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(54) **Stackable box.**

(57) Stackable box from plastic, which at or near the corners is provided with posts (6)(19)(22)(26) extending above the side walls and with cavities (7)(20) which receive these posts when the boxes are stacked in pairs, face-to-face. The corners of the box have been provided with tubular profiles (2) of rectangular cross section, which profiles are each by a wall (5) divided into two tubes of similar cross section, one of which has been extended above the side walls of the box to form a post (19), the other forming a cavity (20) for insertion of a post of another box in the case of face-to-face stacking.

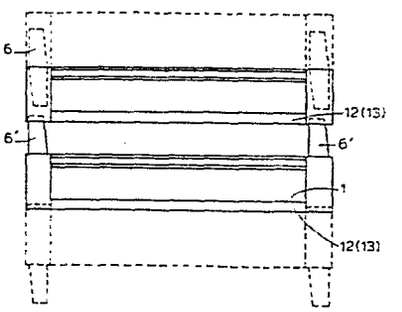

FIG 3

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STACKABLE BOX

The invention relates to a stackable box from plastic, which at or near the corners is provided with posts extending beyond the top of the side walls and with cavities which receive these posts when the boxes are stacked in pairs, face-to-face.

A similar box is known from Dutch Patent Application No. 78 03307.

Boxes of this type are used, for example, for storage and transport of agricultural and horticultural products. When filled boxes are stacked, they are kept apart by the posts, so that the bottom of one box does not touch the products in another. The posts and cavities should be provided in such a manner that when boxes covered with lids are stacked in face-to-face pairs, to save space, the posts do not stick out into the opposite box.

In a stack, the total weight of the stacked boxes bears on the posts of the bottom box. The posts must be capable of resisting this load without being deformed, because otherwise the stack is in danger of leaning over or even collapsing.
The maximum allowable stack height is thus determined by the strength of the posts.

In the known design, the posts consist of V-shaped profiles. The load-bearing power of these posts is relatively low. Further, the niche-shape of the cavities does not add strength to the corner construction. As a result, the allowable stack height and hence also the efficiency with which the storage room can be used are low.

The invention provides a stackable box with a corner construction in which the posts as well as the cavities contribute to the load-bearing capacity.

This is achieved by providing the corners of the box, according to the invention, with tubular profiles of rectangular cross section, each profile being divided by a wall into two tubes of similar cross section, one of the tubes being extended beyond the top of the side walls of the box to form a post and the other tube forming a cavity for insertion of a post of another box in the case of stacking in face-to-face pairs.

By using these tubular profiles, a high strength of the posts and a high rigidity of the corner construction of the box are obtained, enabling stable stacking to a great height. The partition wall runs through the centre of the profile, which is thus divided into two similar tubes having, for example, a triangular, rectangular or trapezoid cross section, depending on the angle at which the partition meets the side walls of the box.

By preference, the tubular corner profiles are square in cross section and are divided into two tubes of similar triangular cross section by a diagonal wall meeting the adjacent side walls of the box at an obtuse angle.

In a highly preferable embodiment, the corner profiles are square in cross section and the partition walls meet one of the side walls of the box at a right angle. Boxes with partition walls provided in this way offer the advantage that face-to-face stacking can occur with less difficulty as long as during stacking care is taken that the walls which pass each other first are the ones which the partition walls meet at a right angle. With rectangular boxes it is therefore preferred in this case to provide the partition walls at a right angle with a long side wall, because these boxes are usually taken hold of at the short side walls.

For fast stacking, and to enable proper centring of the posts in the cavities, the posts and the cavities are preferably so made that the cross section of the posts decreases towards the top.

In the posts, at some distance from the bottom an arresting surface may have been provided, with which the box rests on the posts of the underlying box in a stack.

The tubes forming posts and the tubes forming cavities may terminate at different distances below the bottom. Boxes stacked bottom to bottom will then lie with the tubes unshiftably against one another, so that the forces occurring in a stacked assembly cannot act on the bottom.

At their lower surface, the bottoms of the boxes may have been provided with ribs so excentrically positioned with respect to the centre line of the box that when boxes are stacked bottom to bottom the ribs of one box project between the ribs of the other.

