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(11) **EP 0 969 172 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**05.01.2000 Bulletin 2000/01**

(51) Int. Cl.<sup>7</sup>: **E05D 7/04**, E05D 5/08

(21) Application number: **98830395.4**

(22) Date of filing: **01.07.1998**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**

Designated Extension States:  
**AL LT LV MK RO SI**

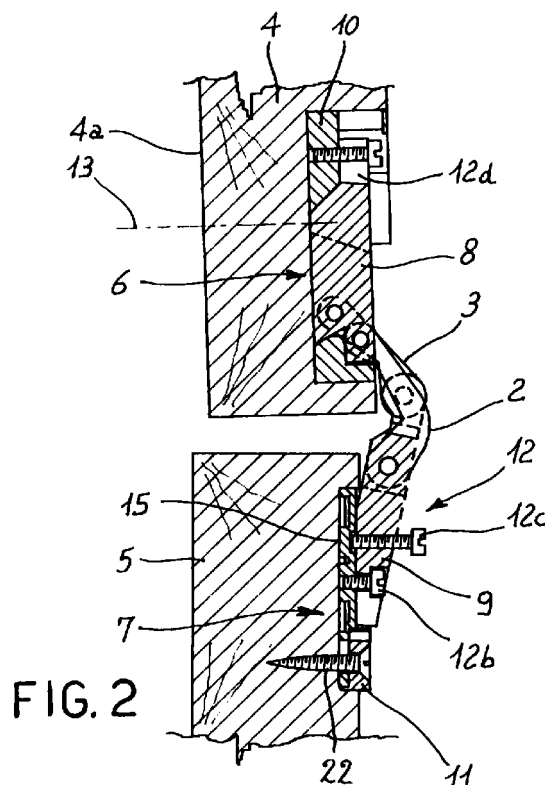
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(54) **Hinged-connection device, in particular for wardrobe and cabinet doors**

(57) A hinged-connection device is provided, in particular for cabinet doors, comprising at least two swinging rods (2, 3) and two attachment sets (6, 7) to be connected with a cabinet door (4) and a cabinet post (5), respectively. At least one of the attachment sets (6, 7) is provided with a positioning element (11) of circular profile (11a) and a bearing body (15) to be fastened to a plurality of operating positions relative to the positioning element (11). The bearing body (15) is shiftable relative to the positioning element (11) in the door or post plane along a substantially horizontal movement axis (16).



**FIG. 2**

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## Description

**[0001]** The present invention relates to a hinged-connection device, in particular for wardrobe and cabinet (in the following cabinet) doors.

**[0002]** It is known that hinged-connection devices for cabinet doors or similar furniture components may each comprise at least two swinging rods hinged on appropriate attachment elements in turn in engagement with a door and an upright or post.

**[0003]** Practically these swinging rods, in addition to supporting a door weight, define an appropriate opening and closing path for said door, which is characterized by a non-fixed but varying rotation axis enabling the door both to be put in abutment against the post edges when it is in its closed position, and to form a very wide opening angle, even wider than 90°.

**[0004]** Common attachment elements associated with the ends of the swinging rods are generally made up of a single piece of circular conformation which, during assembling, is fitted into and fastened to a mating cavity formed in the cabinet door or post.

**[0005]** Due to the nature of the components briefly described above and as a result of their coupling for mounting, it is only possible to make hinges of great stiffness and little versatility.

**[0006]** It is to point out that due to interposition of a single attachment between the swinging rods and the cabinet door or post (or interposition of several elements to be fastened to each other in a single pre-established relative position), the possibility of adjusting the door positioning relative to the posts both in the opening and closing steps is greatly reduced. In fact, for the purpose it is necessary to directly modify the anchoring position of the attachment elements to the piece of furniture.

**[0007]** Under this situation, the technical task underlying the present invention is to provide a hinged-connection device capable of substantially overcoming the cited limits.

**[0008]** Another important aim of the invention is to provide a device enabling the greatest adjustment versatility, while still keeping the possibility of using attachment elements of substantially circular conformation, so that mating coupling seats can be made in the cabinet doors and posts by simple working operations, round milling operations, for example.

**[0009]** It is a further aim of the invention to enable a continuous adjustment, that is which is not limited to a discrete number of positions, at least along a predetermined axis.

**[0010]** The technical task mentioned and the aims specified are substantially achieved by a hinged-connection device in accordance with the appended claims.

**[0011]** Description of two preferred non-exclusive embodiments of a hinged-connection device in accordance with the invention is now given hereinafter by way of non-limiting example and illustrated in the accompa-

nying drawings, in which:

- Fig. 1 is a plan section of a first embodiment of a device applied to a post and a door in a closed position;
- Fig. 2 shows the device seen in Fig. 1 in the open position of a door;
- Fig. 3 is a plan section of a second embodiment of a device in accordance with the invention applied to a post and a door in a closed position;
- Fig. 4 shows the device seen in fig. 3 in the open position of a door;
- Fig. 5 is a plan section of a support body and a hinging element to be coupled together, of the device shown in Figs. 3 and 4;
- Fig. 6 is a plan section of a support body and a first hinging element to be coupled together, of the device shown in Figs. 1 and 2;
- Fig. 7 is a diagrammatic front view of a second hinging element of both the device shown in Fig. 1 and the device shown in Fig. 3;
- Fig. 8 is a bottom view of a support body being part of the device of the invention;
- Fig. 9 is a section taken along plane IX-IX in Fig. 8;
- Fig. 10 is a top view of the body shown in Fig. 7;
- Fig. 11 is a bottom view of a centering element being part of the inventive device;
- Fig. 12 is a section taken along plane XII-XII in Fig. 11;
- Fig. 13 is a top view of the body shown in Fig. 7; and
- Figs. 14 and 15 are diagrammatic views of the support body and the centering element coupled together in a first and a second operating positions.

**[0012]** With reference to the drawings, the connection device in accordance with the invention has been generally identified by reference numeral 1.

