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(71) Applicant: **GE POLYMER LOGISTICS LTD.**
**69 492 Tel Aviv (IL)**

(72) Inventor: **Feiner, Gideon**
**B-2930 Brasschaat (BE)**

(74) Representative: **Price, Paul Anthony King et al**
**D. Young & Co.,**
**21 New Fetter Lane**
**London EC4A 1DA (GB)**

## (54) Pallet

(57) A pallet (2) includes a panel having legs (4) for supporting the panel (2) in a horizontal position on a horizontal supporting surface, and a plurality of tensioned cables (6) extending across the panel (2) and having their ends fixed to opposite sides of the panel (2) for applying a compressive force to the panel (2) to increase the panel strength against buckling or bending.

FIG.3a

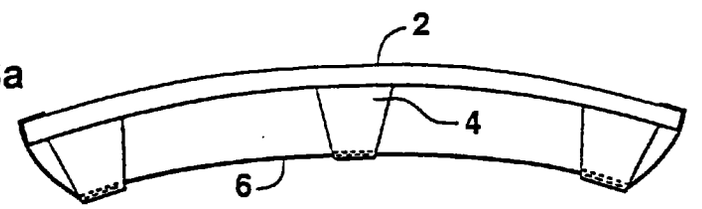
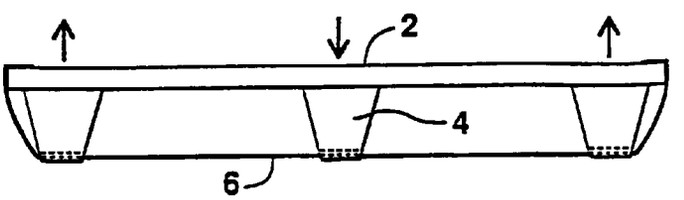



FIG.3b

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## Description

The present invention relates to pallets used for supporting loads.

Pallets generally comprise panels of a construction to bear a load, and legs at their lower faces for supporting the panel in a horizontal position above a horizontal supporting surface. The pallet generally includes a 2-way or a 4-way forklift entry enabling the forks of a lift truck or the like to pass between the panel and supporting surface for raising the pallet. Wood is commonly used for making the panel and its legs, although plastic is now gaining widespread use for this purpose. Both wood and plastic panels, however, are relatively thick and heavy in order to support the load against buckling and bending, and therefore are expensive to produce and costly to handle and to store.

There is a need for a panel which can be constructed relatively thin and light in weight for the load it is to carry, and which therefore can be handled in a simpler and less costly manner than the conventional pallets.

According to the present invention, there is provided a pallet comprising a panel of a construction to bear a load and having legs at its lower face for supporting the panel in a horizontal position on a horizontal supporting surface; and a plurality of tensioned cables extending across the panel and having their ends fixed to opposite sides of the panel for applying a compressive force to the panel to increase the panel strength against buckling or bending forces.

A number of pallets constructed in accordance with the foregoing features are described below for purposes of example. Thus, described below are pallet constructions wherein the plurality of cables are applied across the lower face of the panel, across the upper face of the panel, or across both faces; wherein the panel is of rectangular configuration and the tensioned cables are applied in parallel spaced relation along one axis of the panel, along both axes, and/or diagonally across the panel; wherein the ends of the cables are fixed to the panel by clamping bars, by anchoring bolts, or by pulley wheels rotatable to adjust the tension of the cables; and wherein the panel includes a plurality of guide rollers for supporting mid-portions of the tensioned cables.

According to further features in the described preferred embodiments, the panel may be flat in its unloaded state, or may be outwardly bowed in its unloaded state such as to become flat in its loaded state.

As will be more apparent from the description below, a panel constructed in accordance with the foregoing features may be made relatively thin and light weight as compared to a conventional panel for supporting a comparable load, thereby enabling substantial savings to be made not only in the cost of the materials used in manufacturing the pallets, but also in the cost of handling the pallets particularly when returning the pallets empty or storing the pallets. The foregoing features of the invention are particularly applicable when making pallets of plastic materials, but could also be used when making pallets of wood, metal, or other materials.

The invention may be advantageously used in pallets of a wide variety of types, including nestable pallets, non-nestable pallets, pallets having bottom skids or bottom decks, etc.