The invention will be further explained with reference to the embodiment represented in the drawing, which serves as an example.

Fig. 1 is a top view of a box according to the invention;

Fig. 2 is a bottom view of this box;

Fig. 3 is a side view of the various ways of stacking the boxes;

Fig. 4 is a sectional view along line IV-IV in Fig. 2 with face-to-face stacking.

Fig. 5 is a top view of a box according to a variation of the invention and

Fig. 6 is a schematic representation of face-to-face stacking of boxes according to Fig. 5.

The box consists of a bottom 1, two long side walls 2 and two short side walls 3. At the corners of the box, the side walls join tubular profiles 4 having a square cross section. The profiles are by a diagonal wall 5, which meets the adjacent side walls at an angle of 135°, divided into two triangular tubular profiles, one of which points to the middle of the box and the other to the outside. At one pair of opposite corners the inner triangular tubes have been extended above the side walls to form posts 6, and at the other pair the outer triangular tubes, while the other tubes form cavities 7 running along the entire height of the box. The box has been made by injection moulding of a thermoplastic, such as polyethylene, polypropylene or polystyrene.

When the boxes are placed oppositely against each other (Figs. 3 and 4), the posts 6 project into the cavities 7. The posts are slightly tapered in design. At a short distance from the bottoms of the posts, cams or cross-ribs 8 have been provided, which form arresting surfaces 9 with which the box can rest on the column 6' of an underlying box when the boxes are stacked top-to-bottom.

The tubular profile 4 projects below the bottom 1 of the box, with the post-forming part 6 of the tubular profile 4 projecting a little further below the bottom 1 of the box than the cavity-forming part 7 of the tubular profile. In Figure 4, these parts are indicated by 10 and 11 respectively. When boxes are stacked bottom to bottom, one box rests with the parts 10 and 11 on corresponding parts of another box. On account of the triangular cross section of parts 10 and 11, boxes stacked in this way cannot shift with respect to each other. The bottom of the box has on the lower side been rigidified by means of ribs which have been positioned so excentrically with respect to the centre line of

the box that with bottom-to-bottom stacking the ribs of one box project between the ribs of another. The ribs 12 and 13 project as far from the bottom 1 of the box as part 10 of the tubular profile. This is of importance in the case of transportation of the boxes on roller conveyors.

In Fig. 5, a variation of a box according to the invention is represented, with bottom 14, short side walls 15 and long side walls 16. Again, in the four corners the tubular profiles 17 are situated, which are this time by partition walls 18 perpendicular to the side walls 16 divided into two tubes of similar cross section, one of which has been extended to form a post 19, the other forming a cavity 20 for insertion of a post of another box in the case of face-to-face stacking. The cross section of the posts decreases towards the top, resulting in bevels 21. The advantage of this box in stacking is explained with reference to Fig. 6, where A and B represent a bottom and a top view, respectively, of a box with tubes of triangular cross section, and C and D represent a bottom and a top view, respectively, of a box with tubes of rectangular cross section. A', B', C' and D' schematically represent the side views of the boxes A, B, C and D. The posts 22, 23, 24 and 25 of box B are in A referred to as 22', 23', 24' and 25'. Similarly, the posts 26, 27, 28 and 29 of box D are referred to as 26', 27', 28' and 29' in box C. When box A is to be placed on box B in face-to-face stacking, post 22' of box A must first be moved over (arrow L) or past (arrow M) the posts 22 and 23 of box B. The route along arrow L requires continuous high lifting of the box A, while in the case of the route along arrow M and awkward turning motion must be made with box A.
In the case of a high stack, with vision of the top of the stack being blocked, this will make stacking of the top box difficult.

When box C is to be stacked on box D, however, once post 26' of box C has been moved over (arrow P) or past (arrow Q) post 26 of box D the box can be put in place without further awkward turning motions or high lifting.

The boxes according to the invention can be used, for example, for hot-bed germination of seed-potatoes. In this application, boxes of, for example, 400 x 600 mm, each filled with approx. 12 kg of potatoes, are stacked on each other in a room of well-defined temperature and humidity. The boxes have a height of, for example, 100 mm and are kept apart by posts which project about 80 mm above the top rim of the box, to enable ventilation-air flow between the boxes. Further, the bottom

and the side walls may have been provided with openings for ventilation. Without the danger of deformation of the posts, thirty filled boxes can be stacked on each other, to a height of 5.5-6 m. In this way, the conditioning room is optimally utilized.

