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(54) Hinge assembly for tilt-and-turn window fixtures

(57) 1. A hinge assembly for windows of the tilt-and-turn type, comprising a lower hinge body (1) to be fixed to a window frame (2) and a upper hinge body (3) to be fixed to the mobile portion (4) of the window as well as a hinge pin (5) engaging with respective hub portions (1a, 3a) of said lower and upper hinge bodies. The hub portion (3a) of upper hinge body (3) have a circular axial seat (9) for pivotally engaging a corresponding cylindrical portion (5a) of said pin. The pin comprises a shaped portion (5b) engaging with said hub portion (1a) of said lower hinge body (1) in a not rotatable way with respect to its own axis, but angularly displaceable therewithin on a plane containing said axis and perpendicular to the window plane. The pin further comprises an intermediate annular body (5c) acting as an abutment and placed between the shaped portion (5b) and the cylindrical portion (5a) and slidably abutting on a end of hub portion (1a) of the lower hinge body (1), the centre of rotation (C) of the angular displacement being located substantially at the other end thereof.

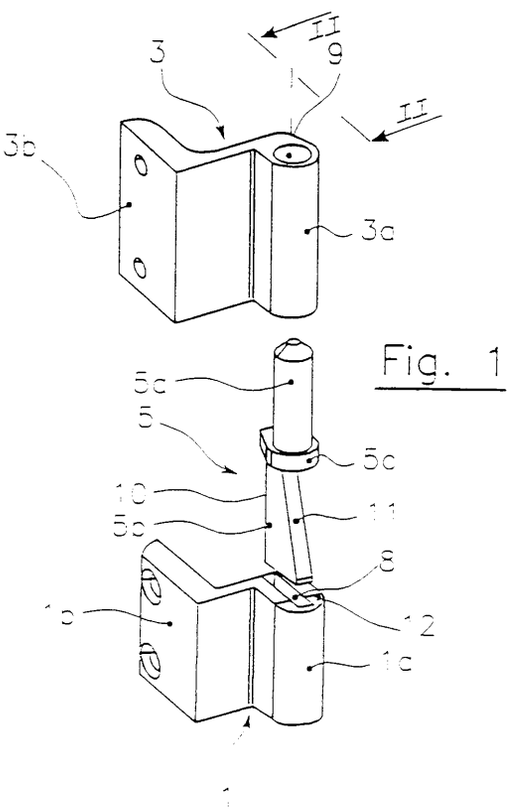


Fig. 1

EP 1 074 687 A2

Description

[0001] The present invention relates to a hinge assembly for windows and doors of the type which can be opened both in the leaf mode, i.e. by turning of their mobile part around a vertical axis, and in the tiltable mode, i.e. by rotation of their mobile part around an horizontal axis.

[0002] The windows and doors requiring a tilt-and-turn type opening are provided with hinges allowing both way of opening and a device associated to the handle which allows the window or door to be opened according to the requested mode. In particular, the leaf type opening is obtained by a 90° rotation of the actuating handle starting from its closure position, i.e. the mobile part of the window opens by rotating on a pair of vertically aligned side hinges. The tiltable mode opening is obtained by means of a 180° rotation of the actuating handle with fulcrum on the lower side hinge; a upper stop arm, extending between the upper edge of the mobile part and the fixed window frame, supports the mobile part in a tilted position. Solutions in which a 90° rotation allows for the tiltable mode opening and a 180° rotation the leaf mode opening are also known.

[0003] The lower side hinge performs the double task of allowing for the rotation of the mobile part around its vertical axis and, as an alternative, around an horizontal axis. In order that the lower hinge can work appropriately in the tiltable mode, it is essential that the horizontal axis of rotation be placed as lower as possible and preferably into alignment with the lower edge of the mobile part so as to prevent said edge from bumping into the window frame when opening in the tiltable mode. Furthermore, in the leaf mode opening, the lower hinge must support all the weight of the window as the upper hinge is disengageable from the mobile part.

[0004] In a known type of tilt-and-turn type window the above problem is solved by positioning the hinges beyond the lower end of the mobile part, this clearly resulting in a large and complex hinge structure with comparatively high production costs. Moreover, this type of solution sacrifices considerably the aesthetic appearance of the window.

