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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **High-strength tubular beam of folded corrugated cardboard.**

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Description

This invention relates to a box beam of folded corrugated cardboard, which has high resistance to bending and to transverse crushing, and is suitable for example for constructing load resting or carrying platforms of the pallet type.

Disposable corrugated cardboard pallets are known, formed from a set of cardboard box-section beams disposed mutually crossing.

Said box beam elements, of known type, are formed from two sheets of cardboard which are folded several times back on themselves to form, respectively, the actual body of the box element and a cover therefor which is fixed to this latter by gluing, and which ensures the transverse constituency of said body and improves its bending resistance. This body is in the form of a beam of parallelepiped form, constituted by two adjacent symmetrical elements, the cross-section of each of these comprising a diagonal which is locked against central abutments which rise from the base of said parallelepiped form.

Said central abutments are produced by punching them from the sheet which constitutes the parallelepiped beam, and are disposed alternately on one and the other side of the axis of longitudinal symmetry of said sheet, to which they are joined along said axis of longitudinal symmetry.

The use of such box beams, for example for forming load-carrying platforms in general, has shown up drawbacks deriving from the fact that it is necessary to prepare two separate corrugated cardboard sheets provided with respective predetermined creasing lines, and of which one, i.e. that designed to form the body of the box element, must also be subjected to a punching operation for creating said central abutments.

After this, the second sheet, which has been previously folded several times back on itself, must be assembled.

A tubular beam of folded corrugated cardboard is also disclosed in GB—A—620701, consisting of a single sheet folded back several times on itself to form an overall section divided into two adjacent half sections mating along the longitudinal symmetrical axis of the beam.

According to this known construction, the two end strips of the cardboard sheet are enclosed in the interior of the beam, and thus cannot be connected together.

Furthermore, this known beam comprises only three upright strips for each half section, and its transverse strength is often not adequate.

Accordingly, it is an object of the present invention to provide a tubular box beam composed of a single sheet of cardboard folded back on itself several times, having properties in the form of resistance to bending, to transverse crushing and to deformation of its cross-section which are comparatively superior to those obtainable with the aforesaid known box beams.

A further object of the present invention is to provide a box beam which can be manufactured automatically and continuously by machine, without manual intervention.

In a tubular beam of folded corrugated cardboard of the type indicated in the prior art portion of claim 1 (known from GB—A—620701) these objects in conformity with the present invention are reached in that each half section comprises four upright strips of width substantially equal to the height of the beam, the two end strips of the cardboard sheet mating together.

Suitable adhesive zones are provided in order to ensure the consistency of said complex section.

The characteristics and constructional merits of the invention will be more apparent from the detailed description given hereinafter, with reference to the figures of the accompanying drawings which illustrate one particular embodiment thereof by way of non-limiting example.

Figure 1 is a cross-section through a tubular element constructed in accordance with the invention.

Figure 2 shows a completely extended sheet of cardboard arranged to form the tubular element of Figure 1.

Figure 3 is a perspective view of a pallet or load-carrying platform constructed with a tubular element according to the invention.

Said figures show a corrugated cardboard sheet 1 of constant width and indefinite length, the axes of its corrugations being orthogonal to the longitudinal axis of symmetry 2 of said sheet. Said flat sheet 1 is provided longitudinally with a series of predetermined creasing lines, which are symmetrically disposed about the longitudinal axis of symmetry 2.

More specifically, as shown in Figure 2, the sheet 1 comprises two predetermined creasing lines 3 and 3', which define a central longitudinal portion 4 straddling the longitudinal axis of symmetry 2 and having a length equal to that of the tubular element 101 which is to be obtained, this latter being shown in section in Figure 1.

Said pair of lines 3 and 3' is arranged to enable the two sheet side portions lying to the side of said central portion 4 to be folded upwards. Externally to the lines 3 and 3', there are two further predetermined creasing lines 5 and 5', which with respect to their folding direction are concordant with the preceding.

Between the pairs of lines 3 and 5, and 3' and 5', there thus become defined two respective longitudinal strips 6 and 6', having a width equal to the height of the cross-section of the tubular element to be obtained (Figure 1).

Two predetermined creasing lines 7 and 7' are provided in symmetrical positions externally to the lines 5 and 5', to define, with the aid of said lines 5 and 5', two further strips 8 and 8' respectively. The lines 7 and 7' are concordant with the lines 5 and 5', and the strips 8 and 8' have a width which is practically equal to one half the width of the cross-section of the tubular element, less the thickness of the cardboard sheet.