The invention is not restricted to the example described. The tubular corner profiles may, for example, also be realized as rectangulars, which by a wall through their middle are divided into two similar triangular, rectangular or trapezoid tubes.

C L A I M S

1. Stackable box from plastic, which at or near the corners is provided with posts extending above the side walls and with cavities which receive these posts when the boxes are stacked in pairs, face-to-face, characterized in that the corners of the box have been provided with tubular profiles of rectangular cross section, which profiles are each by a wall divided into two tubes of similar cross section, one of which has been extended above the side walls of the box to form a post, the other forming a cavity for insertion of a post of another box in the case of face-to-face stacking.
2. Stackable box according to claim 1, characterized in that the tubular corner profiles are square in cross section.
3. Stackable box according to claim 1 or 2, characterized in that the corner profiles are by a diagonal wall, which meets the adjacent side walls of the box at an obtuse angle, divided into two tubes of similar, triangular cross section.
4. Stackable box according to claim 1 or 2, characterized in that the corner profiles are divided into two tubes of rectangular cross section by a wall perpendicular to one of the side walls of the box.
5. Stackable box according to claim 4, characterized in that with a rectangular box the walls dividing the corner profiles into tubes are perpendicular to the long side walls of the box.
6. Stackable box according to any one of the claims 1-5, characterized in that the cross section of the posts decreases towards the top.
7. Stackable box according to any one of the claims 1-6, characterized in that in the posts at some distance from the bottom an arresting surface has been provided, with which the box rests on the posts of an underlying box in a stack.
8. Stackable box according to any one of the claims 1-7, characterized in that the tubes forming the posts and the tubes forming the cavities terminate at different distances below the bottom.
9. Stackable box according to any one of the claims 1-8, characterized in that the bottom of the box has on its lower side been provided with ribs, which have been positioned so excentrically with respect to the centre line of the box that when boxes are stacked bottom-to-bottom the ribs of one box project between the ribs of another.

10. Stackable box according to claim 9, characterized in that the ribs project as far from the bottom as the part of the tubular profile which projects farthest below the bottom.

