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(54) Title: PALLET, METHOD FOR THE MANUFACTURING OF THE PALLET, BLANK FOR A MEMBER INCLUDED IN THE PALLET, AND APPARATUS FOR ITS MANUFACTURING		
(57) Abstract The invention relates to a pallet comprising a number of parallel base beams (3, 3') and a deck (2) which is joined to the base beams. The characteristic feature is that the deck consists of a web or sheet of foldable material which has been folded to form a deck surface (4) consisting of a number of parallel panels (5) which adjoin one another at least essentially, and on the underside thereof, below the joints between the panels, parallel projections (8), that the base beams have a height which substantially exceeds the vertical extent (h) of the projections, that the base beams extend up to a point at least essentially level with the underside of the deck surface, that the top portion (49) of the base beams has through-recesses (21) of the same cross-section as the projections on the underside of the deck surface, and that the projections on the underside of the deck surface are introduced into the recesses in the top portion of the base beams, as a result of which a pallet is formed with spaces (23) for lifting forks between the base beams under the projections, the underside of which projections forms a lifting surface (9) for the lifting forks. The invention also relates to a unit consisting of a plurality of interconnected pallets, a blank for the base beam, a method for the manufacturing of the pallet, and an apparatus for the manufacturing of base beams.		

PALLET, METHOD FOR THE MANUFACTURING OF THE PALLET, BLANK FOR A MEMBER INCLUDED IN THE PALLET, AND APPARATUS FOR ITS MANUFACTURING

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TECHNICAL FIELD

The invention relates to a pallet comprising a number of parallel base beams and a deck which is joined to the base beams. The invention also relates to a method for the manufacturing of the pallet, a blank for the manufacturing of a base beam, and an
10 apparatus for the manufacturing of such base beams.

BACKGROUND OF THE INVENTION

Pallets made of cardboard, paper and/or paperboard have previously been proposed with the primary aim of offering a cheaper and easier alternative to conventional pallets made
15 of wood. However, these pallets have not gained general acceptance. The reasons for this have generally lain in features such as too poor a load-bearing capacity, difficulty of handling with lifting forks, too high a price in relation to the technical qualities of the pallet, prohibitive costs for transport from producer to user, difficulties in recovering the material, etc.

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The object of the invention is to tackle this set of problems. The invention aims in particular to afford the following advantages:

- The pallet will be of such a construction that it can suitably be produced at or near
25 the site of the user. The storage space for pallets can be drastically reduced in this way. Instead, sheets or web-shaped material can be stored for producing the pallets, which takes up much less space.
- The pallet has a very good load-bearing capacity both in absolute terms and in particular in relation to its own weight.
- 30 - The space-consuming transportation of pallets from the producer to the user is discontinued and is replaced by transportation of the starting material, which can consist, for example, of sized cardboard in sheet stacks.

- The logistical problem of producing the correct number of pallets at the site of the external pallet producer and of transporting and storing these pallets can be dispensed with. Instead, the starting material, which takes up a minimal amount of space, can be ordered and stored adjacent to a machine at the site of or near the user of the pallets.
- The pallets can be made extremely light, which fact facilitates the overall transportation work and means that greater loads can be transported.
- Provided the pallets are made of material which is not plastic-coated, the said pallets can be recovered in their entirety within the paper industry. By suitable sizing of the material, the pallets are nevertheless made almost completely water-proof. Should the pallets be used for energy production by firing, the gases which develop are the same as occur upon incineration of paper.
- The pallets can advantageously be used as disposable pallets, particularly in the type of industry which sets strict hygiene requirements.
- When the pallets have been finished with, they can be crushed down or compressed and in this way regain their minimal volume, before the material is recovered or burned.
- According to a preferred embodiment, the pallet can be manufactured from a reduced number of components, more specifically from blanks for the deck and blanks for the manufacturing of the base beams, which fact affords advantages in terms of logistics and production technology.

The invention also aims to provide a method for the manufacturing of the pallet, and an apparatus for the manufacturing of base beams starting from blanks which have been manufactured in advance.

The invention also aims to provide such a blank which is adapted for the manufacturing of base beams.