[0005] In another type of tilt-and-turn type window disclosed in EP-A-0478519 the same problem is solved by positioning the lower side hinge at an higher level, but carrying out the horizontal rotation by sliding the whole lower side hinge on an arched support integral to the frame. More particularly, the lower body of the hinge has a bracket engaging with a box-like body integral with the fixed frame. The bracket is shaped with a concavedly arched base resting on an equally shaped support extending at the bottom of the box-like body and is also connected to said body by means of a transverse pin crossing the bracket in correspondence of a slot, the width of which defines the maximum angular displacement of the window. This solution is expensive and difficult to assemble. Furthermore, since the lower hinge body must bear the weight of the window and must be oscillating to allow the window opening according to the tiltable mode, it obviously exhibits a lower load capacity with respect to a similar, fixed and screw-secured component.

[0006] The object of the present invention is to provide a hinge assembly for tilt-and-turn type windows capable of being mounted at a certain distance from the lower edge of the mobile part even though the horizontal axis of rotation is close to said edge, and having a structure particularly simple and, therefore, inexpensive and, at the same time, not sacrificed as regards its load capacity.

[0007] The above object is reached with the hinge assembly according to the present invention, the essential features of which are set forth in the appended claim 1.

[0008] Substantially, in the hinge according to the present invention the tiltable opening mode is performed by providing a pin which engages with the hub portion of the lower body of the hinge in a not pivotal way, but angularly movable around a rotation center substantially at the lower end of the hub portion of the hinge lower body, i.e. the end close to the lower edge of the window.

[0009] Advantageously, the possibility of angularly displacing the pin can be achieved by properly shaping the pin portion which engages with the hub portion and/or the corresponding seat formed therein. In particular, the seat may have a rectangular cross-section and the pin portion engaged therewith may be of a flat, elongate shape with a side parallel to the pin axis and the other one inclined with respect to it and with the maximum width at the free end.

[0010] Features and advantages of the hinge for fixtures of the tilt-and-turn type according to the present invention will be apparent from the following description of an exemplifying and nonlimiting embodiment made with reference to the attached drawings, wherein:

- Figure 1 is an exploded schematic view of the hinge assembly according to the invention;
- Figure 2 is a transverse cross-sectional view of the hinge in the leaf opening mode, taken along line II-II of figure 1;
- Figure 3 is a transverse cross-sectional view similar to that of figure 2, but with the hinge in the tiltable opening mode;
- Figure 4 is a partial schematic view of the hinge according to the invention mounted on a conventional fixture of the tilt-and-turn type;
- Figure 5 is a plan view of the fixture portion shown in figure 4 according to the direction F;
- Figure 6 shows the portion of fixture according to arrow G of figure 4 opened in the tiltable mode;
- Figure 7 is a perspective view of a possible embodiment of a pin for the hinge of the invention;
- Figure 8 is a perspective view of the metallic core of the pin of figure 7;
- Figure 9 is a longitudinal section of the pin of figure

7.

[0011] With reference to the attached drawings, 1 denotes a lower body of a hinge fixable to a fixed frame 2 of a window and 3 an upper body of the hinge fixable to the mobile part or leaf 4 of the window. Furthermore, 5 denotes a pin pivotally connecting lower hinge body 1 to upper hinge body 3.

[0012] Lower hinge body 1 comprises a hub la and an angle bracket 1b extending from hub 1a for connecting lower hinge body 1 to fixed frame 2 by means of screws 6. Likewise, upper hinge body 3 comprises a hub 3a and an angle bracket 3b extending from hub 3a for connecting upper hinge body 3 to leaf 4 by means of screws 7. Hub la of lower hinge body 1 has an axial seat 8 of substantially rectangular cross-section extending from one end to the other one of hub la. The major axis of the section of seat 8 lies on a plane perpendicular to the window plane and containing the axis of pin 5. Hub 3a of upper hinge body 3 has an axial seat 9 of circular cross-section extending from one end to the other thereof.

[0013] Pin 5 comprises a cylindrical portion 5a and a flat portion 5b separated by an intermediate abutting ring 5c. Cylindrical portion 5a can be pivotally engaged within seat 9 of hub la of upper hinge body 3, while flat portion 5b can be engaged within axial seat 8 of hub la of lower hinge body 1.

