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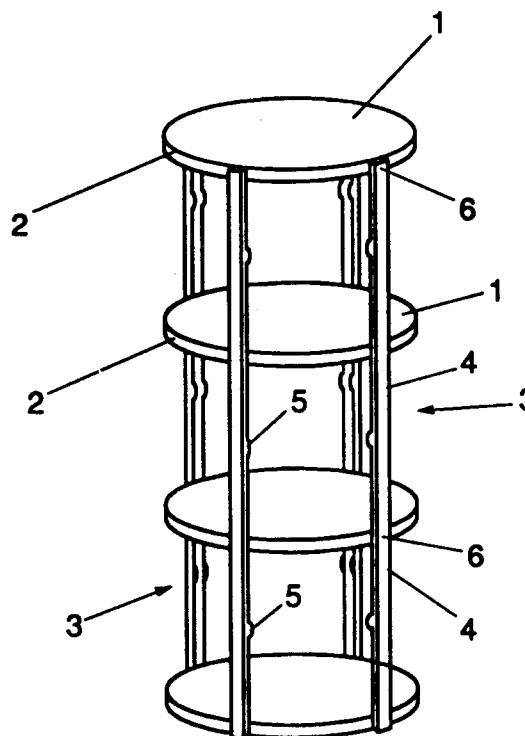
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AT BE CH DE ES FR GB IT LI NL SE(71) Applicant: **LAARHOVEN DESIGN
INTERNATIONAL B.V.
Energieweg 43B
NL-2382 NC Zoeterwoude(NL)**(72) Inventor: **Lemaire, Raoul A.
Poortwachter 10,
2401 KV Alphen a/d Rijn(NL)**(74) Representative: **Smulders, Theodorus A.H.J.,
Ir.
Vereenigde Octrooibureaux, Nieuwe
Parklaan 97
NL-2587 BN Den Haag(NL)**(54) **Collapsible rack.**

(57) An axially collapsible frame adapted to be collapsed axially by means of a turning movement, suitable in particular for display racks comprising a plurality of shelves (1) arranged above each other, said frame comprising uprights (3) interconnecting circumferential edges of shelves arranged above each other, which uprights are each composed of elements (6) hingedly interconnected between successive shelves and are each connected to a shelf edge by means of a pivot which permits limited rotation of the upright element in a plane substantially tangential to the shelf edge.

**FIG. 1****EP 0 476 729 A1**

This invention relates to a frame adapted to be axially collapsed by means of a turning movement, suitable in particular for display racks comprising a plurality of shelves arranged above each other.

It is an object of the invention to provide such a frame which is light and yet stable, occupies little space in collapsed position and can be erected and collapsed in simple manner.

To that end, according to the invention, the frame comprises uprights interconnecting the circumferential edges of shelves arranged above each other, which uprights are each composed of elements which are hingedly interconnected between successive shelves and are each connected to a shelf edge by means of a pivot which permits limited rotation of the upright element in a plane substantially tangential to the shelf edge.

In the erected position of a rack comprising the frame according to the invention, the shelves are disposed above each other and the uprights are vertical columns whose constituent elements are in alignment. In the collapsed position, the shelves are disposed substantially on top of each other and the uprights, viewed in a vertical projection, extend around the shelves as a polygon, each upright following an angular helix extending from a circumferential point of the bottommost shelf to a circumferential point of the topmost shelf.

To permit, on the one hand, each upright to follow the abovementioned angular helical path in the collapsed position and, on the other, to ensure that the rack has a good stability in the erect position, in further elaboration of the invention, the upright elements may be formed from sections having a good bending stiffness but a slight torsional stiffness. Thus, the hinges interconnecting two upright elements can be so constructed that they exclusively permit changes of the angle between these elements in their common longitudinal median plane, so that the stability of a rack in erect position is not adversely affected by clearance in these hinges, and the flexibility required to enable each upright to extend along the angular helical path in the collapsed position of the rack can be provided by slight torsional resistance in the upright elements themselves.

A section having the desired bending stiffness and little torsional resistance is for instance a steel U-section having external dimensions of the order of 10x10 mm and a thickness of the material of the order of 0.5 mm.