Again in a symmetrical position externally to the lines 7 and 7', there are two further lines 9 and 9' concordant with the preceding, and defining two longitudinal strips 10 and 10' having a width practically equal to the thickness of the beam, less double the thickness of the cardboard sheet as shown in Figure 1.

Symmetrically in positions external to the lines 9 and 9' there are a further two lines 11 and 11', which are discordant with the preceding and define two longitudinal strips 12 and 12' respectively. These latter have a width which is practically equal to the length of the hypotenuse of the right angled triangle defined by the catheti 8 and 10, or 8' and 10', as shown in Figure 1.

Beyond the lines 11 and 11', and again in a symmetrical position, there are lines 13 and 13' which are concordant with the lines 11 and 11', and define two further longitudinal strips 14 and 14'. These latter have a width practically equal to that of the corresponding strips 10 and 10'.

Finally, in a symmetrical position externally to the lines 13 and 13', there are two marginal longitudinal lines 15 and 15' concordant with the latter lines, and defining two strips 16 and 16' having a width practically equal to that of the strips 8 and 8' respectively.

To the side of the lines 15 and 15' there are the longitudinal edges 17 and 17' of the flat sheet 1, which define two end strips 18 and 18' having a width practically equal to that of the strips 10 and 10', or 14 and 14'.

Starting with the flat sheet 1, the tubular element or beam 101 which is shown in Figure 1 is obtained by successively folding said sheet following the folding directions of the aforesaid lines, until the strips 16 and 16' mate with the central portion or base 4, the strips 14 and 14' mate with the strips 6 and 6' respectively, and the strips 10 and 10' mate with the end strips 18 and 18', these latter resting one against the other.

Simultaneously with said folding operation, the sheet is provided with suitable adhesive zones intended to ensure the transverse consistency of the beam 101.

In this manner, a tubular element is obtained having elevated properties of resistance to bending, to transverse crushing and to deformation of its cross-section, and of which the configuration and component elements are clearly visible in Figure 1.

From said figure it can be seen that the cross-section of the beam has an overall rectangular configuration which is divided into two adjacent symmetrical half sections which mate along the vertical longitudinal plane of symmetry through said beam.

Furthermore, each half section comprises two triangular configurations which in the case of the left hand half section are defined by the strips 8, 10 and 12, and by the strips 16, 14 and 12 respectively.

The two triangular configurations are connected together by a common diagonal constituted by the strip 12, and are mutually inverted.

Finally, it is apparent that by suitably sizing the width of the component strips it is possible to obtain a beam 101 having an overall section different from that shown, for example square or of isoceles trapezium form, this latter constituted by two adjacent half sections of rectangular trapezium configuration.

Using the tubular element portions according to the invention, disposable pallets or load-carrying platforms, or platforms for storing goods can for example be constructed, together with other structures for uses other than the preceding.

One of said pallets is shown in perspective view in the accompanying Figure 3.

The invention is not limited to the single embodiment heretofore described, and modifications and improvements can be made thereto without leaving the scope of the invention, the fundamental characteristics of which are summarised in the following claims.

Claims

1. A tubular beam of folded corrugated cardboard constituted by a single corrugated cardboard sheet (1) folded back several times on itself parallel to its axis (2) to form an overall section of right angled or isosceles trapezium form (4, 6', 8', 8, 6) and divided into two adjacent half sections (4, 6', 8', 18')—(4, 6, 8, 18) which mate along the longitudinal symmetrical axis of the beam (101), each half section comprising two triangular channel configurations (16', 14', 12')—8', 10', 12'), (10, 8, 12)—(16, 14, 12) which mate along a common diagonal and are mutually inverted, characterized in that each half section comprises four upright strips (6, 14, 10, 18 or 6', 14', 10', 18') of width substantially equal to the height of the beam, the two end strips (18, 18') of the cardboard sheet mating together.