[0014] Flat portion 5b is of a length substantially equal to that of axial seat 8 and its maximum width is in correspondence of its free end, the width progressively decreasing while approaching to the intermediate abutting ring 5c. To that end, opposite sides 10 and 11 of flat portion 5b are parallel to the axis of pin 5 and, respectively, inclined toward said axis. The section of the free end of flat portion 5b is substantially equal to that of axial seat 8 of hub la, whereby the mutual engagement occurs with a minimum clearance sufficient to define a not pivotable coupling while allowing for the relative sliding between the faces of flat portion 5b and the respective inner faces of axial seat 8. In this way, between inclined side 11 of flat portion 5b and the confronting side of axial seat 8 a substantially triangular room is formed, in which flat portion 5b can be displaced angularly on the plane of the axis of pivot 5 and perpendicular to the window plane and having a rotation centre in correspondence of the free end of flat portion 5b.

[0015] Advantageously, the edge of hub la, on which the intermediate ring 5c of pin 5 abuts, has a rounded portion 12 at the side opposite to that from which angular bracket 1b extends and in correspondence to one of the minor sides of the rectangular, axial seat 8. The radius of curvature R of rounded portion 12 can be any, but preferably such as to allow for a continuous sliding of intermediate ring 5c thereon. In particular, this radius can be substantially equal to the length of axial seat 8, whereby the centre of rotation of pin 5 and the centre of curvature of rounded portion 12 coincide and are both substantially at the level of the lower edge of hub la. In order to allow the hinge to be used with both right and left leaves, rounded portion 12 can be formed on both ends of hub la, as shown in figures 2 and 3.

[0016] The operation of the hinge according to the invention is clear from the above description. With particular reference to figures 2 and 3, in the leaf opening mode the hinge is the condition shown in figure 2, i.e. side 10 of flat portion 5b, parallel to the axis of pin 5, abuts against a inner side of axial seat 8. In these conditions the leaf rotates around cylindrical portion 5a without relative movements between pin 5 and lower hinge body 1, as the flat shape of flat portion 5b of pin 5 does not allow the rotation of pin 5 around the vertical axis. In this case the weight of the leaf is borne by lower hinge body 1 through intermediate abutting ring 5c.

[0017] In the tiltable opening mode the hinge is in the condition shown in figure 3 and the leaf rotates around an horizontal axis passing through centre of rotation C and inclined side 11 of flat portion 5b abuts against the opposed inner side of axial seat 8. This is made possible by virtue of the shape of flat portion 5b of pin 5 that leaves a free room within axial seat 8 between inclined side 11 of flat portion 5b and a inner side of axial seat 8, thus allowing pin 5 to accomplish an angular displacement around centre of rotation C substantially equal to the inclination angle α of inclined side 11 with respect to the axis of pin 5. Even in this case the weight of the leaf is carried by lower hinge body 1 through intermediate ring 5c of pin 5. Moreover, as also shown in figure 6, the tiltable type opening of the leaf is obtained while preventing the lower portion 13 of leaf 4 from significantly approaching to side 14 of fixed frame 2, as centre of rotation C is substantially aligned to the lower end of lower hinge body 1.

[0018] Compared to the similar, conventional hinges, the hinge according to the invention can be mounted at an higher level with respect to the lower edge of the leaf, even though the axis of rotation is very low close to said lower edge, and, furthermore, has a considerably simple structure without additional components. This results in a lower production costs and makes easier mounting operations.

[0019] Pin 5 can be made of metal or plastics in one piece only, or by assembling its component parts even made of different materials, for example by providing for an antifriction plastic coating on the cylindrical portion 5a and on the intermediate ring 5c.

[0020] Figures 5, 6, 7 and 8 show a currently preferred embodiment of the pin used in the hinge according to the invention. In the depicted embodiment, pin 5 is formed by a flat metallic core 15, a portion 15a of which is of an elongate rectangular shape, while the other portion 15b is of substantially trapezoidal shape and forms the flat shaped portion 5b of pin 5. On portion 15a is secured, in any known way, a coating 16 of plastic material, which preferably has antifriction properties, of cylindrical shape and such section that it can engage with

seat 9 of upper hinge body 3.

[0021] Intermediate annular body 5c is obtained in a similar way by forming an annular enlargement 17 in the same material around the intermediate portion of core 15 in correspondence of the region from which parts 15a and 15b of core 15 extends. Obviously, pin 5 can be made in different ways, but equivalent from the functional point of view, as will be clear to a person skilled in the art.