For stiffening the hinge joint between successive upright elements transversely to the direction of the hingeing motion, the flanges of the section at the end of the first element may be recessed inwardly by the thickness of the material, so that when the hinge is in extended position, these flanges can accurately fit between the flanges of

the second section. Further, the web of this second section may be extended so that it rests against the exterior of the first section when the hinge is in the extended position.

A constructively simple embodiment of the pivoted joint through which each upright element is connected to the edge of a shelf and which permits limited rotation of the upright element in a plane that is substantially tangential to the edge of the shelf, is an embodiment in which two plastics members, one to be secured to a shelf edge and the other to an upright element, are capable of relative rotation while in surface-to-surface contact, limited by stops formed thereon.

The member to be secured to an upright element of U-shaped section may be formed as a substantially disc-shaped member with parallel recesses terminating in one side thereof, which recesses can receive with a proper fit the flanges of the U-section of the upright element, while on the opposite side there is formed a sliding surface which, in the assembled condition, is in abutment with the sliding surface of the other member, to be secured to the shelf edge. Thus, there can be obtained a clearance-free securement to an upright element which contributes to the stability of the frame.

Also contributing to the stability of this pivot is an embodiment in which the sliding surfaces of the pivot members are provided on a projecting and a countersunk portion, respectively, the countersunk sliding surface being surrounded by an annular rim for receiving said projecting portion with a sliding fit and the stop means being formed by at least one radial projection which is formed on the inside of the annular rim.

To further explain the invention, one embodiment of the collapsible frame will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows the frame used in a display rack, in erect position;

Fig. 2 shows the rack of Fig. 1 in partly collapsed position;

Fig. 3 shows the rack in the collapsed storage or transit position;

Figs 4 and 4a are a side elevational view and an end view, respectively, of an upright element;

Fig. 5 is a bottom view of the element according to Fig. 4;

Fig. 6 is a perspective view of the hinge joint between upright elements; and

Fig. 7 is a perspective exploded view of an embodiment of the pivot for the connection of an upright element with a shelf edge.

Referring to Fig. 1, a display rack comprises shelves 1 having their edges 2 supported by uprights 3. The uprights 3 are each composed of

elements 4 which are interconnected between the shelves 1 by hinges 5. The upright elements 4 are connected to the edges 2 of the different shelves by means of a pivot 6 of which one embodiment is shown in perspective in Fig. 7.

As will appear from Fig. 2, the upright elements 4 pivot relative to the shelf edges 2 in the pivots 6 and they hinge relative to each other in the hinges 5. To enable mutual approach of the shelves 1 and to reach eventually the fully collapsed position of Fig. 3, the uprights 3 must be capable of bending from the straight form of Fig. 1 into a helical shape as shown in Figs 2 and 3.

This is enabled by the upright elements 4 being formed as sections having a great bending stiffness and a comparatively slight torsional stiffness.

Such a section is shown in Figs. 4, 4a, and 5. As will appear in particular from Fig. 4a, the section, which is substantially U-shaped, comprises a web 7 and flanges 8. At both ends, holes 9, 10 are provided in the flanges for hinge pins (not shown). At the left-hand end of the section, the web 7 is formed with an extension 7a and the legs 8 are locally enlarged with an arcuate portion 8a. From the bottom view of Fig. 5 it appears that at the other, right-hand end the flanges 8 have been recessed inwards (8b), namely by the thickness of the material, so that at the hinges 5 (see Fig. 6) the recessed portions 8b accurately fit between the flanges 8 (in particular the enlarged portions 8a) of the adjacent upright element 4. In the extended position of upright 3, the extended web 7a gives additional stiffness to the hinge 5 by its abutment of web 7 of the adjacent element 4. When the hinges are in the angled position, the enlarged portion 8a of the legs 8 of each section 3 gives additional resistance to twist in the hinge 5.

Figs 5 and 6 show a hole 11 provided centrally in each upright element 4, which hole serves to receive a screw bolt 12 which is part of the pivot 6 through which the upright elements 4 are secured to circumferential rings 2 of a shelf 1. One embodiment of the pivot joint is shown in Fig. 7.