These and other aims and advantages of the invention can be achieved by virtue of the said invention being characterized by what is specified in the patent claims which follow. Further characteristics, aspects and advantages of the invention are evident from the

following description of two conceivable embodiments of the pallet, of the blank for the manufacturing of the base beam, and of an apparatus for the manufacturing of the base beams according to a method which is included as a stage in the manufacturing of the pallets.

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BRIEF DESCRIPTION OF THE FIGURES

The invention will be explained in greater detail hereinbelow with reference to the attached drawing figures, of which:

- 10 Figure 1 represents a perspective view, obliquely from above, of a pallet according to a first conceivable embodiment of the invention,
- Figure 2 shows the same pallet in an oblique view from below,
- Figure 3 represents a perspective view of a supporting member included in the pallet,
- Figure 4 represents a perspective view, obliquely from above, of a pallet according to a second, preferred embodiment of the invention,
- 15 Figure 5 shows an end view of a base beam included in the pallet according to this preferred embodiment,
- Figure 6 shows the same base beam towards one long side, and on a smaller scale,
- Figure 7 represents a plan view of a blank for the manufacturing of the base beam,
- 20 Figure 8 is a side view of a deck before it has been joined to the base beams,
- Figure 9 is a side view of an apparatus for the manufacturing of base beams from blanks according to Figure 7,
- Figure 10 shows, on a larger scale, the upper parts of the apparatus in the direction of the arrow X in Figure 9, and
- 25 Figure 11 is a schematic illustration of the procedure for the manufacturing of base beams.

DESCRIPTION OF A FIRST CONCEIVABLE EMBODIMENT OF THE PALLET

- 30 The pallet 1 consists of the following principle parts, namely a deck 2 and a number of base beams 3, according to this embodiment three in number, which form the legs of the pallet 1. According to the embodiment, the material consists entirely of sized cardboard.

The deck 2 is manufactured from a plane sheet of sized cardboard which has been scored and folded to form a deck surface 4 consisting of a number of parallel main panels 5 and of edge panels 6 which are parallel to the main panels. A suitable material is non-plastic-coated cardboard which consists of several sized layers, each layer consisting of non-plastic-coated liquid cardboard, i.e. cardboard which has been extensively sized. In the preferred embodiment, the multi-layer cardboard has a grammage of approximately 1100 g/m². The sheet which forms the deck 2 is further folded so that the underside of the deck 2 has a number of parallel, longitudinal projections 8. The cross-section of the projections 8 has a horizontal span which increases from a position close to the deck surface 4 down towards the base 9 of the projections, which base 9 forms a lifting surface for lifting forks. To be more precise, the projections 8 have a triangular shape in cross-section, with the base 9 of the triangle constituting the said lifting surface. The said triangles are isosceles triangles and the two sides which are inclined upwards and inwards towards the vertex of the triangle have been designated by 10, 11. The main panels 5 and edge panels 6 of the deck surface 4 thus adjoin one another at the vertices of the said triangles, where the two inclined sides 10, 11 of the triangle meet. The vertex angle V1 of the triangle is approximately 30° according to the embodiment.

The base beams or the legs 3 consist, according to the embodiment, of sized, scored and folded cardboard. In cross-section, the base beams 3 have the shape of isosceles triangles with a base 15 and inclined sides 16, 17. According to the embodiment, the vertex angle V2 is also approximately 30°. The sides 16, 17 of the legs 3 are almost three times as long as the sides 10, 11 of the deck projections 8.

Arranged in the base beams/legs 3 are triangular recesses 21 which, starting from the vertex 20, extend some distance down in the top portion of the base beams. The recesses 21 have the same dimension and shape as the outer cross-section of the projections 8 on the underside of the deck 2. The recesses 21 are arranged in the base beams 3 in a distribution corresponding to the width of the main panels 5 on the deck surface 4. In this way, the deck 2 can be joined by dovetailing with the base beams 3 by the projections 8 being pushed into the recesses 21 in the base beams. The triangular shape of the projections 8 is maintained in this way, and at the same time the deck 2 is

anchored in the base beams, by means of the dovetailing, without the use of binders or of any securing members other than the dovetailing members themselves, i.e. the projections 8 and the recesses 21.