2. A tubular beam as claimed in claim 1, characterized in that said single cardboard sheet (1) comprises, on both sides of a longitudinal central portion (4), seven predetermined creasing lines (3, 5, 7, 9, 11, 13, 15)—(3', 5', 7', 9', 11', 13', 15'), of which the first four (3, 5, 7, 9)—(3', 5', 7', 9') are concordant with respect to their folding direction, the other three (11, 13, 15)—(11', 13', 15') being discordant with the preceding (3, 5, 7, 9)—(3', 5', 7', 9'); said lines defining, starting from said central portion (4), a first (6, 6'), a third (10, 10'), a fifth (14, 14') and a seventh (18, 18') strip of width substantially equal to the height of the beam (101), a fourth strip (12, 12') of width substantially equal to the common diagonal of the triangular channel configuration, and a second (8, 8') and a sixth strip (16, 16') of width substantially equal to one half the width of the beam.

3. A tubular beam as claimed in claim 1, characterized in that the first three strips (6, 8, 10), (6', 8', 10') of each set provided to the side of said

central portion (4) are bent towards this latter to define a beam half section comprising a first configuration of rectangular or rectangular trapezium cross-section, within which there extends in opposite directions from said common diagonal (12, 12'), or fourth strip, and internal configuration of triangular cross-section which emerges from said first rectangular configuration by way of the seventh and last strip (18, 18'), which mates with the corresponding last strip (18', 18) of the other half section.

4. A tubular beam as claimed in claim 1, characterized in that between the contacting faces of said strips which compose the two half sections there are provided adhesive zones arranged to ensure the consistency of said overall right angled or isosceles trapezium section (4, 6', 8', 8, 6).

5. A disposable load-carrying platform constructed with tubular beams (101) in accordance with claims 1 to 4.

Patentansprüche

1. Röhrenförmiger Balken aus knickbaren Wellkarton, gebildet aus einem einzigen Wellkartonbogen (1), der mehrere Male parallel zu seiner Achse (2) zurückgeklappt ist, um einen Gesamtabschnitt von rechtwinkliger oder gleichschenkliger Trapezform zu bilden (4, 6', 8', 8, 6), und der in zwei aneinander anliegende hälftige Abschnitte (4, 6', 8', 18')—(4, 6, 8, 18) unterteilt ist, die entlang der symmetrischen Längsachse des Balkens (101) zusammengepaßt sind, wobei jeder hälftige Abschnitt zwei dreieckige Kanalkonfigurationen aufweist (16', 14', 12')—(8', 10', 12'), (10, 8, 12)—(16, 14, 12), die entlang einer gemeinsamen Diagonale zusammengepaßt und wechselseitig umgekehrt sind, dadurch gekennzeichnet, daß jeder hälftige Abschnitt vier stehende Streifen (6, 14, 10, 18 oder 6', 14', 10', 18') aufweist, die in ihrer Größe im wesentlichen der Höhe des Balkens entsprechen, wobei die zwei Endstreifen (18, 18') des Wellkartonbogens zusammengepaßt sind.

2. Röhrenförmiger Balken nach Anspruch 1, dadurch gekennzeichnet, daß der einstückige Wellkartonbogen (1) auf beiden Seiten eines zentralen Längsabschnittes (4) sieben vorbestimmte Faltlinien (3, 5, 7, 9, 11, 13, 15)—(3', 5', 7', 9', 11', 13', 15') aufweist, von welchen die ersten vier (3, 5, 7, 9)—(3', 5', 7', 9') bezüglich ihrer Faltrichtung übereinstimmen, wobei die anderen drei (11, 13, 15)—(11', 13', 15') nicht übereinstimmen mit den vorgehenden (3, 5, 7, 9)—(3', 5', 7', 9'); diese Linien bilden beginnend von dem Zentralabschnitt (4) einen ersten (6, 6'), einen dritten (10, 10'), einen fünften (14, 14') und einen siebten (18, 18') Streifen von einer Größe, die im wesentlichen gleich ist wie die Höhe des Balkens (101), einen vierten Streifen (12, 12') von einer Größe, die im wesentlichen gleich ist wie die gemeinsame Diagonale der dreieckigen Kanalkonfiguration, und einen zweiten (8, 8') und einen sechsten Streifen (16, 16') von einer Größe, die im wesentlichen gleich ist mit einer Hälfte der Breite des Balkens.