As will appear from Fig. 6, which shows three upright elements 4 with angled hinges 5, for the three elements 4 shown to bend out of the flat plane and assume the helical shape of the uprights 4 shown in Figs 2 and 3, each element 4 twists in the manner indicated by the arrows P, while the portions of the upright elements 4 adjacent the hinges 5 in principle remain oriented in the median plane of each hinge 5.

According to Fig. 7, each pivot 6 through which an upright element 4 is connected to the circumferential edge 2 of a shelf 1 is composed of two members 6A and 6B. In the embodiment shown, member 6A is to be secured to an upright element

4 and member 6B to a circumferential edge 2.

Member 6A is generally disc-shaped and has two recesses 13 provided on one side thereof for accurately fitting therein the legs 8 of the U-section of an upright element 4. On the opposite side, a sliding surface 14 is formed on a projecting portion 15. The projecting portion 15 can be accurately fitted into an annular rim 16 of member 6B, which faces the member 6A in assembled position of the pivot 6, the annular rim 16 surrounding the sliding surface 17 of the member 6B. Projecting inwards from the annular rim 16 are two stop lugs 18 having substantially radially directed stop surfaces 18a adapted for cooperation with the lateral faces 15a of member 6A to limit the angle of pivot permitted in each pivot 6 to a desired value.

As shown in Fig. 7, for further improvement of the stability of pivot 6, member 6A further comprises two ribs 19 having end faces 19a disposed in the same plane as faces 20 on opposite sides of the projecting portion 15. In the assembled pivot 6, the projecting portion 15 of the pivot member 6A extends within the annular rim 16 of the member 6B, whereby the respective sliding surfaces 14 and 17 are in contact with each other while the surfaces 19a and 20 of the member 6A are disposed at a slight distance from the annular rim 16. Thus, any tilting forces exerted on the pivot 6 are opposed by the surfaces 19a and 20 of the member 6A and the oppositely disposed side of the annular rim 16 of the part 6B, which in that event will butt against each other.

It will be clear that the invention is not limited to the embodiment shown and discussed. Essential to the invention is that the frame for a rack with shelves arranged above each other comprises uprights which are composed of elements which are connected to each other and to shelf edges and which are each formed from material having good bending stiffness and slight torsional stiffness, so that the rack is stable in the erect operative position and the uprights are permitted to extend substantially along helical lines around the shelves in axially collapsed position. Further, the shelves need not to be round as shown. They may in principle have any desired circumferential shape.

Claims

1. An axially collapsible frame adapted to be collapsed axially by means of a turning movement, suitable in particular for display racks comprising a plurality of shelves arranged above each other, said frame comprising uprights (3) interconnecting circumferential edges (2) of shelves (1) arranged above each other, which uprights (3) are each composed of elements (4) hingedly (5) interconnected between

successive shelves (1) and are each connected to a shelf edge (2) by means of a pivot (6) which permits limited rotation of the upright element (3) in a plane substantially tangential to the shelf edge (2).

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2. A frame according to claim 1, characterized in that the upright elements (3) are formed from section material (7,8) which has a good bending stiffness but a slight torsional stiffness.

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3. A frame according to claim 1 or 2, characterized in that adjacent the hinge joint (5) between upright elements (4), at the corresponding end of the first element, the flanges (8) of the section have been recessed inwardly (8b) by the thickness of the material, so that they accurately fit between the flanges (8) of the second section in the extended position of the hinge.

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4. A frame according to claim 3, characterized in that the web (7) of the second section is extended (7a) so that it rests against the exterior of the first section in the extended position of the hinge (5).

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5. A frame according to any one of the preceding claims, characterized in that the pivot (6) by means of which each upright element is connected to the edge (2) of a shelf (1) and which permits limited rotation of the upright element (4) in a plane that is substantially tangential to the edge of the shelf (2), comprises two plastics members (6A, 6B), one member (6B) being intended to be secured to a shelf edge (2) and the other (6A) being intended to be secured to an upright element (4), which plastics members (6A, 6B) are rotatable relative to each other while in surface-to-surface contact with each other, limited by stop portions (18) formed on said members.

