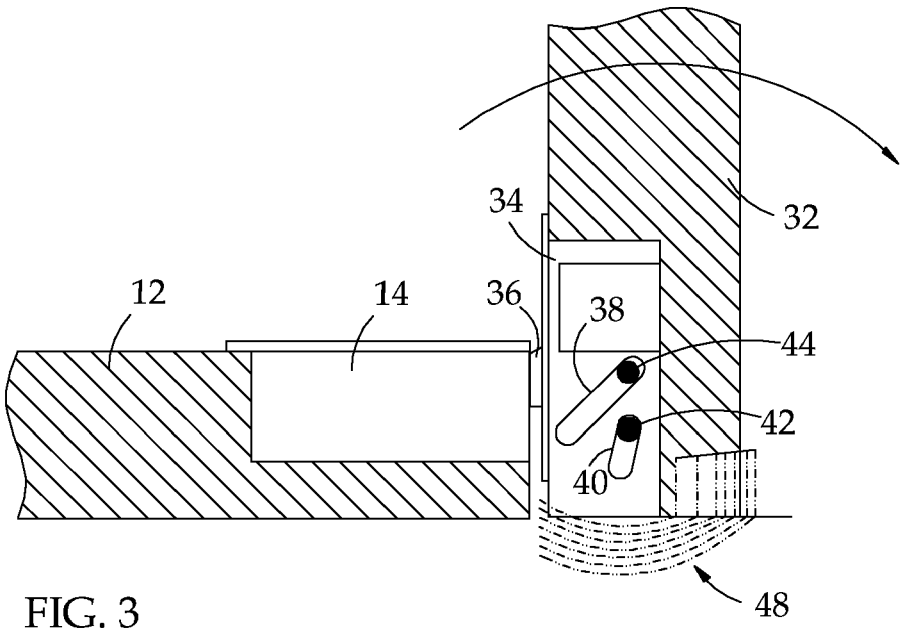


FIG. 3

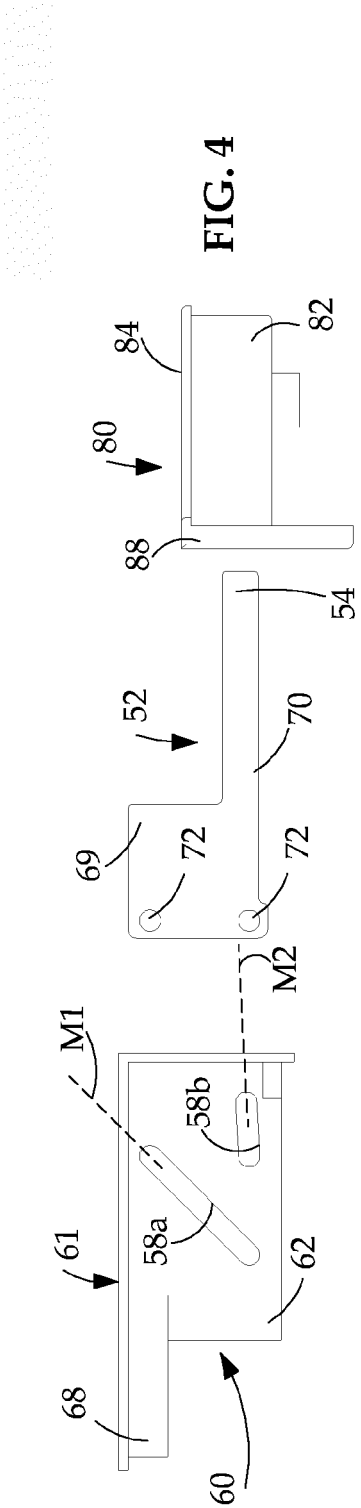


FIG. 4