- 5 Spaces 23 for lifting forks are formed under the projections 8 and between the base beams/legs 3, with the lifting forks using the base 9 of the projections 8 as a lifting surface.

- In order to stiffen the base beams/legs 3, stiffening members 25 are introduced into the
10 base beams 3 in the spaces under the projections 8. Figure 3 shows, on an enlarged scale, the appearance of such a stabilizing and stiffening member 25. The latter also consists of sized cardboard and is scored and folded so that oblique triangles 26, 27 and 28 are formed alternately to the left and to the right. The stiffening member is passed into the
15 legs 3 under the projections 8 on the deck 2, so that the base 29 of the stiffening member rests against the base 15 of the base beam/leg 3, while its plane top side 30 is pressed against the base 9 of the projection 8. The outer sides 31 of the triangles 26 and 28 bear against the inside of the side 16 of the legs 3, while the corresponding outside 32 of the triangle 27 bears against the side 17 of the legs. The corners 33, 34 of the triangles 26, 27, 28 are pressed into the lower corners of the legs 3. The stiffening members 25 in this
20 way give the legs 3 a considerably better load-bearing capacity.

- Pallets 1 of the type described above can be joined together to form larger pallets both in the longitudinal direction of the panels 5, 6 and also in their transverse direction, i.e. in the longitudinal direction of the base beams 3. In the former case, the pallets 1 can be
25 joined with the aid of triangular bars which are passed into the triangular projections 8 on the deck 2 and in such a way that they extend between the pallets which are thus joined. These triangular bars preferably consist of sized cardboard which has been folded to form triangles. In the latter case, the pallets 1 can be joined by using extended stiffening members of the same basic design as the stiffening member 25, which are passed into the
30 base beams/legs 3 in the adjacent pallets 1 which are to be joined to each other and in such a way that they extend between the pallets which are thus joined. These two alternatives can of course be combined.

DESCRIPTION OF A SECOND, PREFERRED EMBODIMENT OF THE PALLET

This embodiment is illustrated in Figure 4 and represents an example of a so-called half pallet. (The pallet which is shown in Figures 1 and 2 is an example of a so-called quarter pallet). This means that the base beams are longer and that the number of projections on the underside of the deck and of corresponding recesses in the top of the base beams has been increased correspondingly. The same reference numbers have been used for parts which have a direct counterpart in the embodiment according to Figures 1 - 3, for which reason these members are not described in detail here, and instead reference is made to the preceding description of the first embodiment. As regards parts which have a counterpart, but whose construction has been modified, the same reference numbers as before are used, but with an added '.

The difference in relation to the preceding embodiment lies in the design of the stiffening or supporting members 25' in the base beams 3'. Whereas the stiffening members 25 in the preceding embodiment consisted of separate units which were guided into the base beams after their production, the supporting members 25' are integrated from the outset with the base beams 3' and represent above all an improvement in terms of production technology, logistics and costs. The design of a base beam 3' is shown in greater detail in Figure 5. The supporting member 25' consists quite simply of an inner pipe 37 in the shape of a regular, isosceles parallel trapezium with an outer shape which corresponds with the shape of the lower part of the base beam 3'. To be more precise, the supporting member 25' consists of several inner turns of the material from which the base beam 3' is made. The supporting member 25' is thus formed of two inner layers 38, 39 and 40, 41, respectively, in the area of the inclined sides of the base beam, and two layers 42, 43 at the top of the supporting member 25'. The side-wall layers 38, 39 and 40, 41, respectively, are integral with the outer layers 44, 45 of the base beam 3' in the area of the two inclined sides 16, 17. The base portion 15 comprises two layers, or in one area three layers 46, 47, 48. The top portion 49 of the base beam consists of only one layer, namely the continuation of the two outer layers 44, 45, and forms an upper pipe or channel 50 of triangular cross-section above the supporting member 25'. The recesses 21 for the projections 8 on the deck 4 are formed in this top portion 49. The layers 38, 39 and 44, and the layers 40, 41 and 45, respectively, that is to say the layers in the area of

the two inclined sides 16 and 17, are connected to one another by sizing, which further strengthens the integrated beam.