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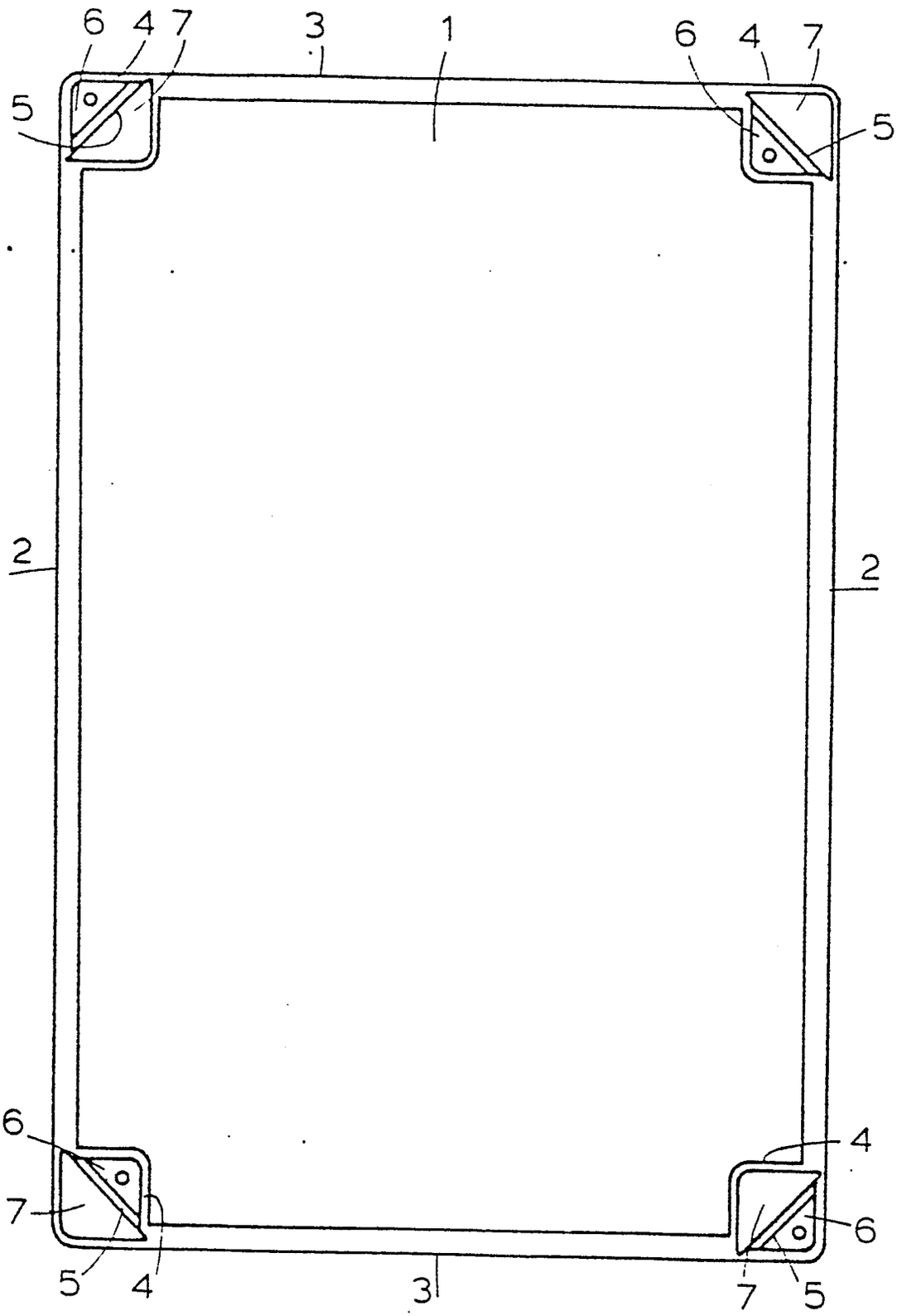