**[0013]** It comprises one or preferably two pairs of two swinging rods 2 and 3, made of steel for example, which are adapted to support a door 4 and to define the opening and closing path of door 4 relative to a post 5 of a cabinet or similar furniture.

**[0014]** The swinging rods 2 and 3 are interposed between a first attachment set 6, in engagement either with door 4 for example (as in the accompanying drawings) or also with post 5, and a second attachment set 7, to be engaged with post 5 or also with door 4.

**[0015]** The attachment sets 6 and 7 respectively comprise a first engagement portion 8, defined by a first hinging element for connection to respective ends of the swinging rods 2 and 3, and a second engagement portion 9 defined by a second hinging element for connection to opposite ends of the swinging rods 2 and 3.

**[0016]** In more detail, the swinging rods 2 and 3 are defined by rocking levers of reduced vertical bulkiness (thickness) and are disposed and move along respective lying planes, which are preferably horizontal, verti-

cally offset relative to each other. Due to the above, a reduced bulkiness is ensured and any interference problem during motion is excluded.

**[0017]** It is also to point out that the two levers 2 and 3 practically form a four-bar linkage, so that the door can move relative to the post according to a movement which is instantaneously rotatory about a (vertical) axis defined by intersection of the vertical plane containing the straight line passing by the hinging points of the swinging rod or rocking lever 2, with a vertical plane containing the straight line passing by the hinging points of the swinging rod or rocking lever 3.

**[0018]** Due to the fact that the two rods are vertically offset, they unequivocally define the rotation axis of the door.

**[0019]** It is therefore apparent that by employing two hinged-connection devices 1 suitably spaced apart from each other, a very high steadiness and precision in the rotatory movement can be achieved.

**[0020]** It is also to point out that preferably the device 1 comprises two swinging rods 2 and two swinging rods 3 disposed symmetrically relative to a horizontal symmetry axis 1a of the whole device 1. In this way, steadiness and precision in rotation are still more marked.

**[0021]** It will be recognized that the structure of device 1 and in particular of the first and second hinging elements 8, 9 is, in an assembled condition, symmetric with said horizontal axis 1a.

**[0022]** In accordance with a further aspect of the invention, the first and second hinging elements (engagement portions 8 and 9) can be shifted from the open condition in which they are spaced apart from each other, to the closed condition in which they are at least partly nested into each other, thereby greatly reducing bulkiness of device 1.

**[0023]** In an original manner, the first and second hinging elements 8 and 9 are made of a material having a different, preferably lower, hardness than the material of the rocking levers. If the latter are made of steel, advantageously the hinging elements are of an easily and precisely workable material, such as brass or aluminium.

**[0024]** In addition, the attachment set 6 comprises a support body 10 to be engaged to door 4 and post 5 by anchoring means, defined by lag screws for example, and connecting and adjusting means 12 interposed between the support body 10 itself and the corresponding hinging element 8.

**[0025]** More specifically, the support body 10 has a base face 10a oriented vertically in an operating position and adapted to be coupled with a corresponding surface of a hollow formed in door 4, and mating regions 10b located in vertical planes inclined to the base face 10a and adapted for coupling with mating edges 8a of the first hinging element 8.

**[0026]** Practically, inclination of edges 8a and of the mating regions 10b enables an easy engagement or disengagement by sliding between the first support

body and the first hinging element 8. Advantageously, inclination of edges 8a also enables a variation in the mutual position between the support body and first hinging element, with possibility of locking by means of a fastening and adjusting screw 12a.

**[0027]** It is to note that screw 12a works close to an elongated hole 12d formed in the hinging element 8, so that a translation of element 8 in a direction parallel to the inclined vertical planes defined by regions 10b and the corresponding edges 8a is allowed. Practically, during adjustment of the portion of element 8 relative to body 10, the elongated hole 12d moves relative to the fastening screw 12a.

**[0028]** In a first embodiment, shown in Figs. 1, 2 and 6, the first support body 10 has a substantially flattened conformation and can be secured to door 4 by lag screws oriented according to an anchoring axis 13 transverse to the main face 4a of door 4.

**[0029]** In a second embodiment, shown in Figs 3, 4 and 5, the first support body 10, seen in top view in an operating position, shows a right-angled conformation defining two transverse base faces 10a and 10c, preferably perpendicular to each other and adapted to be coupled with for example a right-angled mating hollow formed in door 4.

**[0030]** In this second embodiment, the lag screws constituting the anchoring means to the door are also disposed at the base face 10c which is transverse to the main face 4a of door 4 and are therefore oriented according to an auxiliary anchoring axis 14 parallel to the main face 4a itself. In this second embodiment the first support body 10 is very steadily connected to the door, also due to the fact that very long screws can be employed along the auxiliary anchoring axis 14, in spite of the particular conformation of the door edge region.

**[0031]** The second attachment set 7 comprises a positioning element 11 provided with an at least partly circular outer profile 11a and a bearing body 15 to be fastened to a plurality of operating locations relative to the positioning element 11. When the device is in engagement with the cabinet, the bearing body 15 can be moved relative to the positioning element 11 in the door plane or in the post plane according to a substantially horizontal movement axis 16 (see Figs. 14-15). The positioning element 11 is substantially in the form of a "C" and is symmetric with an axis coincident with the movement axis 16.

**[0032]** Practically, this element is made up of three portions defining the three "C" webs, each of which is provided with a respective through hole for connection with the cabinet through fastening means 22, lag screws for example.

**[0033]** The positioning element 11 is therefore provided with a circular outer profile 11a extending through an angle wider than 180°, whereas it is internally delimited by substantially rectilinear sections 11b which are consecutively perpendicular to each other.

**[0034]** Said rectilinear sections 11b and in particular

two of them parallel to the movement axis 16 define a slide for the bearing body 15 along this horizontal axis 16.

