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(54) **Adjustable hinge for refrigerator doors**

(57) An adjustment hinge for refrigerator doors, to be positioned at the bottom of the door to connect the door to the refrigerator cabinet, and comprising a bracket element (9) carrying a hinge pin (11), said bracket element (9) presenting a side (9a) for its fixing to the refrigerator cabinet by screws (10), said side having slotted holes (9c) for said screws (10) and also presenting a projecting part (9e) on which there acts an adjustment screw (21) mounted in a separate hinge component (12) fixed to the refrigerator cabinet (Figure 2).

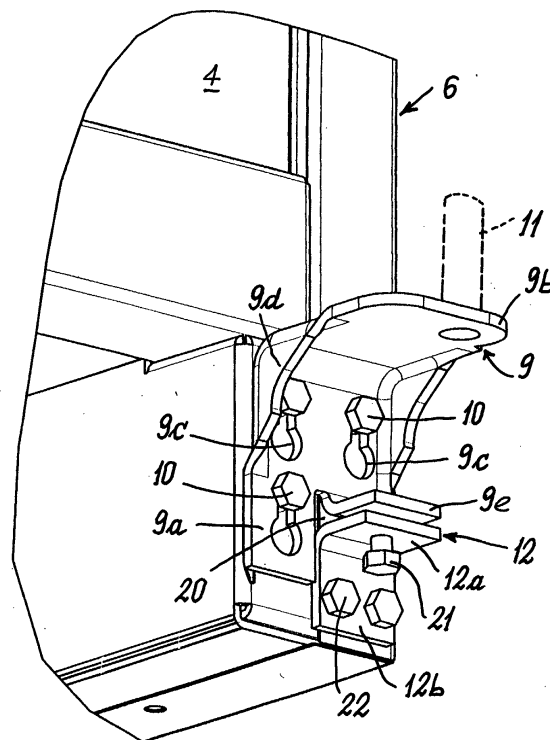


FIG. 2

Description

[0001] The present invention relates to a removable adjustable hinge for refrigerator doors, and to the refrigerator provided with the hinge.

[0002] Large capacity refrigerators comprise two adjacent doors hinged to opposite sides of the refrigerator cabinet. The cabinet presents a vertical dividing wall which divides its interior substantially into two compartments, each closed by a door. One of these compartments forms the freezing compartment, the other the preservation compartment for fresh foods.

[0003] The lower hinges generally consist of an inverted L-shaped bracket, a first arm of which is fixed to the refrigerator cabinet by screws, whereas the other arm, which projects, carries an upwardly directed pin perpendicular to the other arm. The pins are received in seats present in the bottom of the door. Height adjustment is not provided. Moreover when an extremely bulky refrigerator of this type is to be transferred, the doors have mostly to be removed in order to reduce its overall size to an extent enabling it to pass through doors and corridors. When the refrigerator has reached its destination the doors are remounted. However the extending parts of the hinge project to a considerable extent and can cause damage to objects and persons during transportation. To remedy this the bracket also has to be removed and then remounted. As the bracket is fixed by a plurality of firmly tightened screws to enable it to support the door for the rather lengthy time during which the door is open, the removal and assembly process is tedious and tiring.

[0004] To remedy these negative aspects of common hinges, US-6,030,064 provides a hinge comprising an inverted L-shaped bracket with one arm provided with a perpendicular pin and with its other arm insertable into a channel-shaped or tubular part of rectangular cross-section securely fixed to the cabinet by screws.

[0005] The channel-shaped part has a base provided with two threaded holes for connecting the screws which, by bearing against the lower face of the inserted arm, enable the hinge to be vertically adjusted. In the base there is also provided a guide slot for a corresponding appendix of the inserted arm of the bracket. The channel-shaped part is also provided with a transverse baffle which eliminates slack between the L-shaped bracket and the channel-shaped part. To mount the screws which fix the channel-shaped part to the cabinet, apertures are provided in the front wall of the channel-shaped part for passage of the screws. The drawbacks of the hinge include the precision with which the components (i.e. bracket and channel-shaped part) have to be constructed in order to prevent play, i.e. relative movement between the two which can lead to door unbalance, and the use of two adjustment screws, plus the overall constructional complexity of this known hinge.

[0006] A main object of the present invention is to provide a vertically adjustable lower hinge for refrigerator

doors, especially for refrigerators with side-by-side doors, which is of simple and not necessarily high-precision construction, which uses only one adjustment screw for the height adjustment, and which is easily demountable when the doors are removed to reduce the overall dimensions of the refrigerator for transport purposes.