FIG.1

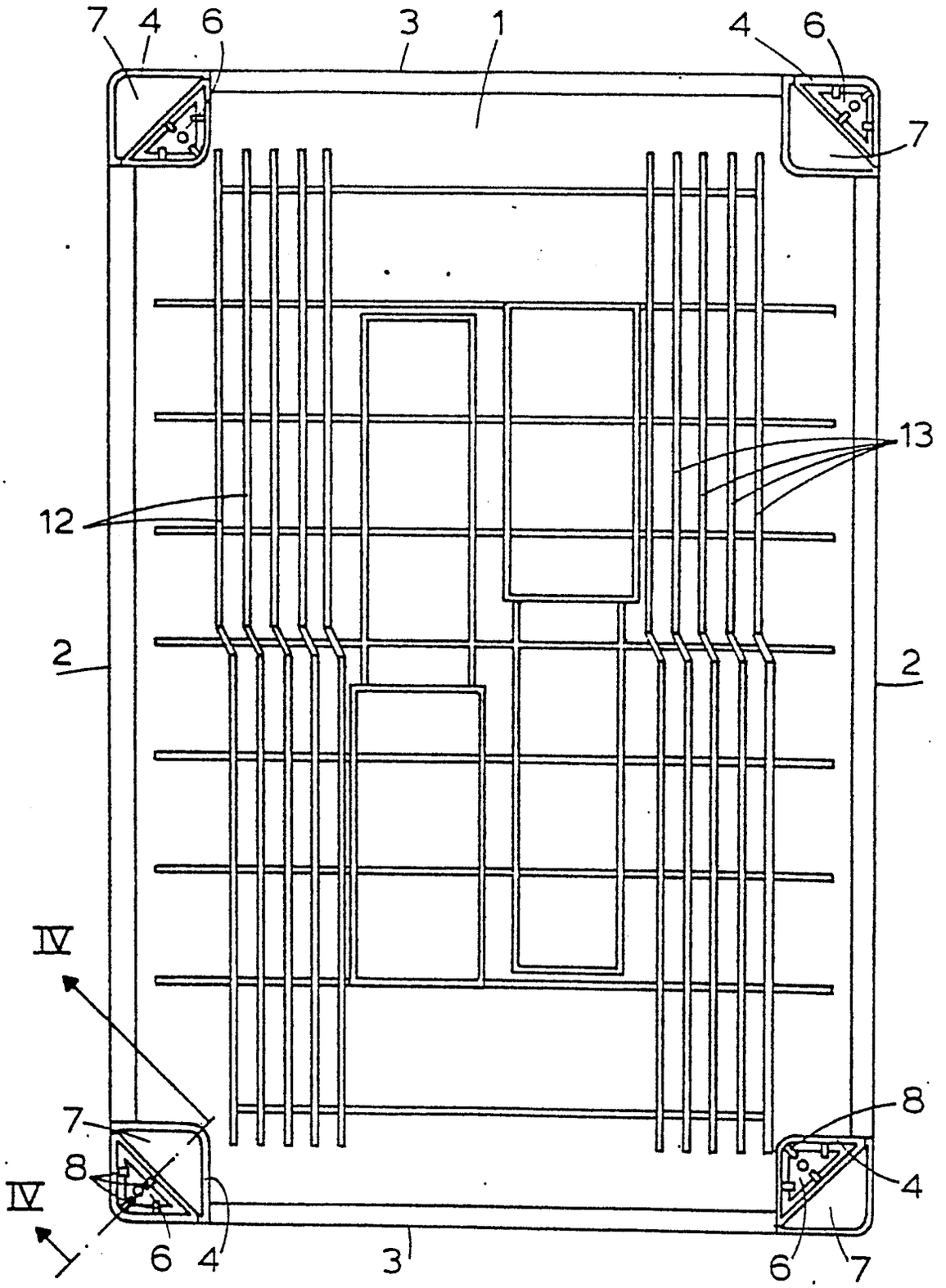

FIG. 2

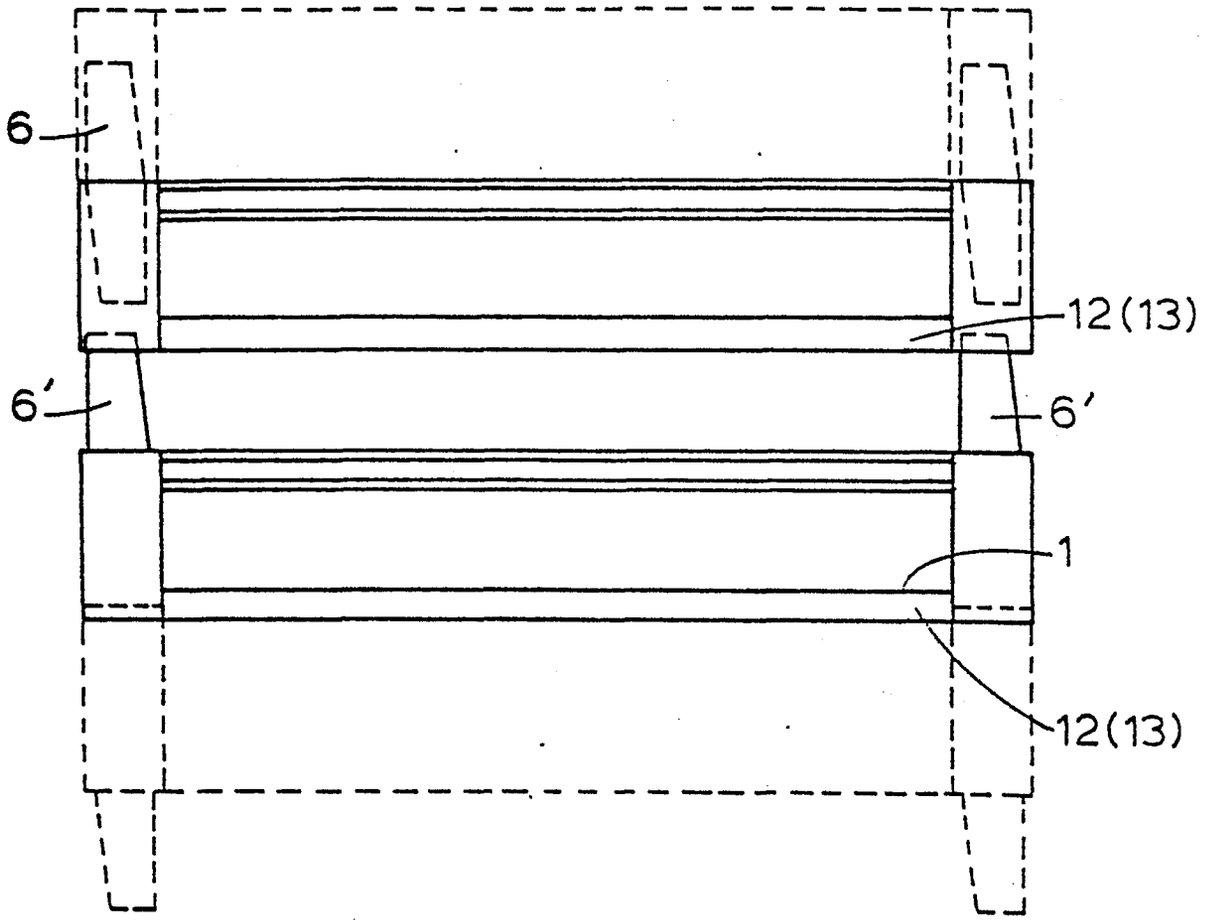