**[0035]** The bearing body 15 is on the contrary formed of a base portion 17 having an at least partly circular outer profile. In more detail, this profile of the base portion 17 is defined by a first region of round profile 17a with a given radius of curvature, extending angularly through an angle slightly lower than 180°, and two connecting regions 17b which are circular as well but provided with a different radius of curvature and disposed symmetrically opposite with respect to the movement axis 16.

**[0036]** Then, provided on this base portion 17 is a predetermined number of elongated holes intended to enable coupling of the bearing body 15 both with the positioning element 11 and the cabinet.

**[0037]** The elongated holes have their major extension directed parallelly of the movement axis 16 to enable adjustment of the relative position of the positioning element 11 relative to the bearing body 15 (see Figs. 14-15).

**[0038]** The bearing body 15 further comprises a rest portion 18 emerging from the base portion 17 and having a surface 18a disposed vertically under operating conditions and adapted to receive the second hinging element 9.

**[0039]** Preferably the upper surface of the base portion 17 of the bearing body 15 (see Fig. 10) and the corresponding lower surface of the positioning element 11 (see Fig. 11) have a knurled finishing to prevent relative sliding between the parts once they have been fixedly fastened to the door or the post.

**[0040]** It is to note that the positioning element 11, at its outer profile 11a and at a region thereof turned towards the cabinet, has a bulge 19 also extending circularly and emerging in a direction substantially perpendicular to a lower surface of the element itself.

**[0041]** The base portion 17 of the bearing body 15 is intended for engagement within the space defined by this bulge.

**[0042]** The shape of the base portion therefore is adapted for being fully contained within the space defined by bulge 19 of the positioning element 11.

**[0043]** Practically, the rest portion 18 slides internally of the "C" cavity, whereas the base portion 17 slides correspondingly under the positioning element 11. Bulge 19 defines abutment regions 20, 21 of the base portion 17 limiting the maximum relative-displacement range between the two bodies along the horizontal axis 16 (see Figs. 14 and 15).

**[0044]** During the assembling step of the device to the cabinet, a cavity of substantially circular form is made on a cabinet door or post, for reception of the positioning element 11 and the bearing body 15. The bearing body 15 is preliminarily inserted and then the positioning element 11 is laid down thereon, partly overlapping it in such a manner that the rest portion 18 emerging

from the bearing body 15 is inserted into the cavity defined by element 11. Once the relative correct positioning on axis 16 of the two components has been established, fastening takes place by screws 22 passing through the holes of the positioning element 11 and the elongated holes of the bearing body 15 and ultimately engaging into the door or post.

**[0045]** The second hinging element 9 is susceptible of engagement with the bearing body, and in particular the rest portion thereof; said second hinging element, in addition to being provided with fork-shaped seats 9a for the ends of the swinging rods 2 and 3, also has an anchoring elongated hole 9b which, in an operating condition, extends in a vertical direction. The connecting and adjusting means of the second hinging element 9 comprises a main connecting and adjusting screw 12b to be locked to a predetermined position of the elongated hole 9b, which enables adjustment of the door in a vertical plane. More specifically, the elongated hole 9b has a longitudinal extension axis 9c along which the relative movement of screw 12b can take place, thereby obtaining the possibility of moving the second hinging element 9 up and down relative to the bearing body 15.

**[0046]** The connecting and adjusting means of the second hinging element 9 also comprises an auxiliary adjusting screw 12c having a thrust end abutting against the rest portion 18, which enables the second hinging element itself to be locked to a predetermined and varying distance in a horizontal direction (i.e. along a horizontal axis perpendicular to the movement axis 16) from the rest portion.

**[0047]** The invention achieves important advantages.

**[0048]** First of all, since the second attachment set is made of several components and since in particular there is the possibility of engaging the positioning element and bearing body relative to each other at different positions along the horizontal movement axis, many advantages and improvements are involved, above all during the hinge-mounting steps.

**[0049]** Due to the fact that this adjustment is made possible, errors in the hinge positioning can be eliminated or at least limited, which errors may be due for example to inaccuracies in centering the milling operations for engagement of the attachment sets.

**[0050]** In the last-mentioned case, in fact, each positioning error along the ideal horizontal axis (i.e. the movement axis 16) joining the attachment sets can be compensated for in a precise manner.

**[0051]** It is also to point out that the relative engagement positions are not obtained with use of many distinct holes in one of the components, but by elongated holes extending in a direction parallel to the adjustment direction.

**[0052]** In this way, a continuous position adjustment (i.e. very precise and adaptable to the different cases) is possible between the two hinge parts.

**[0053]** In addition, the possibility of adjustment in a vertical plane (i.e. along the horizontal axis and vertical

axis) enables tensions that could be generated on the different hinge elements and in particular the swinging rods, to be minimized, which tensions would result from incorrect positioning of the different hinge components.

**[0054]** Even when two hinges are mounted on non-perfectly parallel axes, the inner efforts generating in the hinges during the opening and closing operations of the door give rise during the mounting step to an automatic positioning of the different components to the location of minimum residual stress.

**[0055]** In addition, the presence of attachment sets each comprising two components, for connection to the door and the post enables the materials of same to be easily diversified in respect of those of the swinging rods, and the production cycles of the whole device to be optimized.

**[0056]** For example, the support bodies, positioning element and bearing body can be made of aluminium or other non-ferrous material alloys by adopting die-casting processes. The hinging elements can be made of brass and submitted to a quick and precise mechanical working. The swinging rods may consist of steel elements obtained by a quick cutting-out operation. In this manner the overall production costs are consequently greatly reduced.

**[0057]** The surface hardness of the swinging rods may be different from that of the hinging elements and this enables frictions and wear of the regions intended for sliding on each other to be reduced.

**[0058]** Furthermore, the connecting and adjusting means interposed between the support bodies and relative hinging elements enables the door position to be adapted easily, quickly and in any direction relative to the post during both the closing and opening steps.

**[0059]** Finally, the above-described second embodiment of the support body to be coupled with a door enables a particularly strong anchoring to be made, which anchoring is therefore very reliable and durable also in case of rather heavy doors.