[0007] A further important object of the present invention is to ensure verticality of the door rotation axis by means of an upper hinge which is also adjustable.

[0008] A further object of the present invention is to provide a refrigerator incorporating one or more adjustable lower hinges provided with the aforesaid advantageous aspects, preferably in combination with upper hinges which are also adjustable. These and further objects which will be more apparent from the ensuing detailed description are attained by lower hinge in accordance with the teachings of the accompanying independent claim 1, by an upper hinge in accordance with the teachings of the accompanying claim 2, and by a refrigerator in accordance with the teachings of the accompanying independent claim 3.

[0009] The invention will be better understood from the detailed description of some preferred embodiments thereof given hereinafter by way of non-limiting example and illustrated in the accompanying drawings, in which:

Figure 1 is a front view of a refrigerator with two side-by-side doors, one of which is open;

Figure 2 is a perspective view of a lower hinge for refrigerator doors;

Figure 3 is a perspective view of the lower hinge of Figure 2 taken from a different angle;

Figure 4 is a perspective view of an upper hinge for refrigerator doors.

[0010] With reference to the figures, the reference numeral 1 indicates overall a conventional refrigerator of the type comprising two side-by-side doors 2 and 3, of which that indicated by 2, and shown closed, closes a freezer compartment, whereas the other door 3, shown open, closes a refrigerated preservation compartment for fresh foods. A partition 5 separates the two compartments, the partition and compartments being contained within the refrigerator cabinet 6.

[0011] Each of the doors is hinged both upperly and lowerly to the cabinet 6 by a respective upper hinge 7 and lower hinge 8.

[0012] The lower hinge 8 (Figures 2 and 3) comprises a substantially inverted L-shaped bracket element 9 presenting a first side 9a for fixing to the cabinet 6 and a second side 9b (perpendicular to the fixing side) which projects outwards. The fixing side 9a presents three slotted holes 9c in carefully chosen positions. Screws 10 inserted through the slotted holes fix the bracket element 9 to the cabinet 7. The two sides 9a, 9b are joined together laterally by strengthening parts 9d.

[0013] On the second side 9b there is mounted in

known manner a conventional pin 11 intended to be inserted into a conventional seat, not shown, present in the lower edge of the door concerned, to hence form a hinge.

[0014] The first side 9a lowerly presents, formed from the material (sheet metal) of the bracket element 9, a flange 9e perpendicular to the first side 9a and hence slightly projecting from it. This flange therefore leaves a free space in the region 20 of the side 9a. Against this flange 9a there can act a screw 21 which is used to adjust the height of the bracket element 9 and hence of the lower hinge concerned.

[0015] The screw 21 is screwed into a projecting arm 12a of a separate component 12 of the lower hinge. This component 12 is of inverted L-shape and is inserted by means of its other arm 12b into the space 20 left free by the projecting flange 9e. The component 12 is fixed to the refrigerator cabinet by screws 22 passing through holes present in the arm 12b.

[0016] The lower hinge is mounted on the refrigerator cabinet in the following manner: The component 12 is fixed to cabinet by its screws 22. The screws 10 are only partially screwed down (and hence not tightened) onto the refrigerator cabinet. The bracket element 9 is then passed over the screws 10 by virtue of the slotted configuration of the holes 9c and lowered, after which the vertical position of the bracket element 9 is adjusted by acting on the adjustment screw 21, and when the required position for the bracket element 9 has been attained the screws are screwed tightly down to lock it.

[0017] When the doors and the projecting bracket element 9 need to be removed for the space restriction reasons stated in the introduction, the screws 10 need merely to be slackened (without removing them), so that by utilizing the slotted arrangement of the holes 9c the element 9 can be removed, and then replaced in position (together with the door) as indicated hereinbefore.

[0018] The upper hinge 7 presents a component 30 to be fixed by screws 31 a, b, c to the upper part of the refrigerator cabinet 6. In the example the screws are three in number.

[0019] The component 30 presents a flat part 30a to which, via a step or transition region 30b, there is connected a curved flat arm 30c which when in use projects above the door (for example the door 3). The arm 30c carries, extending downwards, a conventional hinge pin 32 intended to penetrate in known manner into an appropriate seat present in the upper edge of the door.