[0022] Several variations and modifications can be made to the hinge according to the invention. For example, flat portion 5b of pin 5 can be shaped in a different way, in particular it can be lightened with respect to the depicted embodiment. The lightening can result in the removal of a portion of side 10 parallel to the axis of pin or a portion of inclined side 11. It is also clear that an equivalent result can be achieved with a mirror solution according to which the portion of pin 5 engaging with lower hinge body 1 is made of flat shape and constant width, while seat 8 of hub portion la thereof is shaped in such a way that one side is inclined with respect to said axis to make possible the angular displacement which allows tiltable mode opening of the window.

[0023] Other variations and/or modifications may be brought to the hinge according to the invention without departing from the scope thereof as set forth in the appended claims.

Claims

1. A hinge assembly for windows of the tilt-and-turn type, comprising a lower hinge body (1) to be fixed to a window frame (2) and a upper hinge body (3) to be fixed to the mobile portion (4) of the window as well as a hinge pin (5) engaging with respective hub portions (1a, 3a) of said lower and upper hinge bodies, the hub portion (3a) of said upper hinge body (3) having a circular axial seat (9) for pivotally engaging a corresponding cylindrical portion (5a) of said pin, said hinge being characterized in that said pin comprises a shaped portion (5b) engaging with said hub portion (1a) of said lower hinge body (1) in a not rotatable way with respect to its own axis, but angularly displaceable therewithin on a plane containing said axis and perpendicular to the window plane, said pin further comprising an intermediate annular body (5c) acting as an abutment and placed between said shaped portion (5b) and said cylindrical portion (5a) and slidably abutting on a end of said hub portion (1a) of said lower hinge body (1), the centre of rotation (C) of said angular displacement being located substantially at the other end thereof.

2. Hinge according to claim 1, wherein an axial seat (8) of substantially rectangular section is formed in the hub portion (1a) of said lower hinge body (1) and the shaped portion (5b) of said pin is an elongate flat portion for engaging without play within said axial seat, said flat portion having one side parallel to the axis of the pin and the opposite one inclined toward said axis in such a way to result of decreasing width starting from the free end thereof, said flat portion performing said angular displacement around said rotation center to carry out the tiltable opening mode between a first position, in which the side parallel to the axis of the pin abuts against an inner side of the axial seat (8), in said position the upper hinge body being able to rotate around the cylindrical portion of the pin to carry our the leaf opening mode, and a second position in which the inclined side of said flat portion abuts against the opposite inner side of said axial seat.

3. Hinge according to claim 1 or 2, wherein at least on the end of the hub portion (1a) of said lower hinge body (1) on which said intermediate annular body (5c) slidably abuts there is formed a rounded end portion (12).

4. Hinge according to claim 3, wherein said rounded end portion (12) is formed on both ends of hub portion of said lower hinge body.

5. Hinge according to claim 3, wherein said lower hinge body (1) and said upper hinge body (3) comprise angle brackets (1b, 3b) extending from respective hub portions for the connection to the frame (2) and to the mobile portion (4) respectively and wherein said rounded end portion (12) is formed an at least one end of the hub portion of said lower hinge body at the opposite side with respect to said angle bracket (1b).

6. Hinge according to any one of the previous claims, wherein said pin is formed of several components suitable of being assembled.

7. Hinge according to any of the previous claims, wherein said pin is formed by a flat metal core (15), a part of which is of substantially trapezoidal shape (15b) and forms the flat shaped portion of said pin, the other part of said core being of an elongated rectangular form (15a), a substantially cylindrical plastic coating (16) being secured thereon and constituting the cylindrical portion of said pin, said abutting annular body consisting of a plastic expansion (17) in an intermediate position around said core.

8. Hinge according to any one of the previous claims, wherein the flat portion (5b) of said pin is lightened at the side parallel to the axis of said pin or at its inclined side.