Further features and advantages of the invention will be apparent from the description below.

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

Fig. 1 is an end elevational view illustrating one form of pallet constructed in accordance with the present invention;

Fig. 2 is a bottom plan view illustrating the panel of Fig. 1;

Fig. 3a illustrates the panel of Figs. 1 and 2 in its normal, unloaded condition, wherein it assumes an outwardly bowed configuration;

Fig. 3b is a view similar to that of Fig. 3a, but illustrating the panel in its loaded, flat or unbowed condition;

Fig. 4 is a perspective view, and Fig. 4a is a bottom plan view, illustrating a modification in the panel of Figs. 1 and 2;

Fig. 4b is a bottom plan view similar to that of Fig. 4a but illustrating a different arrangement of tensioned cables; and

Figs. 5-11 are side elevational views illustrating further pallet constructions in accordance with the present invention.

The pallet illustrated in Figs. 1 and 2 comprises a panel 2 of a sufficiently strong construction to bear a load. It includes a plurality of legs 4 at its lower face for supporting the panel in a horizontal position on a horizontal supporting surface. The spaces between the legs enable the forks of a lift truck to be received between the panel and the supporting surface for lifting the pallet.

The panel illustrated in Figs. 1 and 2 further includes a plurality of tensioned cables 6 extending across the lower face of the panel with the ends of the cables fixed to opposite sides of the panel by means of clamping bars 8. The tensioned cables 6 apply a compressive force to the panel 2 thereby increasing the panel strength against buckling and bending forces.

Fig. 3a illustrates the panel of Figs. 1 and 2 in its normal, unloaded state, wherein it will be seen that the tensioned cables 6 outwardly bow the panel 2 such that, when the panel is loaded, it becomes flat and unbowed in the loaded state as illustrated in Fig. 3b. The panel may thus have a relatively thin construction, as compared to a conventional panel, for carrying a comparable load.

While it is preferable to tension the cables sufficiently to bow the panel in its unloaded state, the bow shown in Fig. 3a is somewhat exaggerated for purposes of illustration; it could be substantially less than that illustrated

in Fig. 3a, and even could be such as not to be particularly noticeable in the unloaded state of the panel.

As shown in Figs. 1 and 2, the tensioned cables 6 are received within recesses 9 formed in the bottom surfaces of the legs 4, so as to permit the pallet to rest flatly on a flat surface. The clamping bars 8 may be of any suitable construction to firmly clamp the ends of the cables 6 along the outer edges of the panel 2.

The panel 2 shown in Fig. 2 is of rectangular configuration, and the tension cables 6 are applied in parallel spaced relation along one coordinate axis of the panel. If desired, the tensioned cables may be applied along both coordinate axes. Figs. 4 and 4a are perspective and bottom views, respectively, illustrating such a construction.

Fig. 4b is a bottom view illustrating a further construction wherein the tensioned cables, therein designated 16, are applied diagonally with respect to the panel, therein designated 12. As in Figs. 1 and 2, the cables here are also received within recesses 19 formed in the legs 14 and are clamped at their ends by clamps (not shown), corresponding to clamps 8 in Fig. 1.

Fig. 5 illustrates another pallet construction, also including a horizontal panel 22, a plurality of legs 24, and a plurality of tension cables 26 received within recesses 29 formed in the bottom faces of legs 24. In this case, the ends of the cables are secured to the panel by anchoring bolts 28. However, the panel illustrated in Fig. 5 also includes guide rollers 27 for supporting mid-portions of the tensioned cable 26, particularly where they change direction, to permit some relative movement of portions of the cables with the changes in load on the pallet.

Fig. 6 illustrates a similar pallet construction as in Fig. 5, including a horizontal panel 32, a plurality of legs 34, a plurality of tensioned cables 36 fastened at their ends to the edges of the panel, and a plurality of guide rollers 39 for supporting mid-portions of the cables 36 to enable the cables to follow the lower contour of the pallet. In this case, however, one or both ends of each cable is attached to a pulley wheel 38 which enables the cable to be tensioned as desired. For purposes of example, the pallet illustrated in Fig. 6 is one that also includes a bottom deck or skid 35.