[0020] From that end of the flat part 30a opposite the arm 30c there extends perpendicularly upwards a flange 30d against which there bears an adjustment screw 33 screwed into an arm 34a of a right-angled bracket 34, the other arm 34b of which is fixed to the top of the refrigerator cabinet by screws. The arm 34a faces the flange 30d.

[0021] The hole through which the screw 31a passes can be circular, whereas the holes through which the other two screws 31b, 31c pass are slightly elongate and

preferably arched such that their centre line lies along circular arcs having their centre at the centre of the hole through which the screw 31a passes.

[0022] The aforescribed upper hinge 7 enables its pin 32 to be vertically aligned with that 11 of the lower hinge. For this purpose the three screws 31a, b, c are only loosely screwed down (i.e. not completely tightened). On rotating the adjustment screw 33, it thrusts against the flange 30d to swivel the pin 32, which can thus be brought into vertical alignment with the lower pin 11. The screws 21a, b, c are then completely tightened.

Claims

1. An adjustment hinge for refrigerator doors, to be positioned at the bottom of the door to connect the door to the refrigerator cabinet, and comprising a bracket element (9) carrying a hinge pin (11), **characterised in that** said bracket element (9) presents a side (9a) for its fixing to the refrigerator cabinet by screws (10), said side having slotted holes (9c) for said screws (10) and also presenting a projecting part (9e) on which there acts an adjustment screw (21) mounted in a separate hinge component (12) fixed to the refrigerator cabinet.
2. An adjustment hinge for refrigerator doors, to be positioned at the top of the door and carrying a hinge pin (32) for the door, **characterised in that** the pin (32) is carried by a component fixable to the refrigerator and able to be moved angularly by an adjustment screw means (33).
3. A refrigerator, preferably with two side-by-side doors, each provided with a lower hinge and upper hinge provided with hinge pins, **characterised by** comprising: a) a lower hinge comprising a bracket element (9) carrying a hinge pin (11), said bracket element (9) presenting a side (9a) for its fixing to the refrigerator cabinet by screws (10), said side having slotted holes (9c) for said screws (10) and also presenting a projecting part (9e) on which there acts an adjustment screw (21) mounted in a separate hinge component (12) fixed to the refrigerator cabinet;
and/or
b) an upper hinge, the hinge pin (32) of which is carried by a component (30) fixable to the refrigerator and able to be moved angularly by an adjustment screw means (33).
4. A hinge as claimed in claim 1, wherein the projecting part (9e) is a flange forming part of the bracket element (9), the adjustment screw (21) being carried in said separate hinge component (12), which is a right-angled bracket.

5. A hinge as claimed in claims 1 and 4, wherein the flange (9e) leaves a free space (20) into which the right-angled bracket (12) at least partially extends.
6. A hinge as claimed in claim 2, wherein the component (30) presents a substantially flat part (30a) provided, for the passage of screws (31a, b, c), with holes shaped to enable the component (30) to undergo angular movement.
7. A hinge as claimed in claims 2 and 6, wherein the flat part (30a) presents a perpendicularly projecting flange (30d) on which there operates the adjustment screw means (33) disposed in a right-angled bracket (34b) fixable to the refrigerator.