3. Röhrenförmiger Balken nach Anspruch 1, dadurch gekennzeichnet, daß die ersten drei Streigen (6, 8, 10), (6', 8', 10') eines jeden an der Seite des zentralen Abschnittes (4) angeordneten Sets gegen diesen gebogen sind, um einen hälftigen Balkenabschnitt zu bilden, welcher eine erste Konfiguration eines rechtwinkligen oder gleichschenkligen Trapezquerschnittes aufweist, worin sich in entgegengesetzten Richtungen von dieser gemeinsamen Diagonale (12, 12') oder vierten Streifens eine interne Konfiguration von dreieckigem Querschnitt erstreckt, der aus dieser ersten rechtwinkligen Konfiguration mittels eines siebten und letzten Streifens (18, 18') herauskommt, welcher mit dem korrespondierenden letzten Streifen (18', 18) des anderen hälftigen Abschnittes zusammengepaßt ist.

4. Röhrenförmiger Balken nach Anspruch 1, dadurch gekennzeichnet, daß zwischen den kontaktierenden Flächen dieser Streifen, die die zwei hälftigen Bereiche miteinander verbinden, adhäsive Zonen angeordnet sind, um die Haltbarkeit des gesamten rechtwinkligen oder gleichschenkligen Trapezabschnittes (4, 6', 8', 8, 6) sicherzustellen.

5. Einwegladeplatte, gebildet aus röhrenförmigen Balken (101) in Übereinstimmung mit den Ansprüchen 1—4.

Revendications

1. Poutré tubulaire formée par pliage d'une feuille de carton ondulé constituée par une feuille unique de carton ondulé (1) repliée plusieurs fois sur elle-même parallèlement à son axe (2), de façon à constituer un profilé formé en trapèze à angle droit ou isocèle (4, 6', 8', 8, 6) et divisée en deux demi-profilés adjacents (4, 6', 8', 18')—(4, 6, 8, 18) et qui sont réunis le long de l'axe de symétrie longitudinal de la poutre (101), chaque demi-profilé comprenant deux voies conformées en triangle (16', 14', 12')—(8', 10', 12'), (10, 8, 12)—(16, 14, 12) qui sont réunies le long d'une diagonale commune et sont inversées l'une par rapport à l'autre, ladite poutre tubulaire étant caractérisée en ce que chaque demi-profilé comprend quatre bandes verticales (6, 14, 10, 18 ou 6', 14', 10', 18') conformées de façon que la largeur définie soit sensiblement égale à la hauteur de la poutre, les deux extrémités des bandes (18, 18') de la feuille de carton étant réunies ensemble.

2. Poutre tubulaire selon la revendication 1, caractérisé en ce que ladite unique feuille de carton (1) comprend, des deux côtés d'une partie centrale longitudinale (4), sept lignes de pliure déterminées (3, 5, 7, 9, 11, 13, 15, —3', 5', 7', 9', 11', 13', 15') dont les quatre premières (3, 5, 7, 9—3', 5', 7', 9') sont conformées dans leur sens de pliure, les trois autres lignes (11, 13, 15—11', 13', 15') étant conformées en opposition avec les précédentes (3, 5, 7, 9—3', 5', 7', 9'); lesdites lignes définissant, à partir de la partie centrale (4)