Fig. 7 illustrates a similar type pallet as in Fig. 6, including a panel 42, a plurality of legs 44, a plurality of tensioned cables 46 passing over guide rollers 47 and fastened at one or both ends to a pulley wheel 48, and a bottom deck or skid 45. In this case, however, the tensioned cables 46 are received within recesses 43 in the bottom deck or skid 45.

Fig. 8 illustrates a construction similar to that of Fig. 5, also including a panel 52 formed with a plurality of legs 54 having a plurality of tensioned cables 56 supported on guide rollers 59. In this case, however, each cable does not extend completely across the panel 52, but rather for only one-half the length of the panel. Thus, there is one set of cables 56a having one of their ends anchored by anchoring bolts 58a to legs 54 on one side of the panel with their opposite ends anchored by anchoring bolts 58a to a mid-portion of the panel; and another set of cables 56b having one of their ends anchored by anchoring bolts 58b to the legs 54 on the opposite side of the panel with their opposite ends anchored to the mid-portion of the panel. As in the previously-described embodiments, all the cables 56a, 56b are tensioned so as to apply a compressive force to the panel.

Fig. 9 illustrates a further pallet construction including a panel 62, a plurality of legs 64 and a plurality of tensioned cables 66. In this case, however, the tensioned cables 66 are applied across the underface of the panel 62, and through the legs 64. Preferably, the cables 66 are received within recesses or grooves 69 formed in the underface of panel 62, and extending through the base of the legs 64 at their junctures with the panel and anchored to the ends of panel 62 by anchoring members 68.

While in the previously-described embodiments the cables are all shown as being applied to the underside of the panel, preferably to produce some outward bowing of the panel in its normal unloaded state as shown in Fig. 3a, in some applications it may be desired to apply the tensioned cables over the upper side of the panel, particularly to prevent bending of the panel under load. This is shown in the pallet construction illustrated in Fig. 10, which includes a panel 72, a plurality of legs 74, and a plurality of tensioned cables 76 anchored to the pallet legs by anchoring members 78. In this case, however, the tensioned cables 76 are applied in recesses 79 extending over the upper face of the panel 72, rather than over the lower face as in the previously-described constructions.

Fig. 11 illustrates a pallet construction similar to that of Fig. 10, including a panel 82, a plurality of legs 84, and a plurality of tensioned cables 86 anchored by anchoring members 88 and extending through recesses 89 formed in the upper face of the panel. In this case, however, the panel also includes tensioning cables 81 extending through recesses 83 formed in the lower face of panel 82 and anchored at their ends by anchoring members 88. It will be appreciated that, in the construction illustrated in Fig. 11, the cables 81 extending over the lower face of the panel 82 may be continuations of the cables 86 extending over the upper face of the panel supported on guide rollers 85.

While the invention has been described with respect to some preferred embodiments of the invention, it is the case that these are set forth merely as examples, and that many other variations, modifications and applications of the invention may be made.

From the above embodiments, it may be seen that the invention generally provides a pallet comprising a load-bearing frame which includes a top deck and a tensioning system which extends laterally of the frame and applies lateral compression to the top deck. The tensioning system may comprise wires or straps which each extend between the sides of the frame or part of the dis-

tance between the sides of the frame, so as to act together to apply the lateral compression to the top deck.

## Claims

1. A pallet comprising:
   a panel of a construction to bear a load and having legs at its lower face for supporting the panel in a horizontal position on a horizontal supporting surface;
   and a plurality of tensioned cables extending across the panel and having their ends fixed to opposite sides of the panel for applying a compressive force to the panel to increase the panel strength against buckling or bending forces.

2. The pallet according to Claim 1, wherein said plurality of tensioned cables are applied across the lower face of the pallet.

3. The pallet according to Claim 2, wherein said tensioned cables are received in recesses formed in the lower face of said legs.

4. The pallet according to Claim 3, wherein said tensioned cables are received in recesses formed in the lower face of the panel and extend through said legs.

5. The pallet according to Claim 1, wherein said pallet further includes bottom skids, and said tensioned cables are received within recesses formed in the lower face of said skids.

6. The pallet according to Claim 1, wherein said tensioned cables are applied across the upper face of the panel.

7. The pallet according to Claim 6, wherein said tensioned cables are received within recesses formed in the upper face of said panel.

8. The pallet according to Claim 1, wherein said tensioned cables are applied across the upper face and the lower face of the panel.