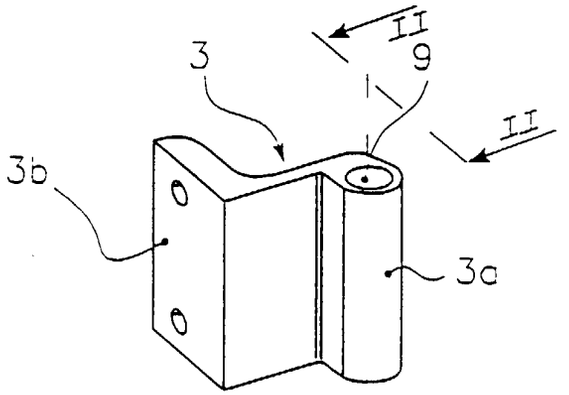
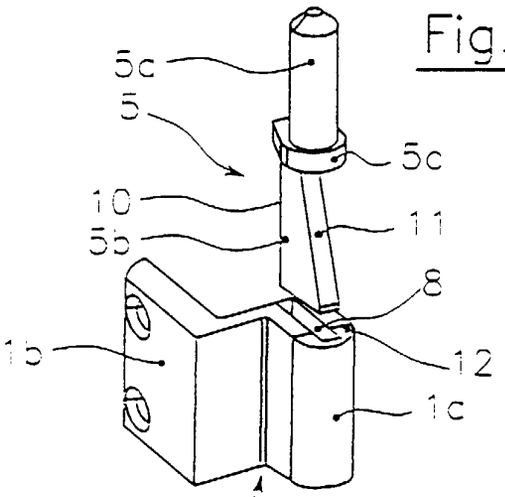


Fig. 1



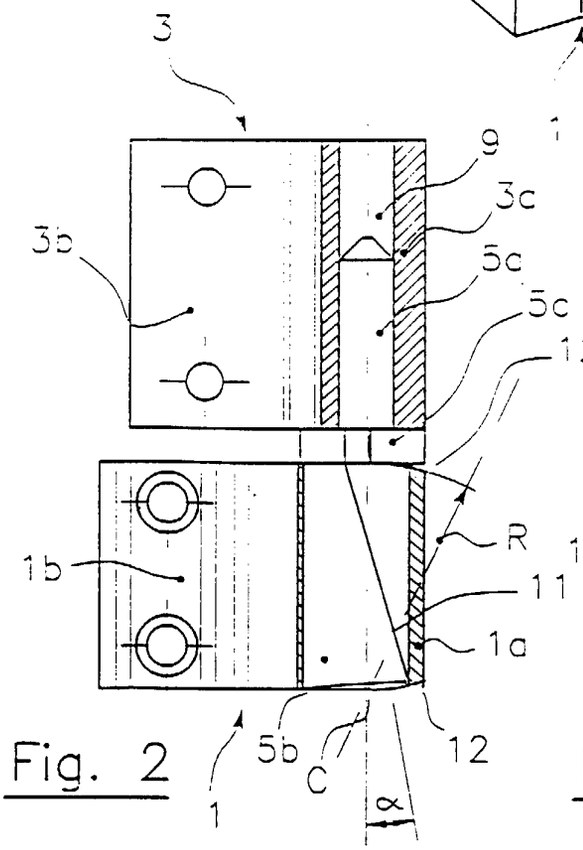


Fig. 2

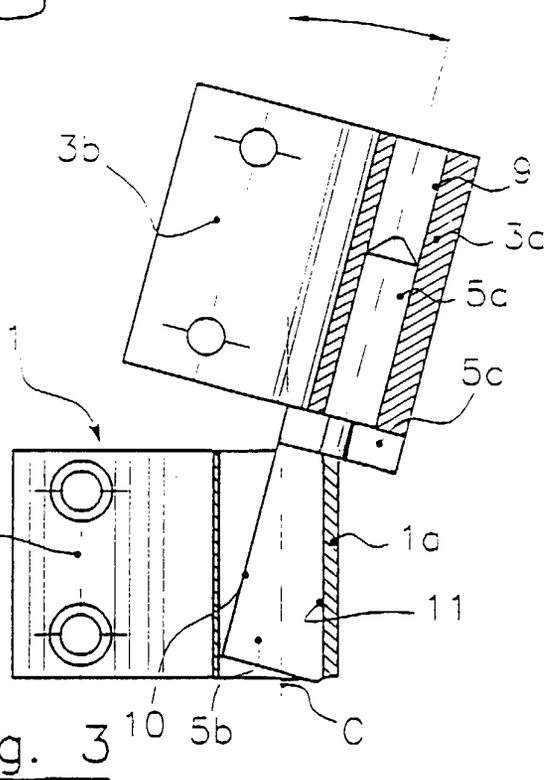
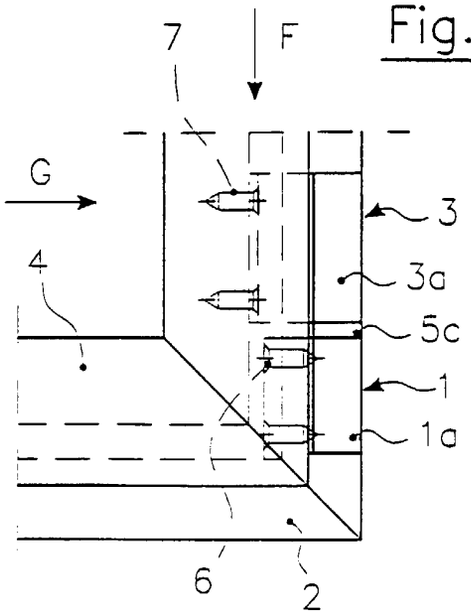