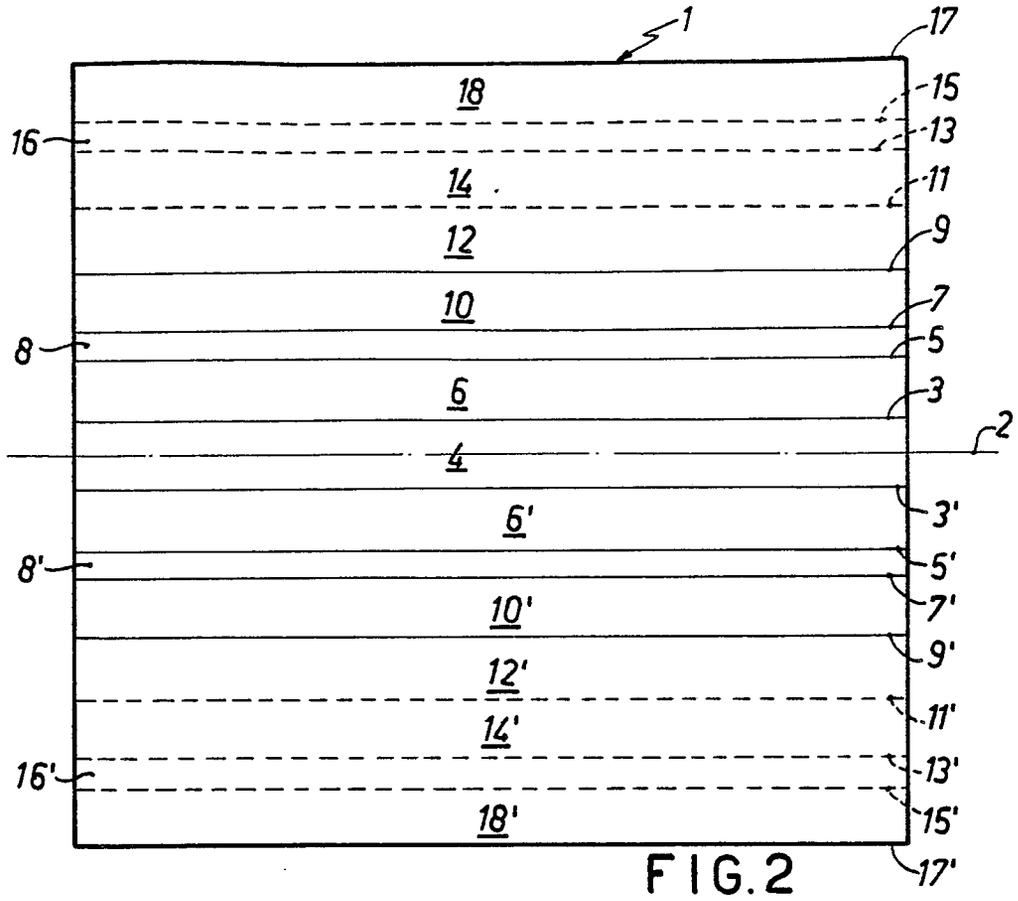
une première (6, 6'), une troisième (10, 10'), une cinquième (14, 14'), et une septième (18, 18') bandes conformées de façon que la largeur définie soit sensiblement égale à la hauteur de la poutre (101), la quatrième bande (12, 12') étant conformée de façon que la largeur définie soit sensiblement égale à la diagonale commune de la voie triangulaire, et, une seconde (8, 8') et une sixième (16, 16') bandes étant conformées de façon que la largeur définie soit sensiblement égale à l'une des demi-largeurs de la poutre.

3. Poutre tubulaire selon la revendication 1, caractérisée en ce que les trois premières bandes (6, 8, 10), (6', 8', 10') de chaque jeu prévues sur le côté de ladite partie centrale (4) sont pliées vers cette dernière de façon à définir un demi-profilé formant poutre et comprenant:

— une première configuration à section rectangulaire ou trapézoïdale rectangle, à l'intérieur duquel profilé la configuration s'étend dans des directions opposées à ladite diagonale commune (12, 12'), ou quatrième bande, et
— une configuration interne à section triangulaire qui sort de ladite première configuration rectangulaire par la septième et dernière bande (18, 18'), laquelle bande se raccorde avev la dernière bande correspondante (18', 18) de l'autre demi-profilé.

4. Poutre tubulaire selon la revendication 1, caractérisée en ce que, entre les faces de contact desdites bandes qui constituent les deux demi-profilés, sont disposées des zones adhésives formées de façon à assurer la cohésion de l'ensemble du profilé formé en trapèze à angle droit ou isocèle (4, 6', 8', 8, 6).

5. Plate-forme de chargement jetable constituée par des poutres tubulaires (101) conformément à l'une quelconque des revendications 1 à 4.


1
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18
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16
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FIG.2