9. The pallet according to Claim 1, wherein said panel is of rectangular configuration and said tensioned cables are applied in parallel spaced relation along one axis of the panel.

10. The pallet according to Claim 1, wherein said panel is of rectangular configuration and said tensioned cables are applied in parallel spaced relation along both axes of the panel.

11. The pallet according to Claim 1, wherein said tensioned cables are applied diagonally across the panel.

12. The pallet according to Claim 1, wherein the ends of said tensioned cables are fixed to the panel by clamping bars.

13. The pallet according to Claim 1, wherein the ends of the tensioned cables are fixed to the panel by anchoring bolts.

14. The pallet according to Claim 1, wherein the ends of the tensioned cables are fixed to the panel by pulley wheels rotatable to adjust the tension of the cables.

15. The pallet according to Claim 1, wherein said pallet further includes a plurality of guide rollers for supporting mid-portions of said tensioned cables.

16. The pallet according to Claim 1, wherein said panel is flat in its unloaded state.

17. The pallet according to Claim 1, wherein said panel is outwardly bowed in its unloaded state such as to become relatively flat in its loaded state.

FIG.1

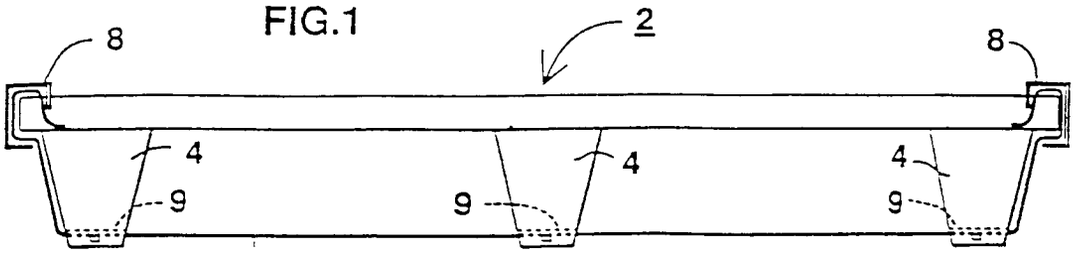
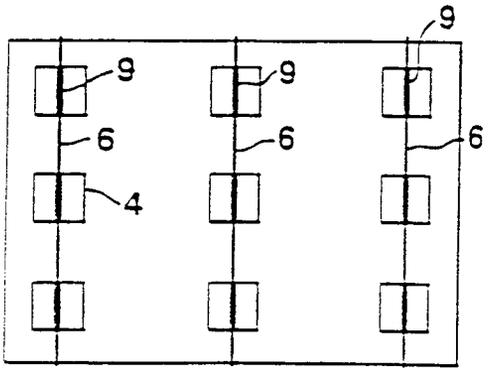