## Claims

1. A hinged-connection device, in particular for wardrobe and cabinet doors, comprising

- at least two swinging rods (2, 3) defining an opening and closing path for a door (4) relative to a cabinet post (5);
- a first and a second attachment sets (6, 7) to be connected to said door and post respectively, said swinging rods (2, 3) being operatively interposed between said attachment sets, characterized in that at least one of said first attachment set (6) and second attachment set (7) comprises:
- a positioning element (11) provided with an at least partly circular outer profile (11a); and
- a bearing body (15) to be fastened relative to

the positioning element (11) to a plurality of different operating positions, under engagement conditions of the device with the cabinet, the bearing body (15) being movable relative to the positioning element (11) in the door or post plane along a substantially horizontal movement axis (16).

2. A device as claimed in claim 1, characterized in that the positioning element (11) is such shaped as to define a slide for the bearing body (15) along said horizontal axis (16).

3. A device as claimed in claim 1, characterized in that the positioning element (11) is substantially C-shaped and is symmetric with an axis coincident with said movement axis (16).

4. A device as claimed in claim 1, characterized in that the bearing body (15) comprises:

- a base portion (17) provided with an at least partly circular outer profile (17a) and having a predetermined number of elongated holes extending parallelly to the movement axis (16); and
- a rest portion (18) emerging from the base portion (17) and arranged to be operatively associated with said swinging rods.

5. A device as claimed in claim 4, characterized in that the positioning element (11) is provided with a partly circular outer profile (11a) the angular extension of which is greater than 180°, and in that the base portion (17) of the bearing body (15) is provided with a partly circular outer profile (17a) of a constant radius of curvature and the angular extension of which is lower than 180°.

6. A device as claimed in claim 1, characterized in that the positioning element (11) at the circular outer profile (11a) has an emerging side bulge (19) which under operating conditions is turned towards the cabinet.

7. A device as claimed in claim 4, characterized in that an upper surface of the base portion (17) of the bearing body (15) and a corresponding lower surface of the positioning element (11) have a knurled finishing to prevent relative sliding between the parts, once they have been fastened to the cabinet.

8. A device as claimed in claims 6 and 4, characterized in that the positioning element bulge (19) defines abutment regions (20, 21) for the base portion (17) limiting the maximum-displacement range of the bearing body (15) relative to the positioning element (11) along said horizontal axis (16).

9. A connection device as claimed in anyone of the preceding claims characterized in that at least one of said first attachment set and second attachment set comprises:

- an engagement portion (8; 9) interposed between the support body and hinging ends of said swinging rods; and
- connecting and adjusting means (12) interposed between the support body itself (10; 11) and the corresponding engagement portion (8; 9).

10. A device as claimed in anyone of the preceding claims, characterized in that said attachment sets (6, 7) comprise a first attachment set (6) formed of a first engagement portion (8) and of a support body (10) having at least one base face (10a) oriented vertically in an operating position and adapted to be coupled with said door (4) or said post (5), and in that said first engagement portion (8) and support body (10) respectively have mutual-mating edges and regions (8a, 10b) disposed in vertical planes, inclined to said base face (10a).

11. A device as claimed in claim 10, characterized in that said support body (10) in top view and in an operating position has a right-angled conformation defining two transverse base faces (10a, 10b), preferably perpendicular to each other, to be coupled with a mating hollow formed in said door or said post.

12. A device as claimed in claim 11, characterized in that said anchoring means between said first support body and door or post can be disposed with an orientation parallel to the main faces of said door (4) or said post (5).

13. A device as claimed in claim 9, characterized in that said attachment sets (6, 7) comprise a second attachment set (7) further comprising a second engagement portion (9) having an anchoring elongated hole (9b) that in an operating position extends along a preferably vertical predetermined axis (9c), and in that said connecting and adjusting means comprises at least one main connecting and adjusting screw (12b) to be locked to a predetermined position of said elongated hole.

14. A device as claimed in claim 13, characterized in that the connecting and adjusting means further comprises an auxiliary adjusting screw (12c) adapted to lock said second engagement portion to a varying distance from said bearing body along a horizontal axis perpendicular to the movement axis.

15. A device as claimed in claim 13, characterized in

that said attachment sets comprise respective engagement portions for connection with said swinging rods which are made of a material having a different hardness from that of the material of the swinging rods themselves.

16. A device as claimed in anyone of the preceding claims, characterized in that the swinging rods (2, 3) are defined by levers of reduced vertical bulkiness which are disposed and movable in respective preferably horizontal, parallel lying planes, vertically offset from each other.

17. A device as claimed in claim 9, characterized in that the first and second engagement portions (8 and 9) are shiftable from a position in which they are spaced apart from each other, corresponding to the door opening condition, to a position in which they are at least partly nested into each other, corresponding to the door closing condition.

18. A device as claimed in claim 10, characterized in that it comprises a screw or another fastening member (12a) working close to an elongated hole (12d) formed in the first engagement portion (8), so as to enable a translation of said engagement portion in a direction parallel to the inclined vertical planes defined by the mutually-mating regions (10b) and edges (8a).