Fig. 3

Fig.4



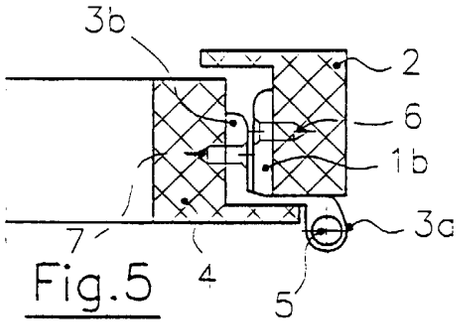


Fig.5

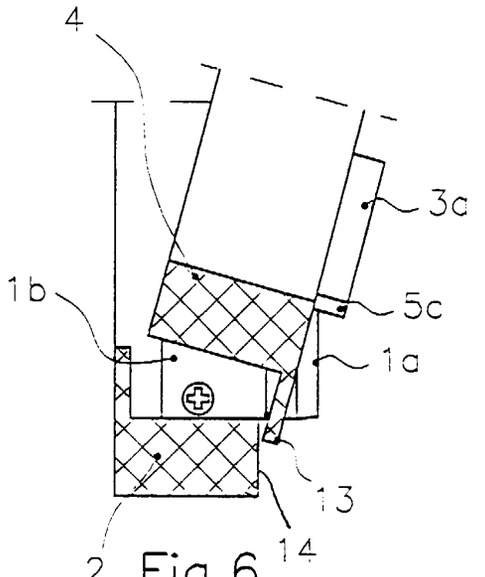


Fig.6

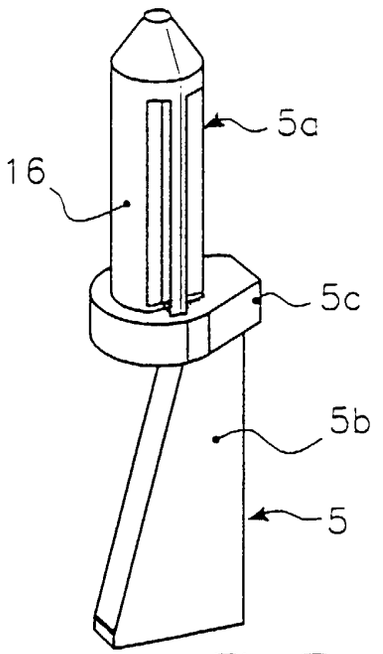


Fig.7

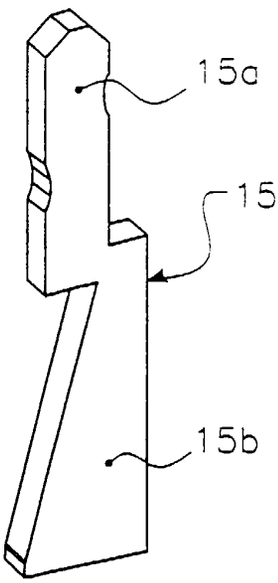


Fig.8

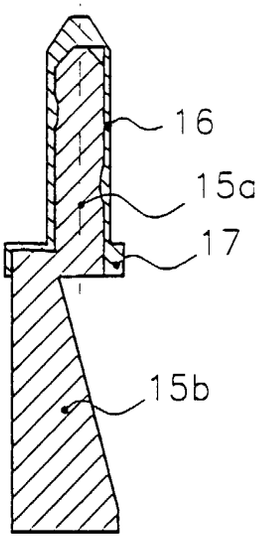


Fig.9