5 The connection of the different layers of the supporting member 25' to the outer layers of the base member 3', so that the outer layers of the base beam and the supporting member form an integral, connected unit, greatly strengthens the base beam 3' and increases the ability of the supporting member 25' to support the deck 2, which rests on the supporting member 25' via the projections 8. The fact that the supporting member 25' forms a lower, inner pipe 37 in the base beam 3' also allows several pallets 1' to be assembled to form
10 larger units by means of connecting members being passed through the inner pipes 37.

The advantages in terms of production technology have been mentioned and will be further explained in the following description of the production of the pallet 1' and in particular of the base beams 3'.

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DESCRIPTION OF THE PRODUCTION OF THE PALLET IN ITS PREFERRED EMBODIMENT

Figure 7 shows a blank 52 for the manufacturing of a base beam 3'. It consists of a rectangular sheet of cardboard which is divided, by means of a number of parallel,
20 transverse fold lines, into a number of parallel panels 46, 38, 42 etc., which have been given the same reference numbers as the different layers in the base beam 3' and which have been explained hereinabove with reference to Figure 5. The two "last" panels 44, 45 which will form outer layers in the two inclined walls 16 and 17, and will form the top portion 49, are provided with a series of holes 21x and 21y, respectively, distributed
25 along the fold line 20a which coincides with the vertex 20 of the base beam 3'. The shape and size of the holes 21x and 21y are such that when the beam 3' has been given its final shape and has been placed with the vertex 20 upwards, projected on a vertical centre plane through the beam, the holes 21x and 21y correspond with the outer cross-section of the projections 8. The holes 21x and 21y thus have the shape of triangles of height
30 h_{xy} , where

$$h_{xy} = \frac{h}{\cos \frac{V2}{2}}$$

5

where

h is the height of the projections 8, Figure 8, and

V2 is the vertex angle of the base beam 3'.

- 10 The base 53 of the recesses 21x and 21y corresponds with the length of the base 9 of the projections 8, which in turn means that the vertex angle V3 of the holes 21x and 21y is somewhat less than the vertex angle V1 of the projections 8 in compliance with simple trigonometric calculations.
- 15 The holes 21x and 21y are joined to each other via a narrow gap 54 which crosses over the fold line 20a. The extent hxy of the recesses 21x and 21y from the fold line 20a is less than half the width of the panels 44 and 45, more precisely about one third of the width of the panels 44 and 45.
- 20 All the other panels, i.e. all the panels other than the two "last" panels 44, 45, are entirely devoid of holes.

Figures 9 and 10 show, somewhat schematically, an apparatus 60 for the production of base beams 3' from blanks 52, Figure 7, with certain details having been omitted from the figures so that the essential features can better be seen. A ring 62 is mounted on a stand 61 so that it can rotate about three supporting rollers 63, 64, 65 which are mounted rotatably on the stand 61. The ring 62 has on the outside a V-belt groove 66 for a V-belt 67 which can be driven by a motor 68 via a drive wheel 69, Figure 10, not shown in Figure 9, for rotation of the ring 62.

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Extending horizontally outwards from the ring 62 is a carrier, generally designated by 70. The carrier 70 consists of an inner pipe 71, an outer pipe 72, a middle screw 73 and bushes 74, 75 at the ends. This arrangement permits a high bending resistance of the unit 70, at the same time as the outer pipe 72 can be rotated about the inner pipe 71.

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A pair of double-armed levers 77 are mounted on the outer pipe 72, near its outer ends, in such a way that they can be rotated together with the outer pipe 72 about its central axis 78. A press roller 81, facing towards the centre of the ring 62, is mounted rotatably between the two outer arms 79 and is arranged to be pressed in a direction in towards
10 the centre of the ring 62 under the effect of a pneumatic cylinder 82 which is arranged as a compression spring and which acts on the other two arms 80. The pneumatic cylinder 82 is mounted rotatably on the ring 62.