FIG. 3

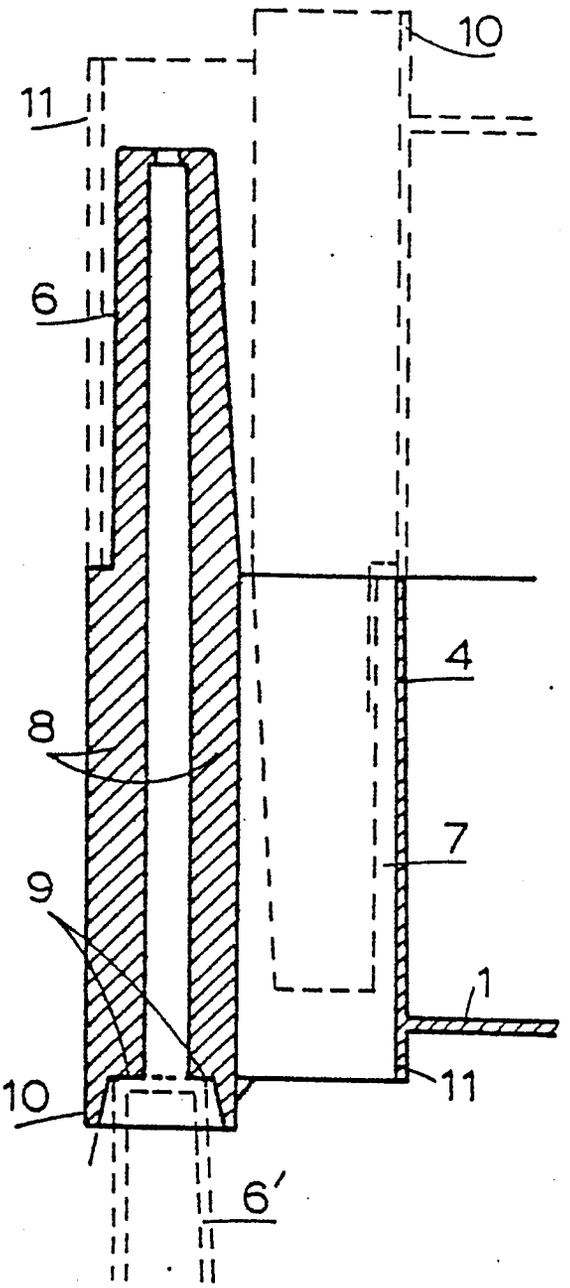

FIG. 4