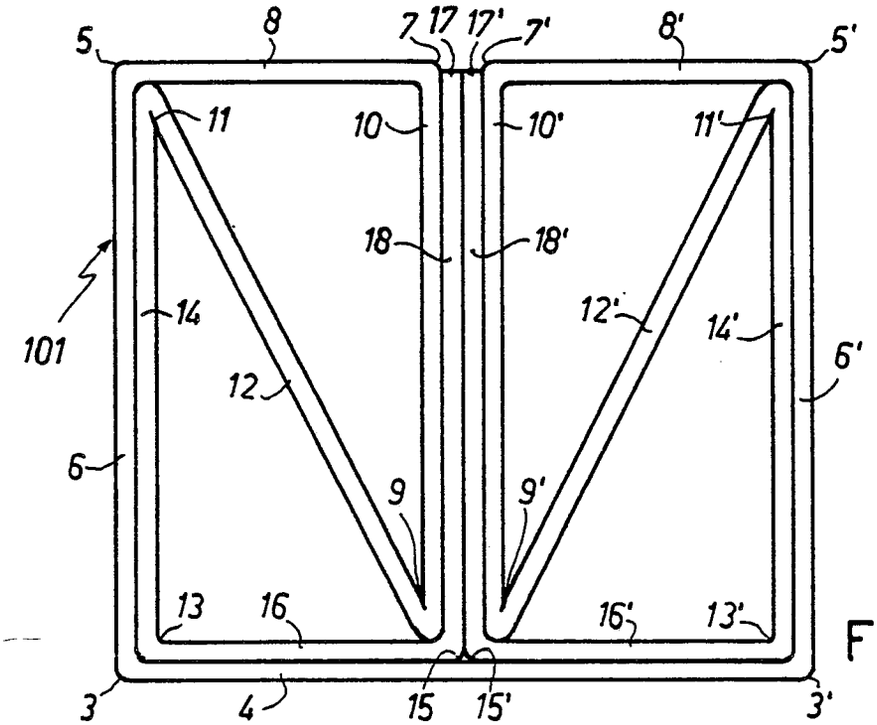
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FIG.1

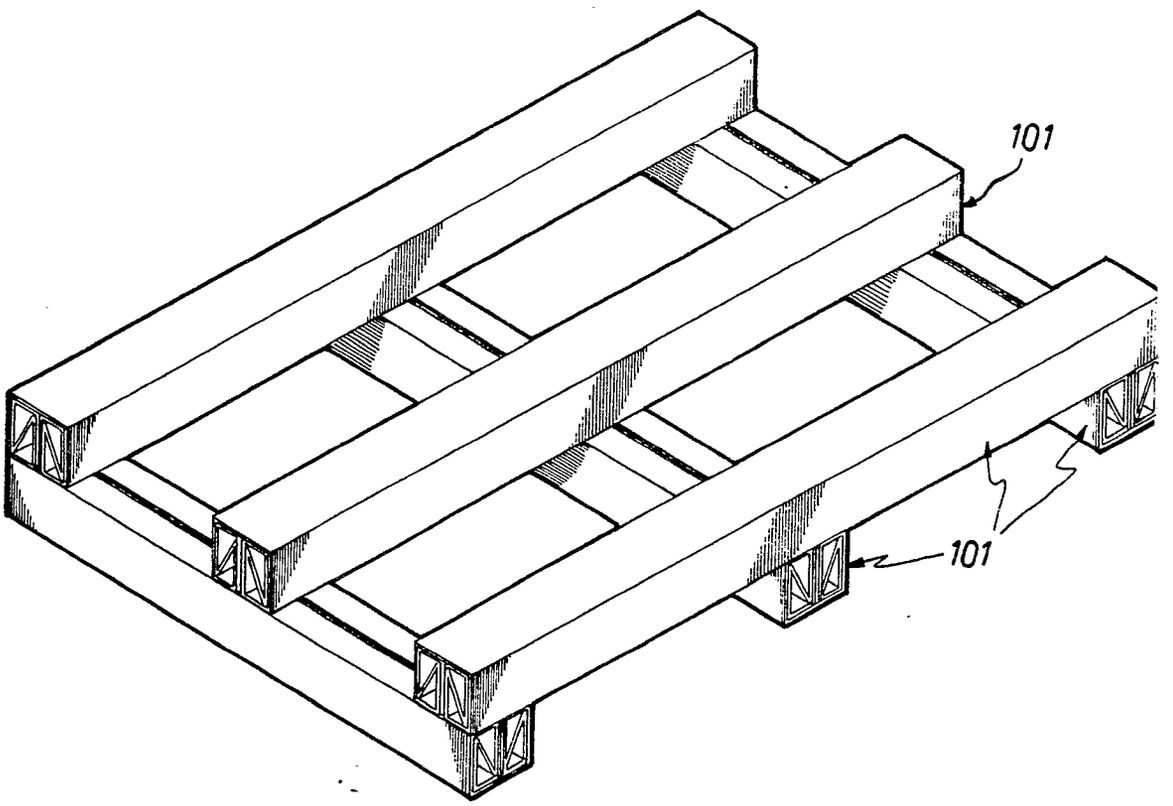

FIG. 3