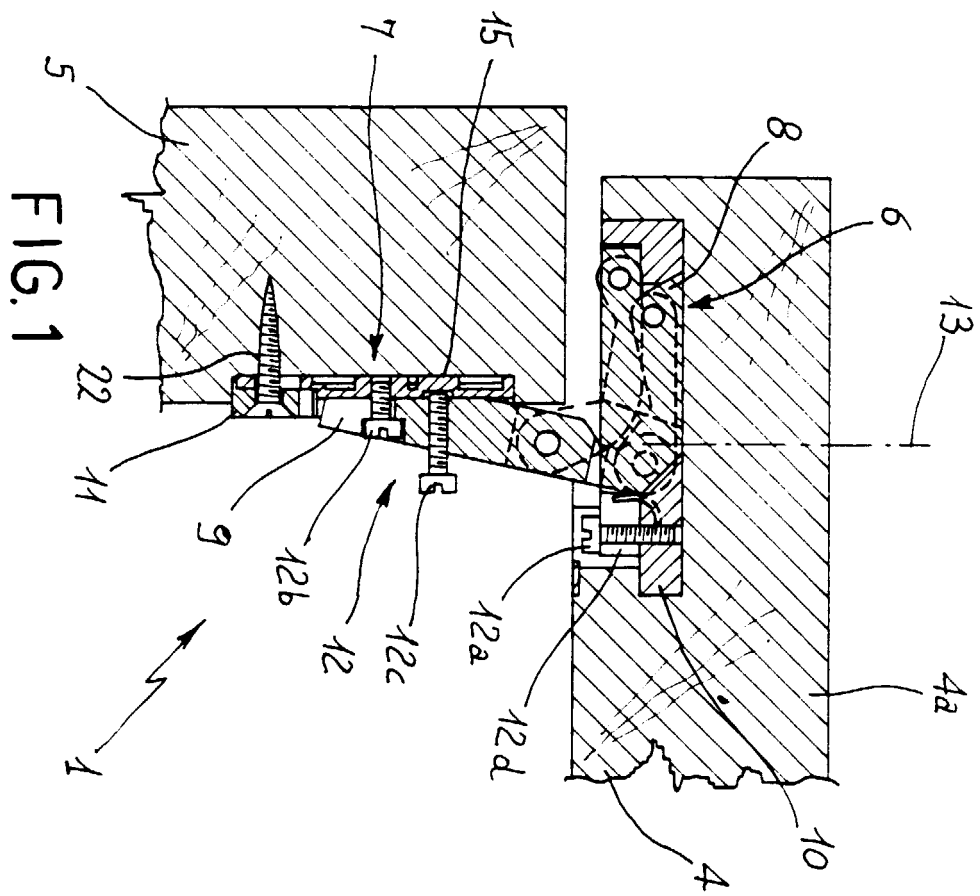


FIG. 1

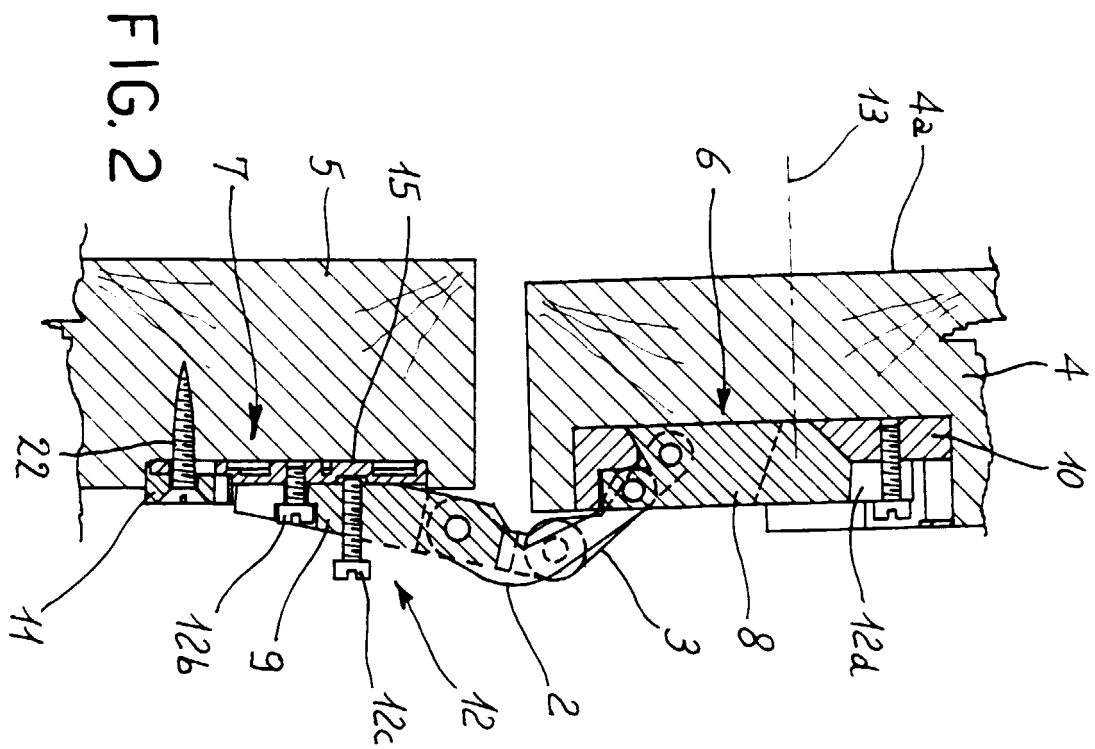


FIG. 2

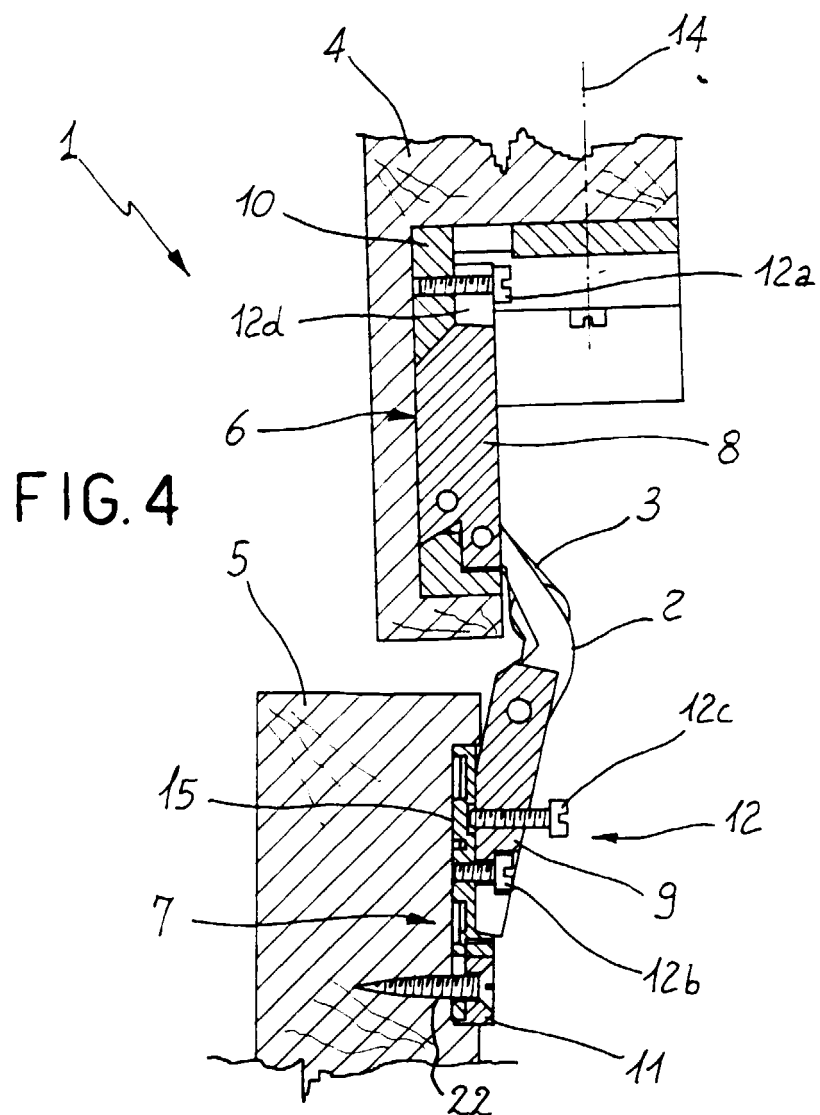