FIG.2



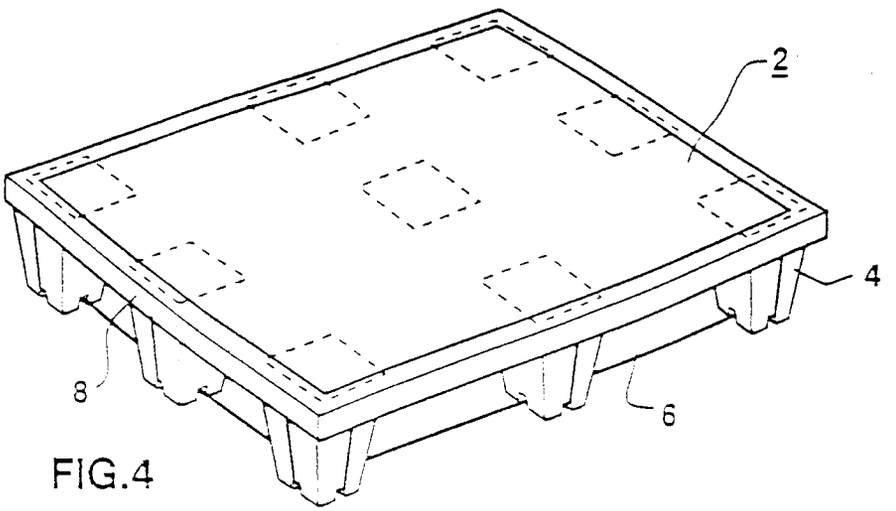




FIG.4

FIG.3a

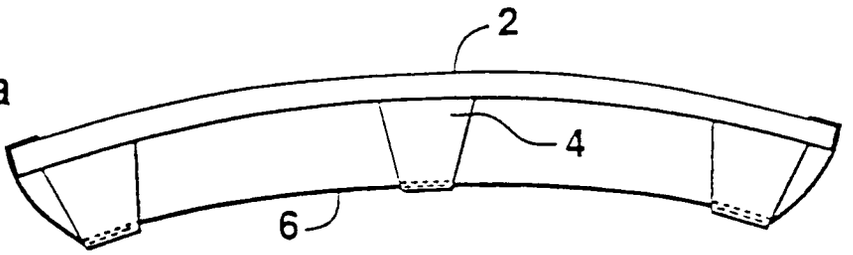



FIG.3b

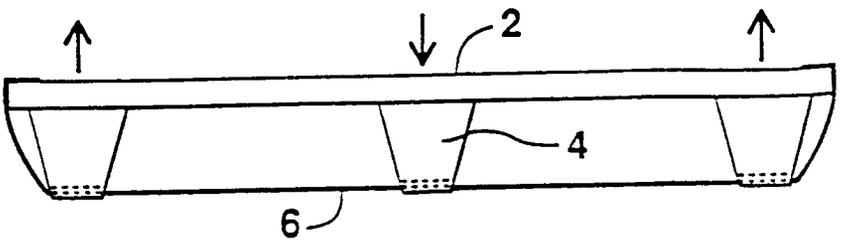



FIG.4a

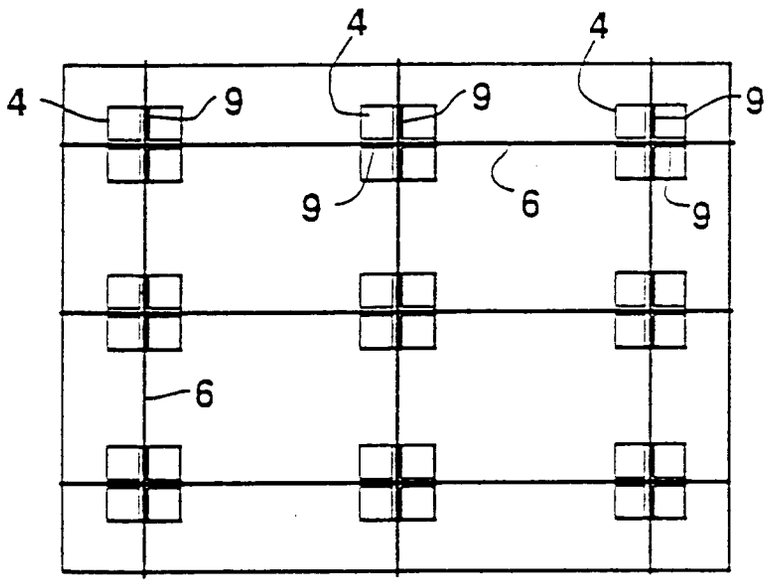



FIG.4b

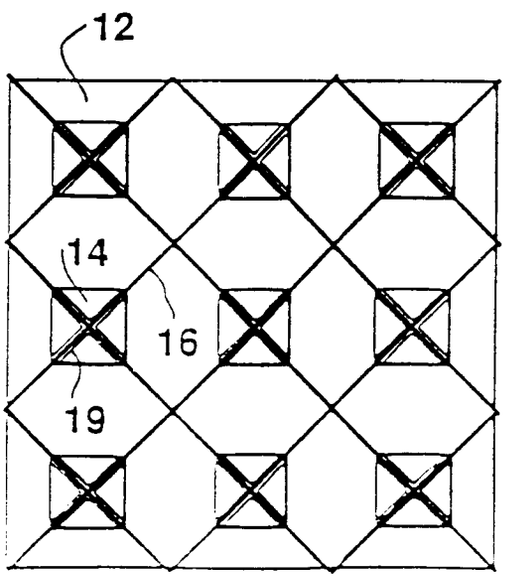
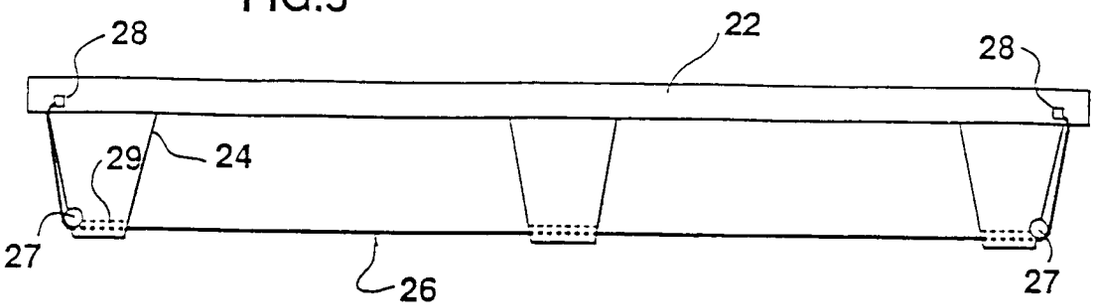