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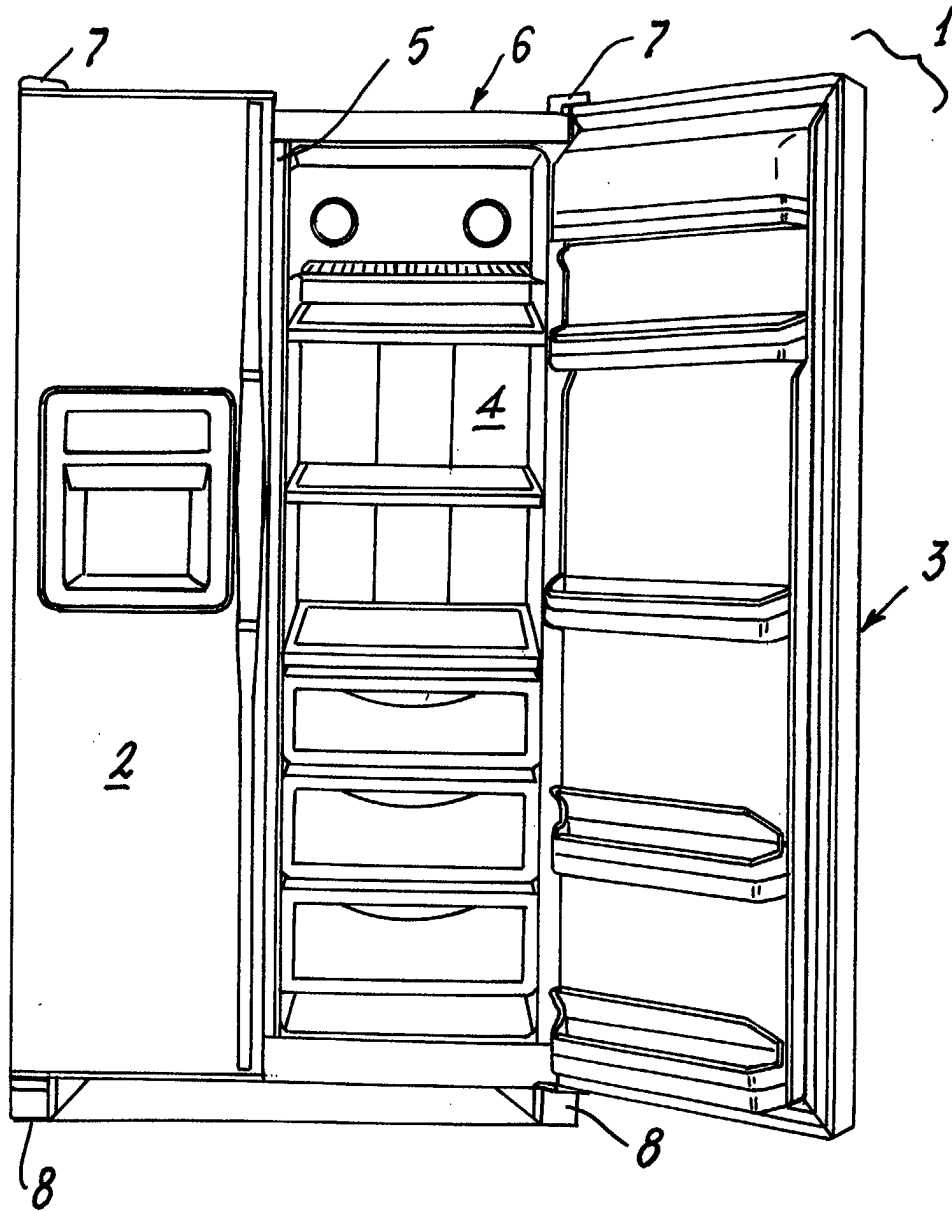