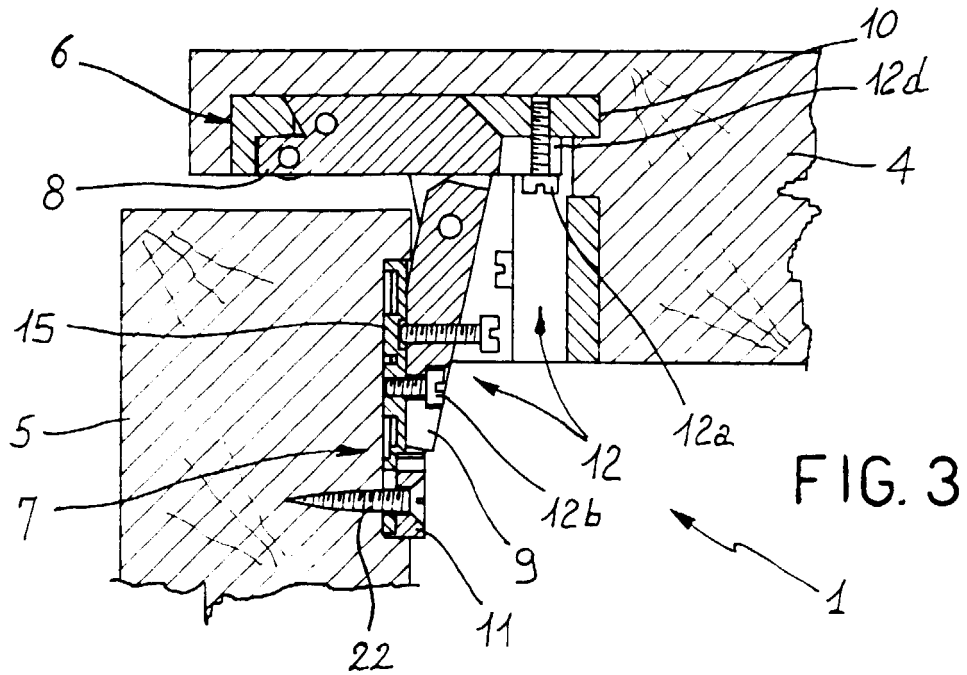




FIG. 5

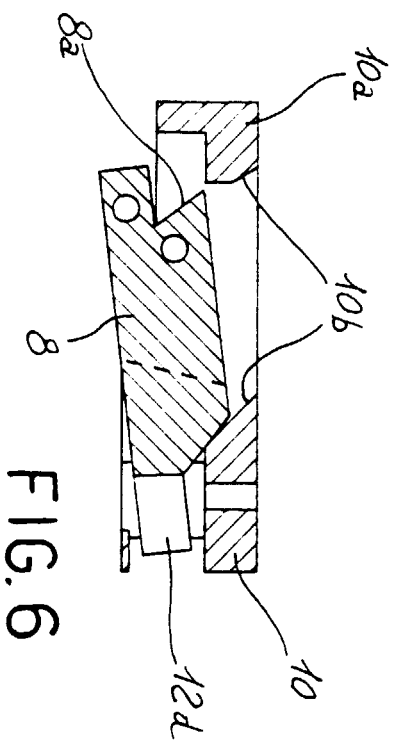
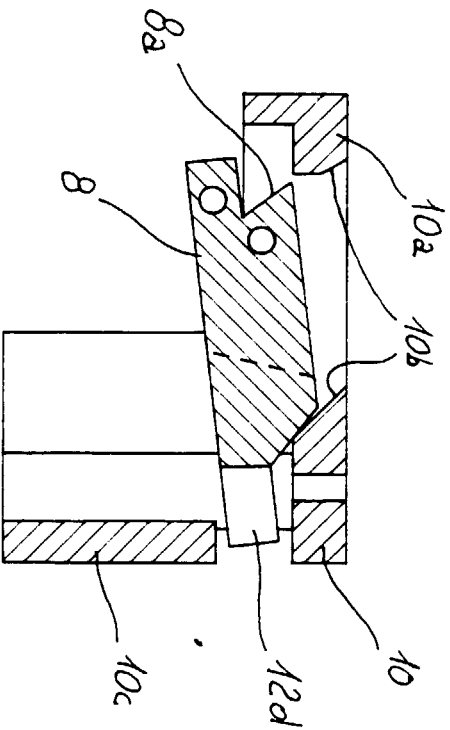
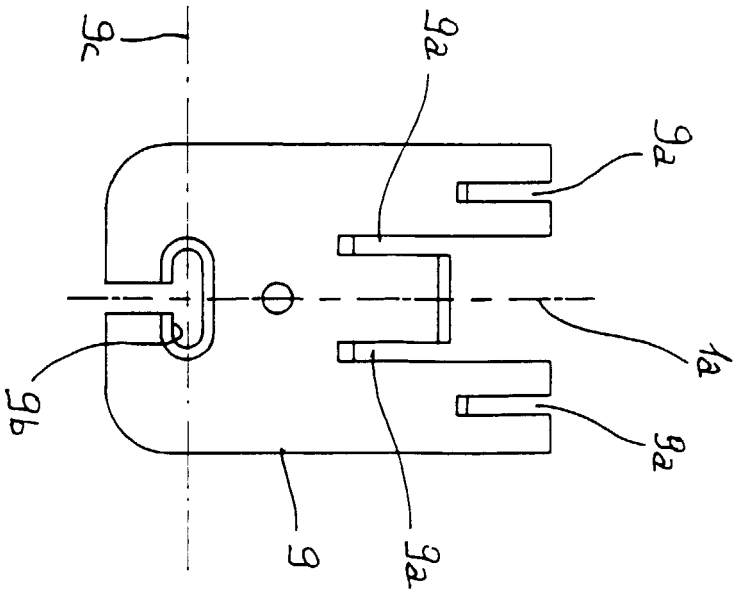