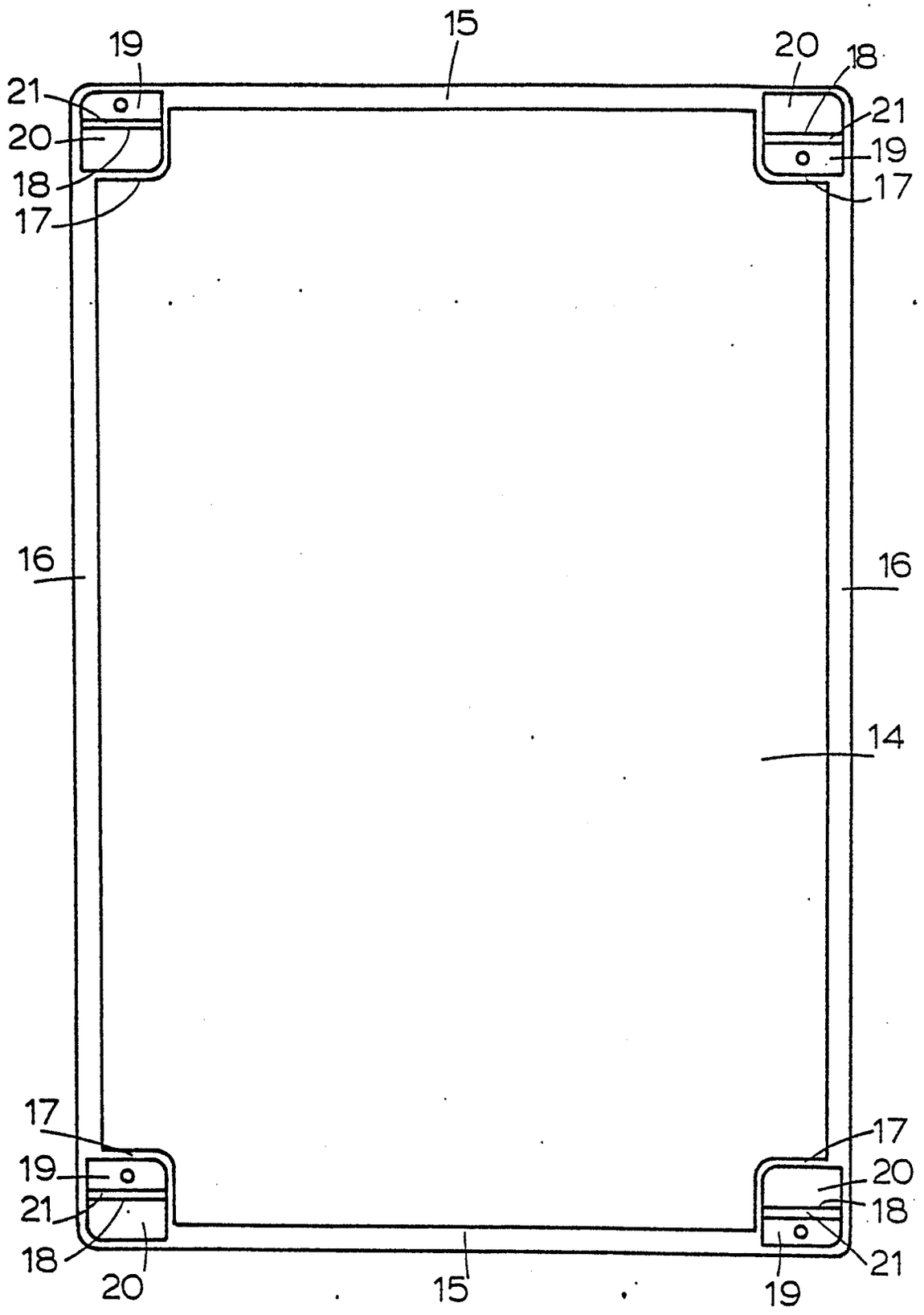
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FIG. 5