A member 84 also extends horizontally outwards from the stand 61 parallel with the
15 carrier 70 and with the press roller 81, and it extends as far as the outer end of the roller 81. The member 84 is referred to hereinafter as the inner core since it is intended to form a counterstay upon winding of the blank 52 into a pipe, a priori upon winding of the inner pipe 37 which is to form a stiffening member/bearing support 25'. The core 84 has an outer contour corresponding to the inner shape of the supporting member 25'/inner
20 pipe 37, i.e. it has the shape of an isosceles parallel trapezium.

There is also a second, outer core 85 which in cross-section has the shape of a triangle with the same contour as the channel 50 in the top of the base beam 3'. This outer core 85 is arranged, in the apparatus 60, below the inner core 84 and can be displaced to and
25 fro in a horizontal direction with the aid of a belt cylinder (so-called Origa® cylinder) 86. The upper and lower supporting rollers for the outer core 85 have been designated 87, 88. Figure 9 shows the core 85 in its advanced operational position, where it is connected at its front end to the inner core 84 by way of a dowel 89 which engages in a hole (not shown) in the outer end of the core 85. The dowel 89 is supported, in a manner
30 such that it can be moved aside, by a holder 90 at the outer end of the inner core 84 and fixes the two cores 84, 85 to each other in the operational position of the outer core 85. The outer core 85 can be guided to and from its operational position via the ring 62 with

the aid of the belt cylinder 86. There are also two glue guns which have been designated schematically by 92 in Figure 11. These can also be moved to and fro via the ring 62 with the aid of movement members, for example a belt cylinder, in the same way as the outer core 85.

5

The production of a base beam 3' will now be explained with reference also to Figure 11. In the starting position, the ring 62 is in the position shown in Figure 10, which corresponds to stage A in Figure 11. The blank 52 is guided by the panel 46 into a slot 93 in the inner core 84. The working of the apparatus 60 is controlled by a

10 microprocessor (not shown) in conjunction with sensors (not shown). From the starting position shown at stage A, the ring 62 is turned clockwise, and the press roller 81 guides the blank 52 downwards by the panel 38 on the first inclined side of the core 84, stage B. In the next phase, stage C, the first narrow panel 42 is folded in under the core 84.

Thereafter, stage D, the panel 40 is folded by the press roller 81 up against the second
15 inclined side of the core 84. The first turn is completed at stage E, when the panel 47 is folded in over the core 84. In this position, the ring 62 stops under the command of the said sensors (not shown). The spray pistols 92 are guided in through the ring 62 by movement and carrier members (not shown). The spray pistols 92 are advanced as far as the end of the core 84 and then back again. During the advance and return movement,

20 the panels 38 and 40 are sprayed with glue. The ring 62 is then rotated one turn further, stages F, G, H and I. During these stages, the panels 39, 43, 41 and 48 are folded in against the respective sides, with the material in the panels 39 and 41 being joined to the panels 38 and 40 by means of the strands of glue applied in stage E. At stage I, the ring 62 is once again stopped. The glue pistols 92 are guided anew through the ring 62 and

25 spray the panels 39 and 40 with glue during the return movement. The outer core 85 is guided into position under the inner core 84 and is fixed in this position by the said dowel 89, Figure 9. The remaining material, the folds 44 and 45 with the holes 21x and 21y, is then folded in, stages J and K, and fixed to the glue-coated panels 39 and 41. The outer core 85 is withdrawn from the triangle-shaped channel 50 which is formed. Finally,
30 the ring 62 is turned to its starting position, stage L, with the press roller 81 bearing against the base 15 of the base beam 3' which has thus been formed. The dowel 89 is

moved aside and the finished base beam 3' is withdrawn from the apparatus 60 to the right in Figure 9.

The deck 2 is also manufactured from a scored blank which is folded to give the shape which is shown in Figure 8. Finally, this deck 2 is joined to a number of base beams 3', of which there are three in the present embodiment, by means of the triangle-shaped projections 8 being introduced into the recesses 21 in the top portion 49 of the base beam.