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6. A frame according to any one of the preceding claims, characterized in that the member (6A) which is intended to be secured to an upright element (4) U-shaped in cross-section, is formed with a substantially disc-shaped part having parallel recesses (13) terminating on one side for receiving therein with a proper fit the flanges (8) of the U-section of the upright element (4), while on the opposite side a sliding surface (14) is formed which in assembled position abuts the sliding surface (17) of the other member, which is secured to the shelf edge (2).

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7. A frame according to claim 6, characterized in

that the sliding surfaces (14,17) of the pivot members (6A,B) are provided on a projecting portion (15) and a countersunk portion, respectively, the countersunk sliding surface (17) being surrounded by an annular rim (16) adapted to receive with a sliding fit said projecting portion (15) and the stop limiting means being formed by at least one radial projection (18) which is formed on the internal side of the annular rim (16).

8. A frame according to claim 7, characterized in that the pivot member (6A) comprises ribs (19) whose end faces (19a) are disposed in the same plane as faces (20) on opposite sides of the projecting portion (15), so that in the assembled position of the pivot (6) the projecting portion (15) of one pivot member (6A) extends within the annular rim (16) of the other member (6B), the respective sliding surfaces (14) and (17) being in contact with each other and, further, the surfaces (19a) and (20) of the member (6A) being disposed at a slight distance from the annular rim (16).