FIG. 7



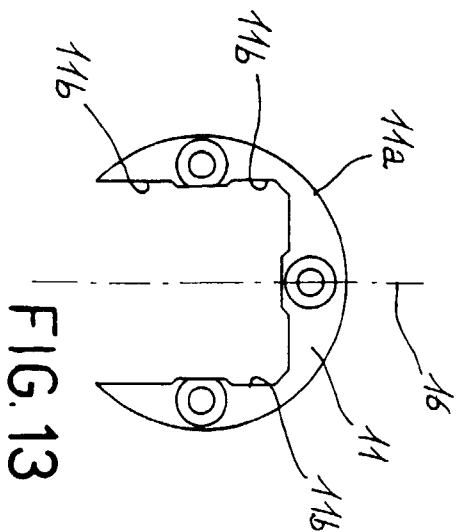
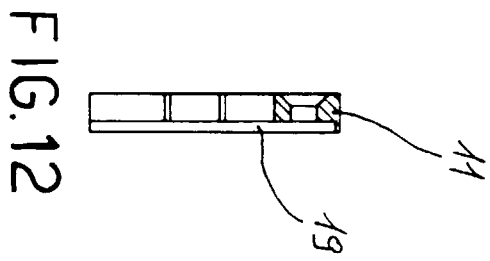
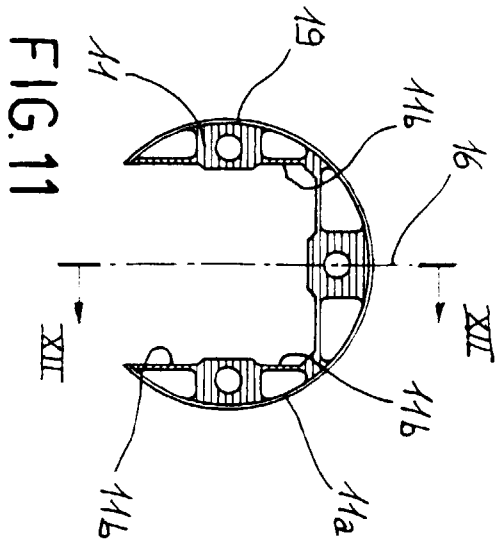
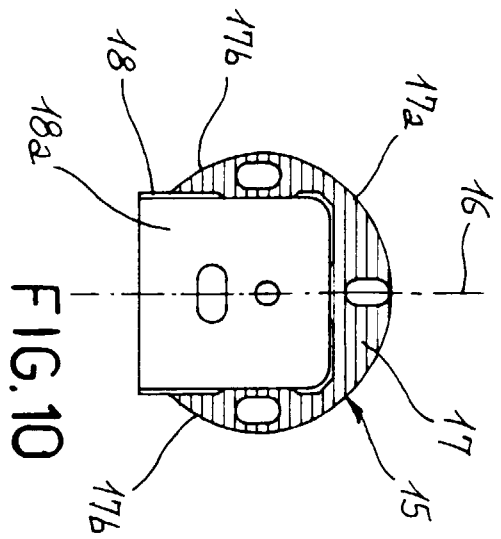
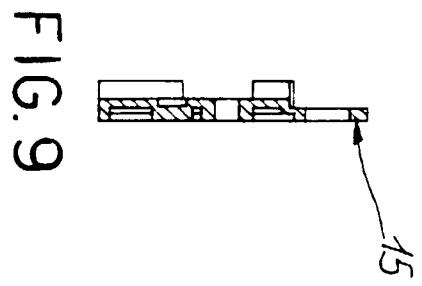
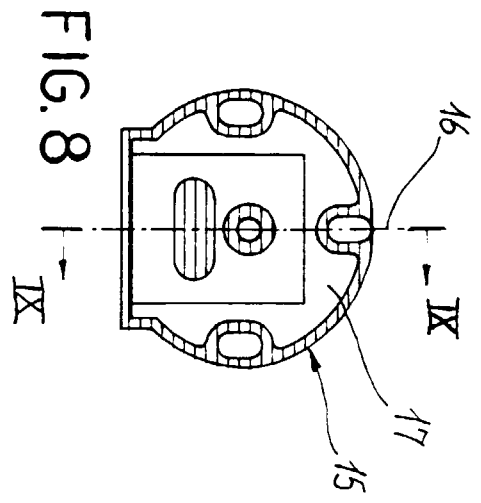