10 GENERAL COMMENTS

It will be appreciated that the invention can be varied within the scope of the patent claims which follow. A fundamental idea behind the construction of the pallet is that the load-bearing capacity of the pallet is in the first instance determined by the strength of the lower portions of the base beams 3, 3', while the top portion of the base beams in the first instance serves to fix the deck 2 to the base beams 3, 3'. The material making up the base beams has therefore been concentrated in the said lower portion, the thickness of which, according to the preferred embodiment, consists of three layers and which consequently forms, together with the connecting panels 42, 43, a powerful bearing support for the projections 8 on the deck. Alternatively, a separate supporting member 25 is introduced as a bearing support into the base beams. It will be appreciated, however, that the embodiments which have been shown are only examples and do not limit the claimed patent protection. It will also be appreciated that the shape of the base beams 3, 3' in particular can be varied. The triangular cross-section of the base beams is preferable, and it is of particular advantage for the sides of the base beams to be inclined. This shape, which is advantageous from the point of view of strength, can also be achieved using base beams whose cross-section is in the shape of an isosceles parallel trapezium with inclined walls and with a narrower side directed upwards, bearing against the top side of the deck 4, and the recesses for the projections 8 also extending over such an upper side of the base beams. It will also be appreciated that material other than cardboard can conceivably be used for the manufacturing of the deck and base beams. For example, it is conceivable to produce the deck and base beams using plastic sheets, expediently comprising recycled plastic, with the fold lines being formed by means of

grooves in the plastic sheets. In this case, the various layers in the base beams can be fixed to one another by heat sealing, for example. The method for producing the pallet and in particular the base beams can also be varied. For example, instead of winding the blank around stationary cores, it is possible to rotate the cores around a central axis, pulling on an otherwise stationary blank.

**PATENT CLAIMS**

1. Pallet comprising a number of parallel base beams (3, 3') and a deck (2) which is joined to the base beams, characterized in that the deck consists of a web or sheet of foldable material which has been folded to form a deck surface (4) consisting of a number of parallel panels (5) which adjoin one another at least essentially, and on the underside thereof, below the joints between the panels, parallel projections (8), in that the base beams have a height which substantially exceeds the vertical extent (h) of the projections, in that the base beams extend up to a point at least essentially level with the underside of the deck surface, in that the top portion (49) of the base beams has through-recesses (21) of the same cross-section as the projections on the underside of the deck surface, and in that the projections on the underside of the deck surface are introduced into the recesses in the top portion of the base beams, as a result of which a pallet is formed with spaces (23) for lifting forks between the base beams under the projections, the underside of which projections forms a lifting surface (9) for the lifting forks.
2. Pallet according to Claim 1, characterized in that the cross-section of the projections (8) has a horizontal span which increases from a position close to the deck surface (4) of the deck (2) down towards the said lifting surface or base (9).
3. Pallet according to Claim 2, characterized in that the deck is joined to the base beams (3) by dovetailing, i.e. the cross-section of the projections (8) and of the recesses (21) is essentially dovetail-shaped.
4. Pallet according to Claim 3, characterized in that the projections (8) have the shape of a triangle in cross-section, the base of the triangle constituting the said lifting surface (9).
5. Pallet according to any one of Claims 1 to 4, characterized in that the base beams in cross-section have the shape of a polygon with inclined side walls, preferably a triangle, formed by folding sheet-like or web-like deck material.
6. Pallet according to any one of Claims 1 to 5, characterized in that the deck surface (4) consists of a number of parallel elongate panels which tightly adjoin one another.

7. Pallet according to Claim 6, characterized in that the triangles which the projections (8) form are isosceles in cross-section, in that the base of the triangle is horizontal, in that the triangle has an upwardly directed vertex whose angle (V1) is at least 20 and at most 40, preferably at least 25 and at most 35, and in that the said recesses are made in the vertex portion.

8. Pallet according to any one of the preceding claims, characterized in that the base beams in cross-section have the shape of isosceles triangles with the vertex directed upwards, and in that the vertex angle (V2) is at least 20 and at most 40, preferably at least 25 and at most 35.