FIG. 1

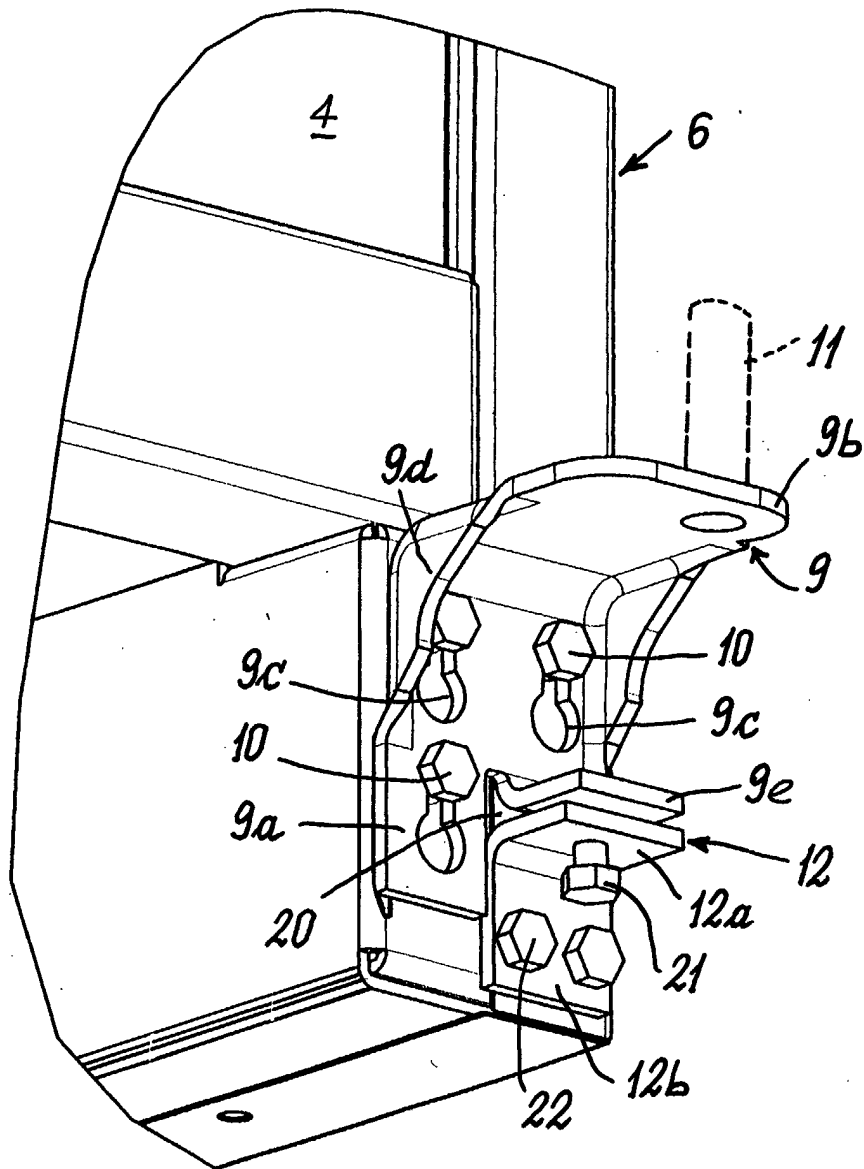


FIG. 2

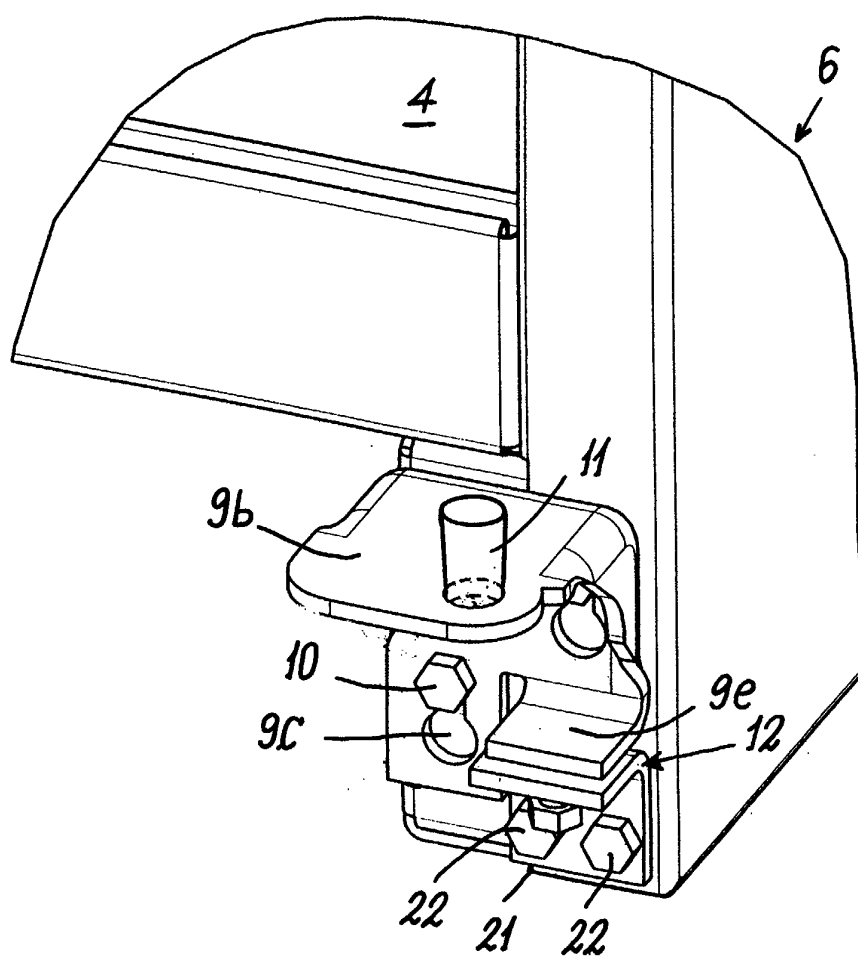


FIG. 3

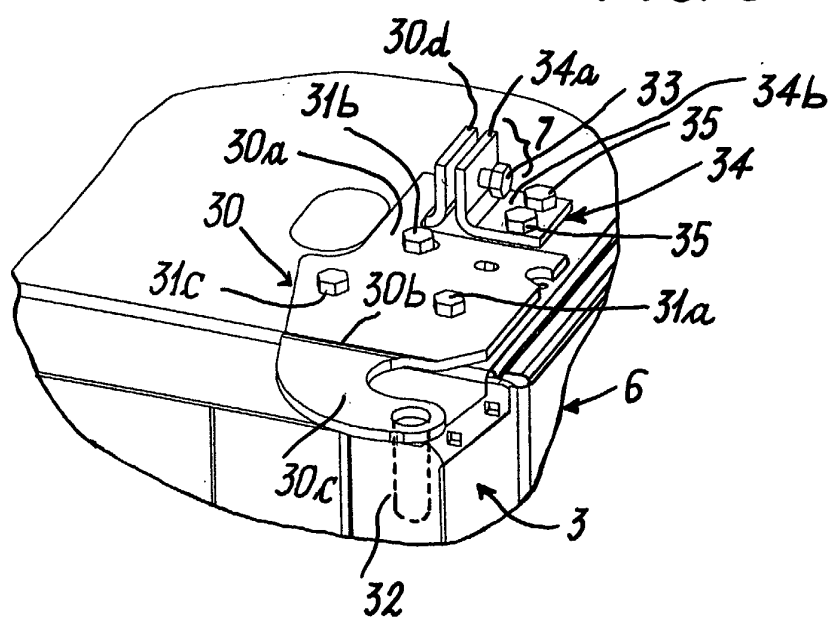


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 02 01 1511

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.7)
A	US 4 070 728 A (HERMAN CHARLES J) 31 January 1978 (1978-01-31) * column 1, line 47 - column 1, line 62 * * column 2, line 31 - column 3, line 42 * * claim 1 * * figure 2 *	1,3	F25D23/02 E05D7/08 E05D7/04
A	US 5 788 351 A (GRACE JAMES M ET AL) 4 August 1998 (1998-08-04) * column 1, line 17 - column 1, line 32 * * column 1, line 42 - column 1, line 67 * * column 2, line 48 - column 5, line 22 * * claims 1,6,14 * * figures 2-9 *	1,3	
D,A	US 6 030 064 A (KIM YONG MYOUNG) 29 February 2000 (2000-02-29) * abstract * * figures 2-5 *	1,3	
A	US 5 884 366 A (JEONG GWAN SIK) 23 March 1999 (1999-03-23) * column 3, line 28 - column 4, line 65 * * claim 1 * * figures 6A,6B,7,9A,9B, *	2,3	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F25D E05D
A	US 4 864 691 A (GANIK JAN ET AL) 12 September 1989 (1989-09-12) * abstract * * figures 2-4,7,10 *	2,3	
A	FR 2 501 274 A (BOSCH SIEMENS HAUSGERAETE) 10 September 1982 (1982-09-10) * page 3, line 8 - page 3, line 31 * * claims 1-4 * * figure 2 *	2,3	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 September 2002	Examiner CORREIA DOS REIS, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EUROPEAN SEARCH REPORT

Application Number
EP 02 01 1511

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.7)
A	US 5 666 764 A (BEATTY SCOTT M ET AL) 16 September 1997 (1997-09-16) * abstract *		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 September 2002	Examiner: CORREIA DOS REIS, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

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

EP 02 01 1511

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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18-09-2002

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 4070728	A	31-01-1978	BR	7707245 A	25-07-1978
US 5788351	A	04-08-1998	NONE		
US 6030064	A	29-02-2000	CN	1213766 A	14-04-1999
			JP	3085938 B2	11-09-2000
			JP	11159949 A	15-06-1999
US 5884366	A	23-03-1999	KR	205397 Y1	01-12-2000
			AU	736410 B2	26-07-2001
			AU	5037298 A	11-03-1999
			CA	2226725 A1	28-02-1999
			CN	1210249 A	10-03-1999
			GB	2328711 A ,B	03-03-1999
			JP	11083294 A	26-03-1999
US 4864691	A	12-09-1989	NONE		
FR 2501274	A	10-09-1982	DE	8106122 U1	10-09-1981
			FR	2501274 A1	10-09-1982
			IT	1190712 B	24-02-1988
US 5666764	A	16-09-1997	CA	2162751 A1	24-05-1996