FIG. 14

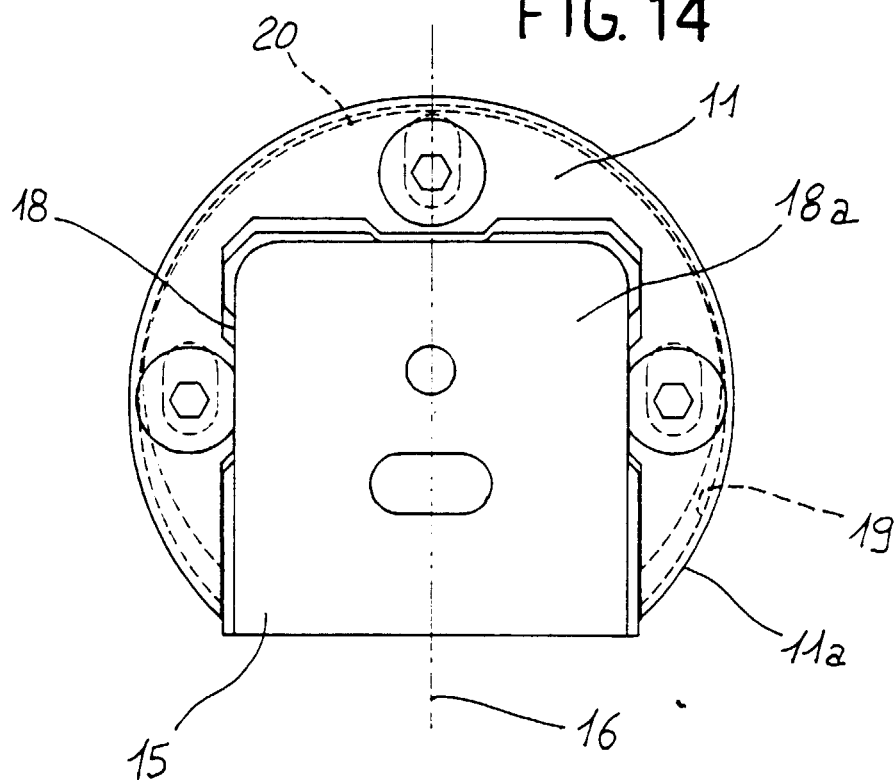
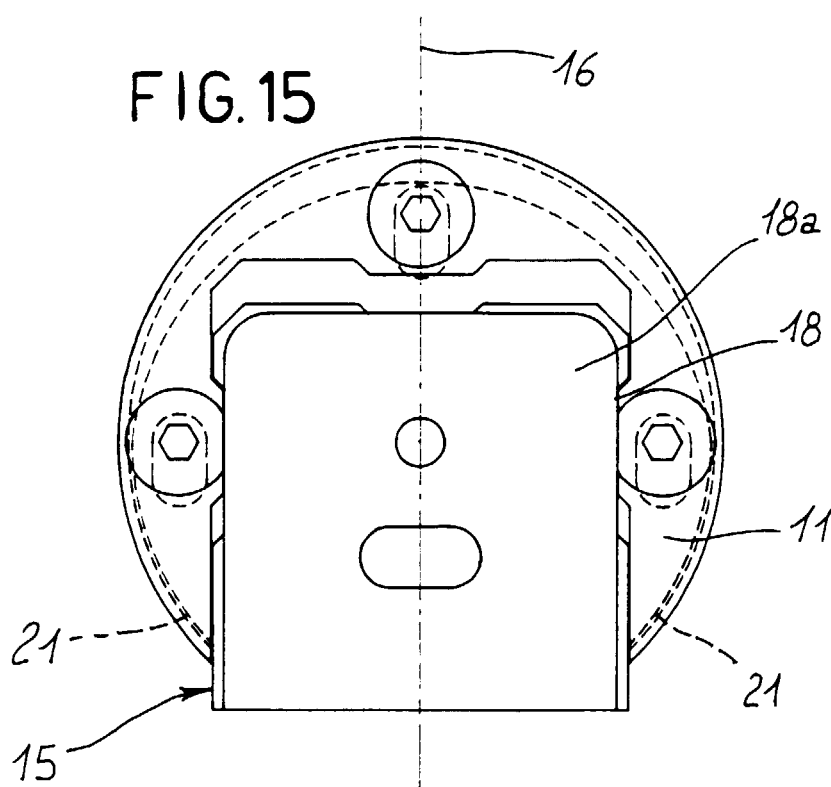


FIG. 15





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 98 83 0395

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	AT 348 371 B (BLUM) 12 February 1979	1-5, 9, 13	E05D7/04
Y	* page 2, line 40 - page 3, line 24; figures *	7, 10, 11, 17	E05D5/08
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X	DE 25 49 352 A (LAUTENSCHLÄGER) 12 May 1977	1, 9, 13, 14	
Y	* page 9 *	7	
	* page 12, paragraph 2 *		
	* page 13, paragraph 2; figures *		
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X	DE 85 13 041 U (HÄFELE) 13 April 1989	1, 2, 16, 17	
Y	* page 16, last paragraph - page 17; figures *	6, 8, 9, 13, 14	
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Y	DE 30 04 313 A (LA PORTE SÖHNE) 13 August 1981	6, 8, 9, 13, 14	
A	* page 6, last paragraph - page 8, line 7; figures *	1, 3-5	
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Y	DE 28 06 958 A (BLUM) 31 August 1978	10, 11, 17	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
	* page 14, paragraph 2; figures *		E05D
	* page 15, last paragraph *		
	---		
A	DE 23 53 043 A (BLUM) 20 June 1974	1-3, 6, 8, 10, 11	
	* page 4, last paragraph - page 8; figures *		
	---		
A	EP 0 790 378 A (BLUM) 20 August 1997	6, 8	
	* column 3, line 55 - line 56; figures 13A, B, C *		
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		2 December 1998	Van Kessel, J
CATEGORY OF CITED DOCUMENTS		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	
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EPO FORM 1503 03/82 (P04C01)

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

EP 98 83 0395

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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02-12-1998

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