9. Pallet according to any one of the preceding claims, characterized in that in the base beams there are stiffening members (25, 25') under the projections on the underside of the deck (2).

10. Pallet according to Claim 9, characterized in that the stiffening members (25) consist of separate members which are arranged in the lower part of the base beams, extending up to a point level with the base (9) of the projections.

11. Pallet according to Claim 9, characterized in that the base beams consist of a pipe of foldable material which, by means of folding, is wound at least two turns, comprising at least one winding which determines the outer contour of the base beam (3') and an inner pipe (37) also formed from at least one winding which forms the said stiffening member in the lower part of the base beam.

12. Pallet according to Claim 11, characterized in that the said inner pipe which forms the said stiffening has in cross-section the shape of a symmetrical parallel trapezium.

13. Pallet according to Claim 12, characterized in that each of the base beams, including the supporting member, is manufactured from a single web of the said foldable material.



14. Pallet according to any one of the preceding claims, characterized in that it is manufactured from a sized multi-layer cardboard of grammage 700 - 1500 g/m², preferably 800 - 1400 g/m², expediently 900 - 1200 g/m².

5 15. Pallet according to Claim 13, characterized in that the cardboard consists of three to five non-plastic-coated layers of sized cardboard which have been sized together to form the said multi-layer cardboard.

10 16. Pallet unit consisting of two or more pallets according to any one of Claims 1 to 15, characterized in that the pallets (1) included in the unit are joined to each other by connecting members which extend through each of the base beams (3, 3') or through the said projections (8) or through both the base beams (3, 3') and the projections (8) and also between the pallets which are thus joined.

15 17. Blank for a base beam included in the pallet according to any one of Claims 1 to 16, characterized in that it consists of a rectangular web or sheet of foldable material, in that the web is divided into a number of parallel long and narrow panels which are delimited from one another by fold lines, in that at least two of these panels (44, 45), which adjoin each other, have a series of recesses (21x, 21y) which are situated opposite one another,
20 are similar but mirror-inverted, pass through the material and are distributed along the fold line (20a) between the panels, which recesses have essentially the same shape as the said projections on the underside of the deck, and in that each pair of such recesses joins across the fold line via a connection (54) in order to form a continuous hole.

25 18. Blank according to Claim 17, characterized in that the said recesses (21x, 21y) are arranged only in the panels (44, 45) which are to form the sides (16, 17) and top portion (49) of the base beam, while the remaining panels (46, 38, 42, 40, 47, 39, 43, 41, 48) are devoid of such recesses.

30 19. Blank according to Claim 18, characterized in that the said remaining panels which are devoid of the said recesses form the main part of the blank (52).





This Sheet Has Been Replaced



20. Blank according to any one of Claims 16 to 19, characterized in that the said recesses have essentially the shape of isosceles acute-angled triangles with the apex on the fold line and with the base parallel thereto.

- 5 21. Method for the manufacturing of a pallet according to any one of Claims 1 to 16, characterized in that blanks of a foldable material provided with fold lines are used to manufacture base beams (3') by means of winding the blank and folding it along the folding lines in order to form a pipe, where that part of the blank which is devoid of the said recesses is first used to manufacture the inner pipe (37) which is to form the said
- 10 stiffening in the lower part of the base beam, by means of at least one winding turn, and in that the procedure is thereafter continued by winding that part of the blank which has the said recesses on the outside of the inner pipe, so that an elongate channel (50) is obtained in the area of the top portion of the base beam, the panels which have the said recesses being included in the sides and top portion of the base beam, with the recesses
- 15 coinciding in the said top portion, and in that at least some of the winding turns are fixed to each other by adhesive means; in that a deck (2) is manufactured by rotating a foldable deck blank along fold lines in order to form a deck surface (4) consisting of a number of parallel panels (5) which essentially adjoin each other, and, on the underside of the pallet surface, below the joints between the panels, parallel projections (8) having the same
- 20 cross-section as the recesses in the base beams; and in that the deck is joined to a number of the base beams by means of the projections on the deck being introduced into the recesses in the top portion of the base beams.