FIG.5



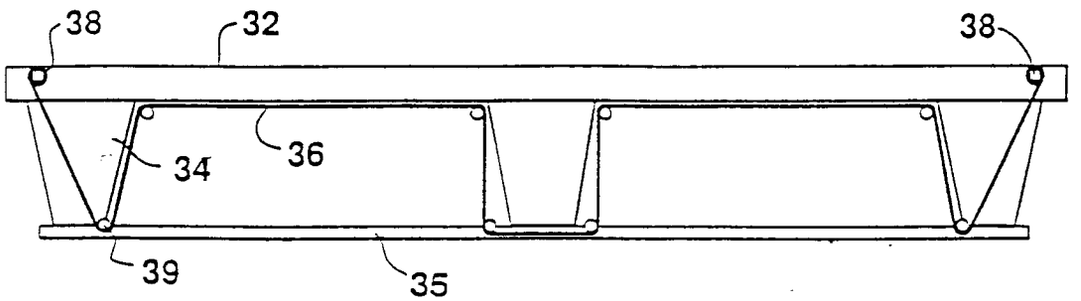




FIG.6

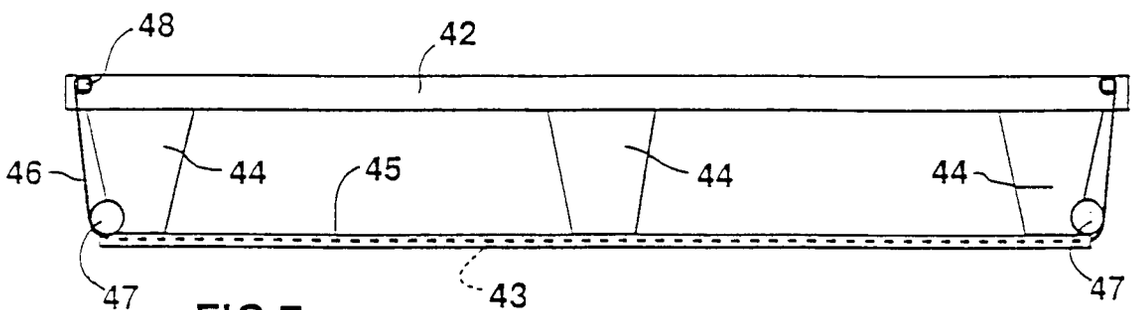



FIG.7

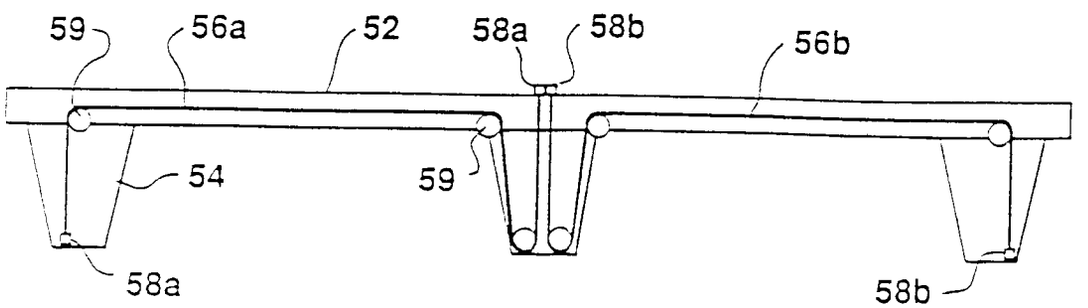



FIG.8

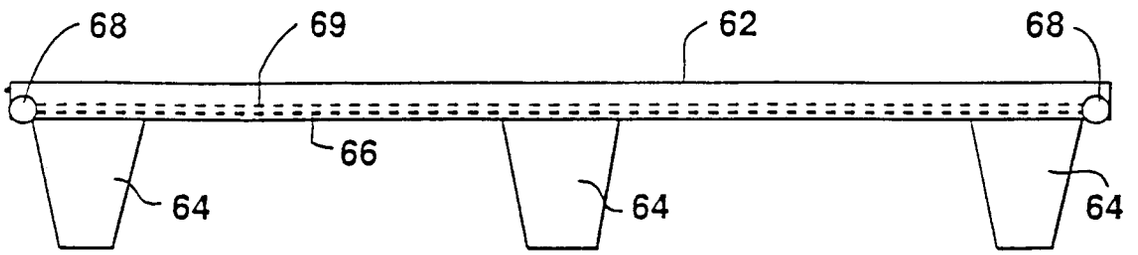



FIG.9

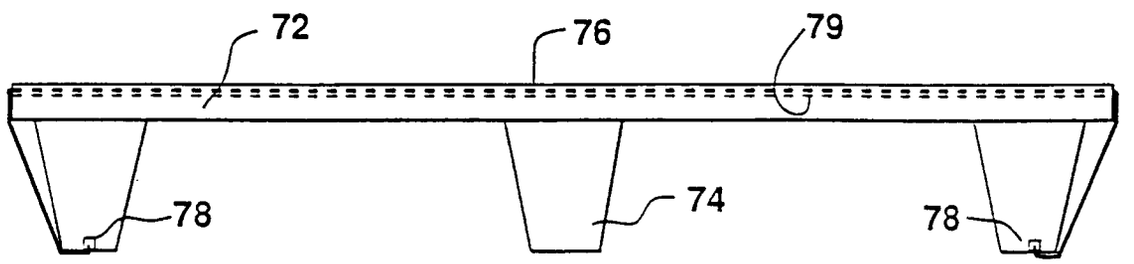



FIG.10

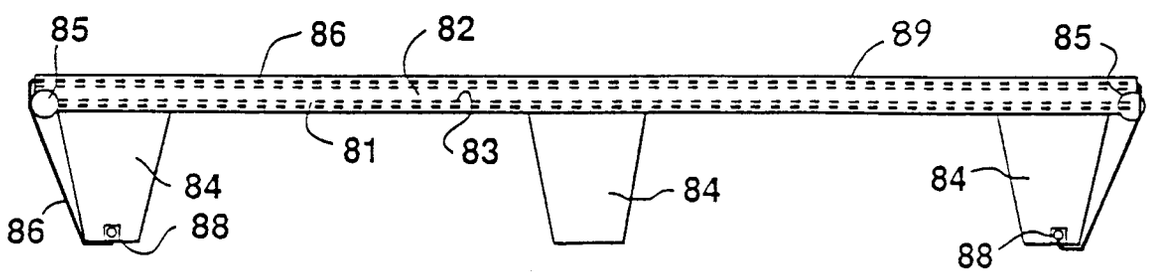



FIG.11

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# EUROPEAN SEARCH REPORT

Application Number
EP 95 30 8893

## 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<br>A | FR-A-2 351 867 (SOLVAY & CIE) 16 December 1977<br>* page 3-6; figures 1-4 * | 1,2<br>3,4,6,7, 10,16,17 | B65D19/38<br>B65D19/24 |
| A | FR-A-2 309 417 (CEGEDUR SOC. DE TRANSFORMATION DE L'ALUMINIUM PECHINEY) 26 November 1976<br>* page 2, line 38 - page 3, line 4; figures 1,2 * | 5 | |
| A | US-A-1 698 038 (WARSHAW) 8 January 1929<br>* page 1, line 55 - page 2, line 79; figures 1-4 * | 12,13, 16,17 | |

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 20 March 1996 | Vollering, J |

CATEGORY OF CITED DOCUMENTS

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