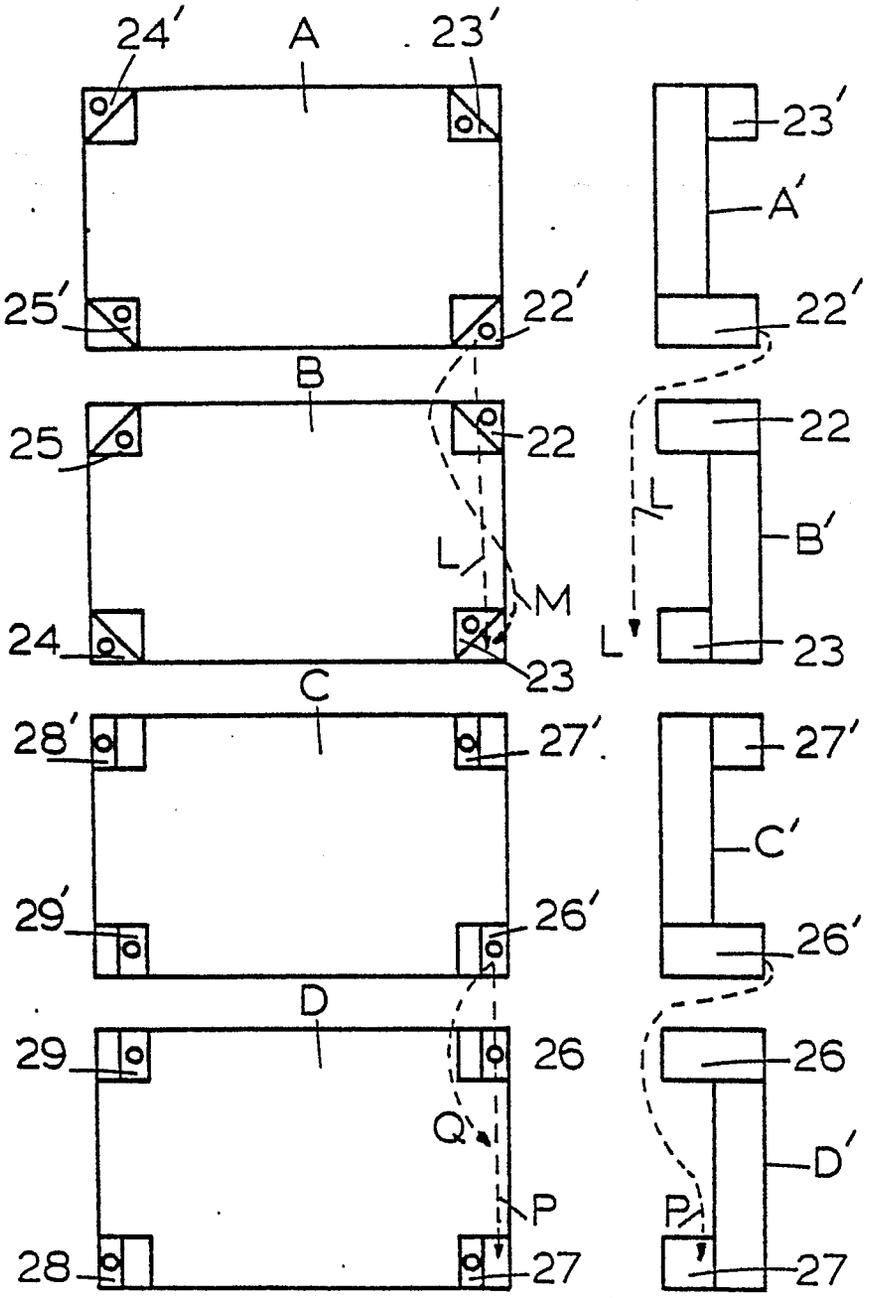
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FIG. 6

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EUROPEAN SEARCH REPORT

0092888
Application number

EP 83 20 0589

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. ³)
Y	FR-A-2 385 596 (DELBROUCK GmbH) * Figures 1,2; page 2, lines 1-6; page 3, lines 21-25, 32-36; page 4, lines 10-18; page 5, lines 13-15 *	1-7	B 65 D 21/02
Y	FR-A-2 348 113 (SPUMALIT-ANSTALT) * Figures 1,6; page 4, lines 24-28, 36-38; page 5, lines 9-11; page 6, lines 26-28, 35-38 *	1-7	
A	US-A-4 304 334 (HIROTA) * Figures 2,11; column 2, lines 41-42, 64-67 *	1,2,4, 5	
A	DE-A-2 721 129 (DELBROUCK GmbH) * Figures 1,4; page 6, lines 12-14, 24-25; page 7, lines 7-21 *	3,6,7	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) B 65 D
A	BE-A- 817 424 (BRACKENIER) * Figure 3; page 6, lines 13-26 *	9	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-07-1983	STEEGMAN R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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