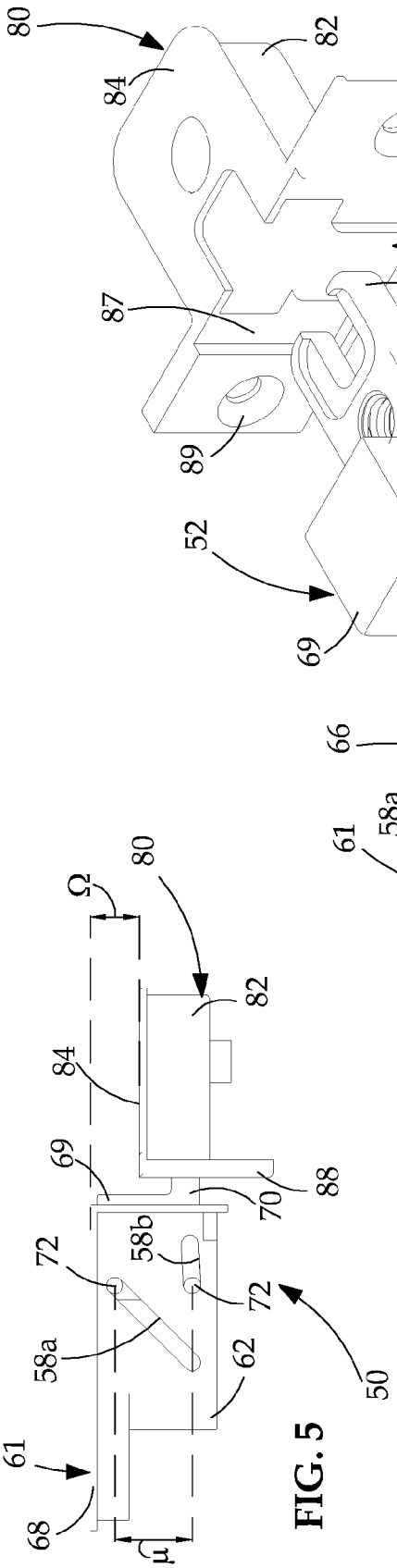


FIG. 5

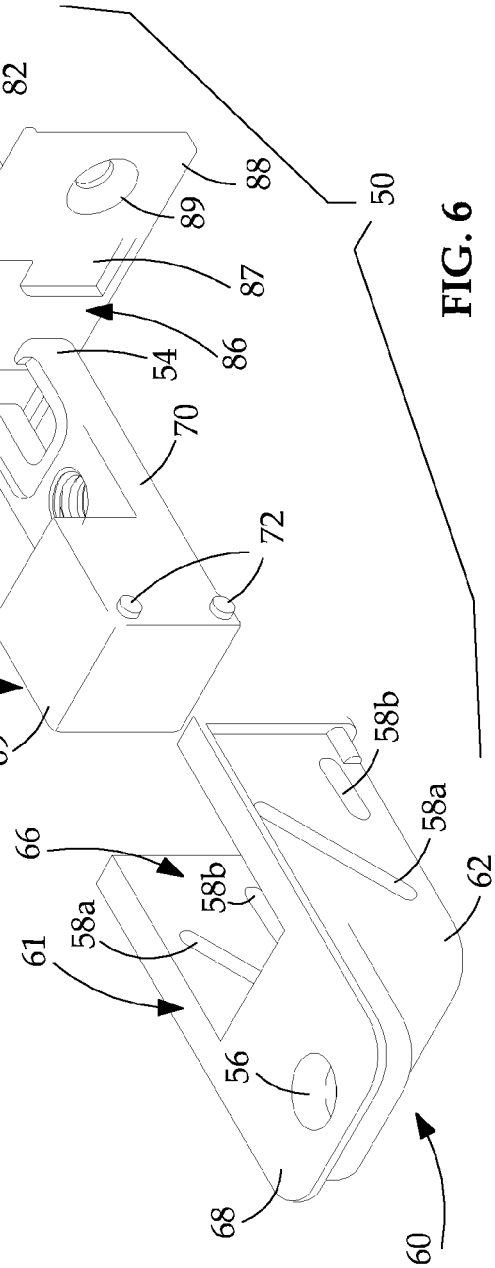
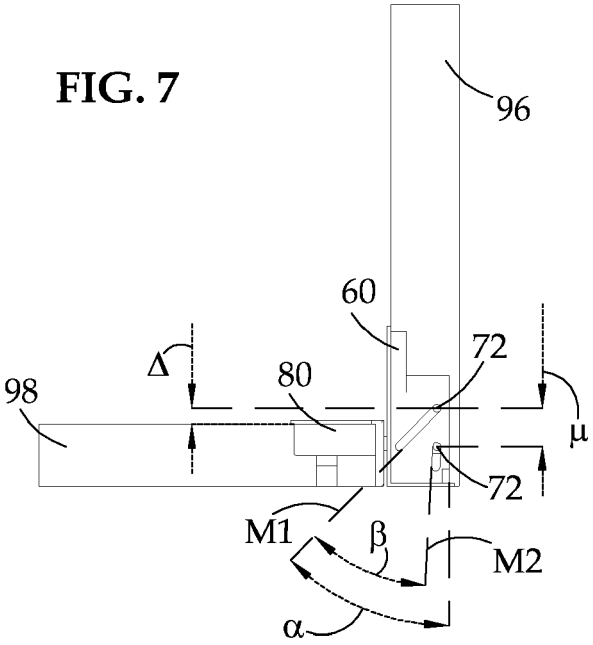