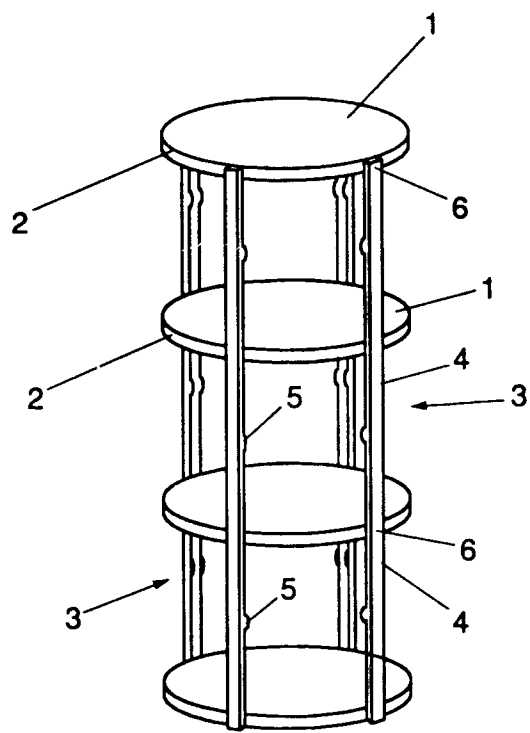


FIG.1

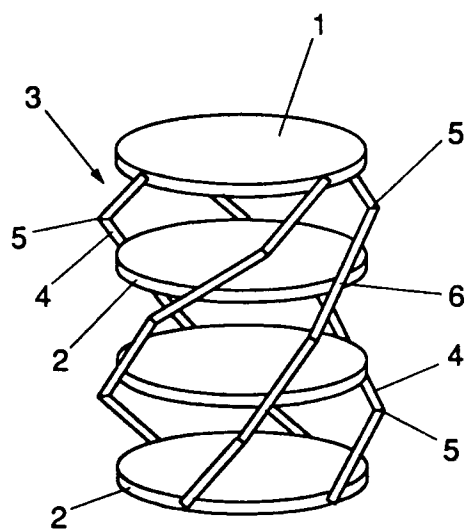


FIG.2

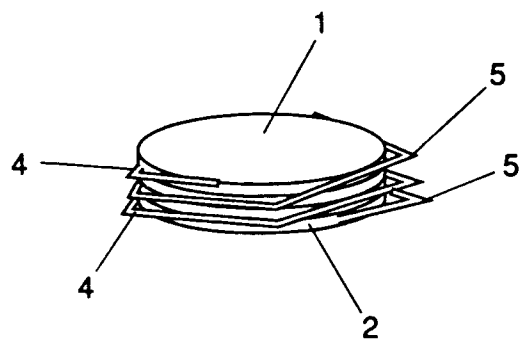


FIG.3

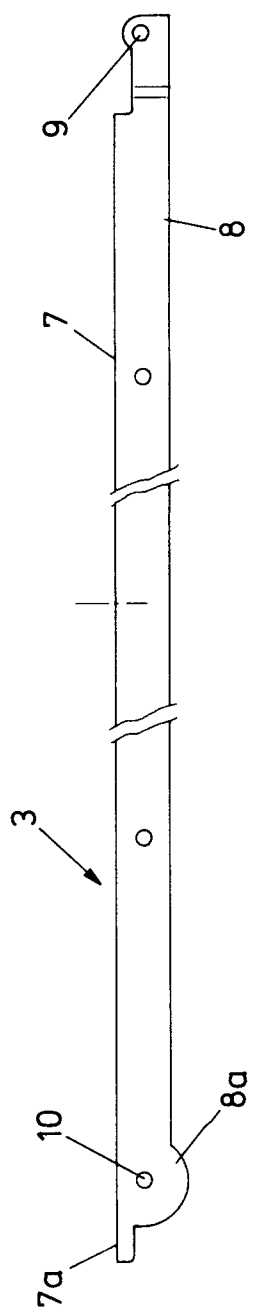


FIG. 4

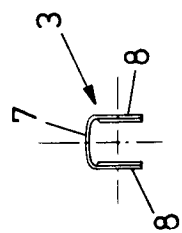


FIG. 4a

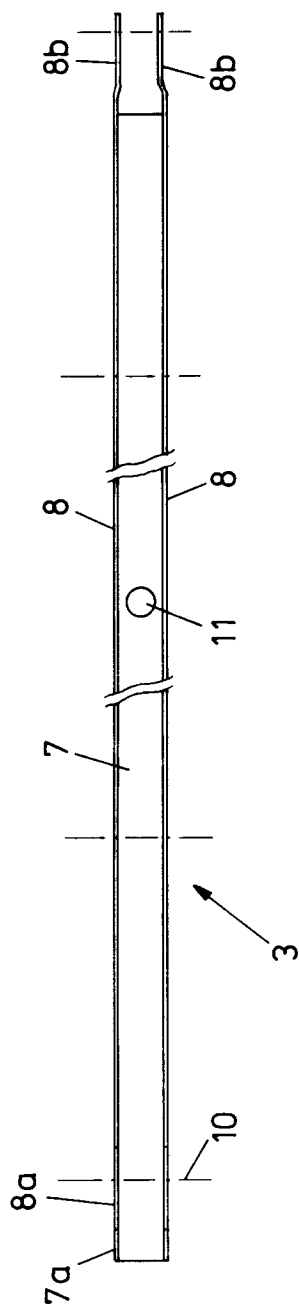
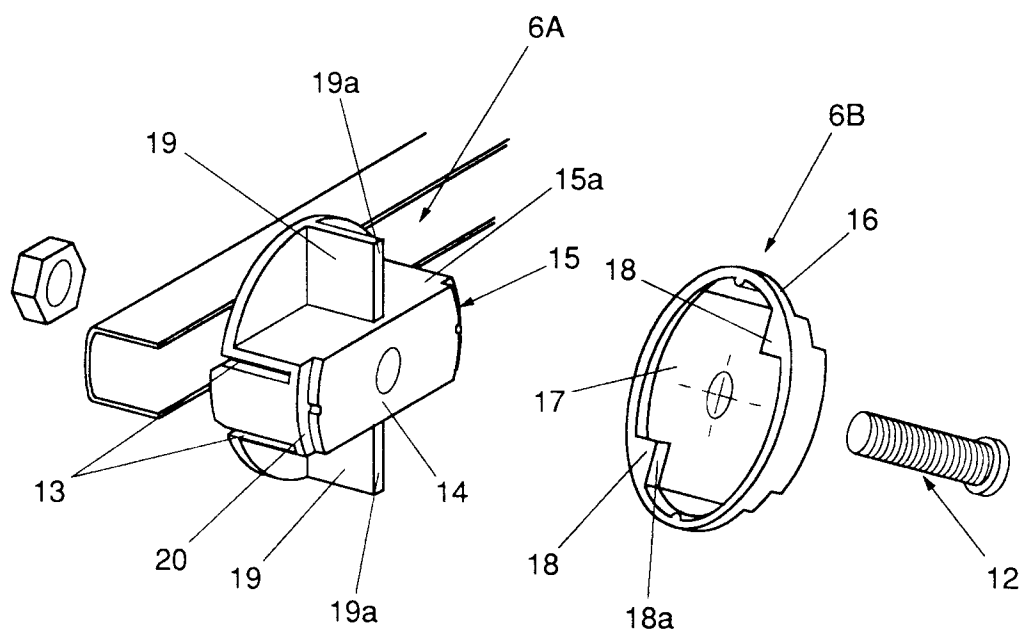
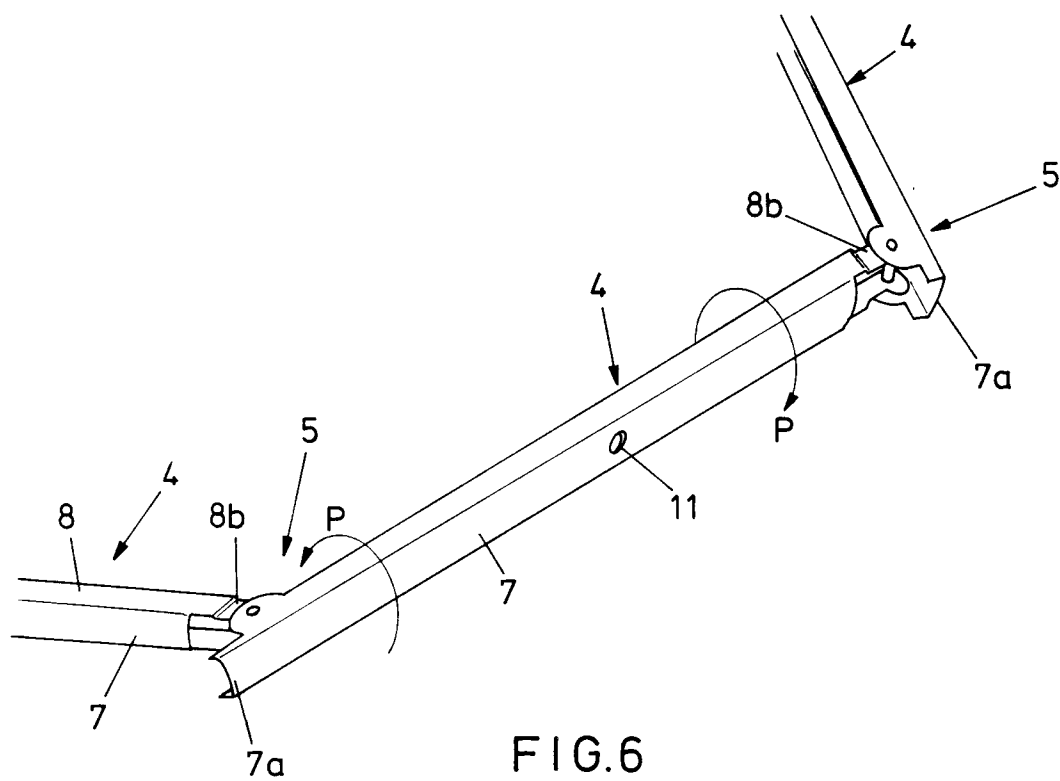


FIG. 5





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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 2091

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.5)
X	NL-A-8 503 540 (PRODUCT PROCESSING V.O.F.) * Figures 1-3; page 4, lines 1-30 * - - -	1-8	A 47 B 43/00
Y	US-A-4 082 046 (BAGLIN) * Figures 1-5; abstract; column 1, lines 65-68; columns 2-4 * - - -	1	
Y	US-A-3 261 308 (SZYMBER) * Figure 1; column 1, lines 14-20 * - - -	1	
A	US-A-4 746 022 (BENHAM) * Figures 1-4; column 3, lines 38-68 * - - -	1,2,5	
A	GB-A-2 027 588 (BERRY) * Figures 1,5 * - - - - -	1,2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A 47 B B 65 D B 65 B A 47 F E 04 H
Place of search		Date of completion of search	Examiner
The Hague		19 November 91	NOESEN R.F.
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