FIG. 6

FIG. 7



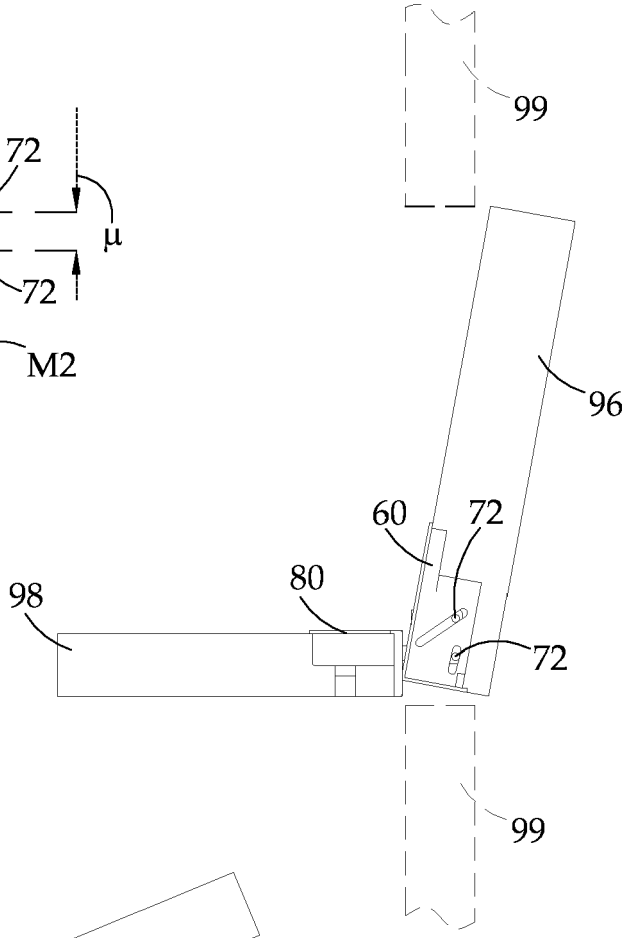


FIG. 8

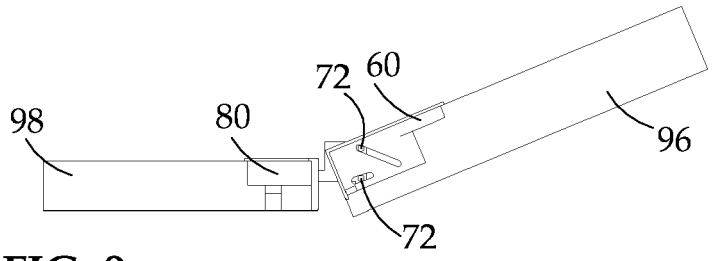


FIG. 9

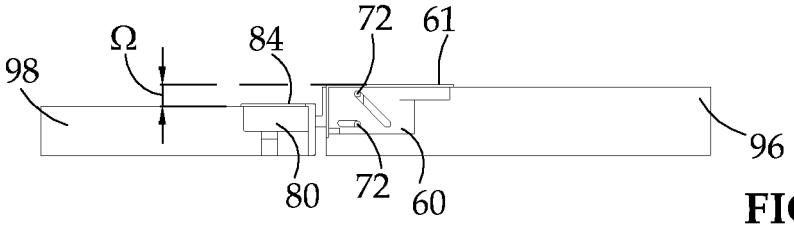


FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 2379

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 15 59 943 A1 (LAUTENSCHLAEGER KG KARL) 14 May 1970 (1970-05-14) * page 4, paragraph 2; figures 1-4 *	1,2,4-6, 10	INV. E05D3/18
X Y	DE 19 64 577 A1 (HETTICH F KG) 27 August 1970 (1970-08-27) * page 5, paragraph 2 - page 9, paragraph 1; figures 3,6 *	1-7,10 8	
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Y	US 4 397 064 A (LAUTENSCHLAEGER HORST [DE] ET AL) 9 August 1983 (1983-08-09) * column 3, line 50 - column 4, line 58; figure 1 *	8	

TECHNICAL FIELDS SEARCHED (IPC)

E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 March 2012	Guillaume, Geert

CATEGORY OF CITED DOCUMENTS

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16-03-2012

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

REFERENCES CITED IN THE DESCRIPTION

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