22. Method according to Claim 21, characterized in that when the base beams are being
- 25 manufactured, the inner pipe is wound on a first inner core (84), in that a second outer core (85) is arranged on the outside of the shaped inner pipe, and in that the rest of the blank is thereafter wound on the inner pipe and the outer core.

23. Apparatus for the manufacturing of base beams included in the pallet according to
- 30 any one of Claims 1 to 16, characterized by an inner core (84), means for winding a portion of a blank (52) of foldable material on the inner core, an outer core (85), means for arranging the outer core on the material which has been wound on the inner core,

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means for winding the rest of the blank so that it bears against the material which has been wound round the inner core, means for fixing at least some of the winding turns to each other, means for removing the outer core, and means for removing the finished base beam from the inner core.



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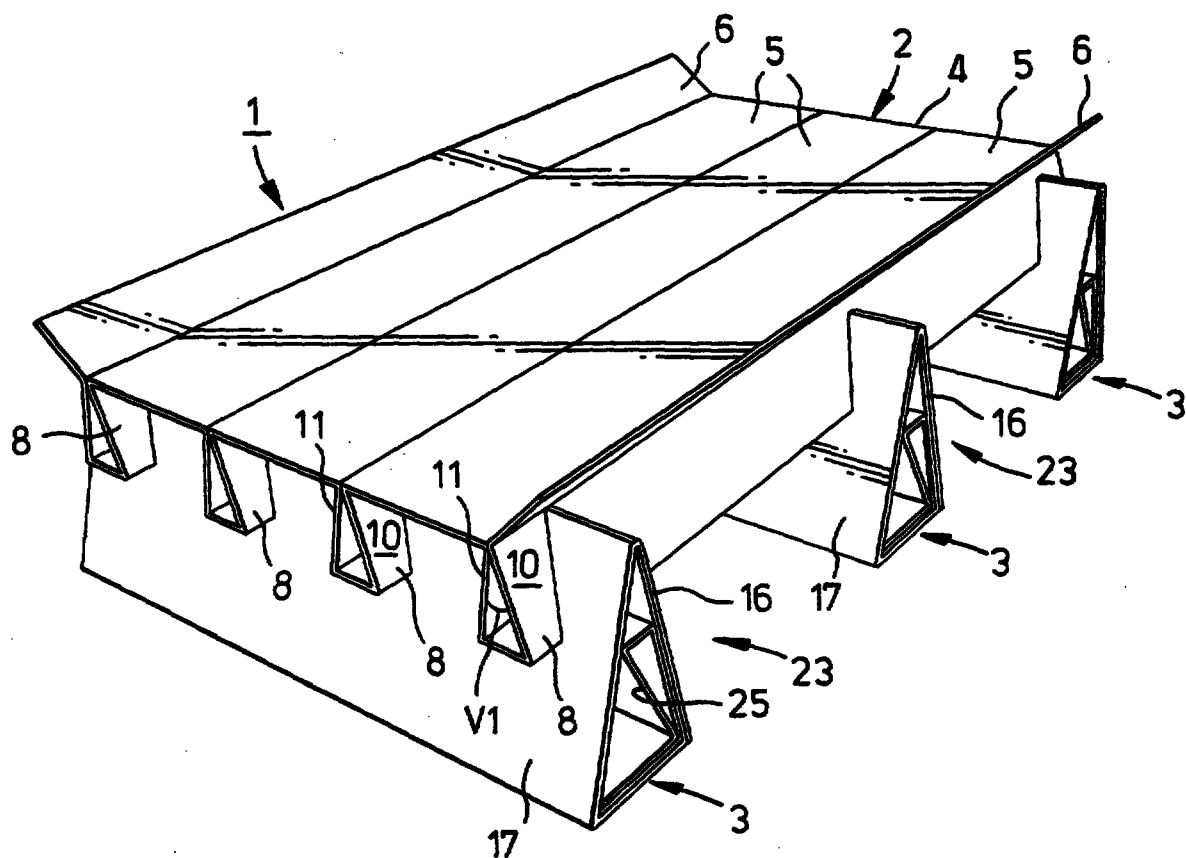


Fig.1.

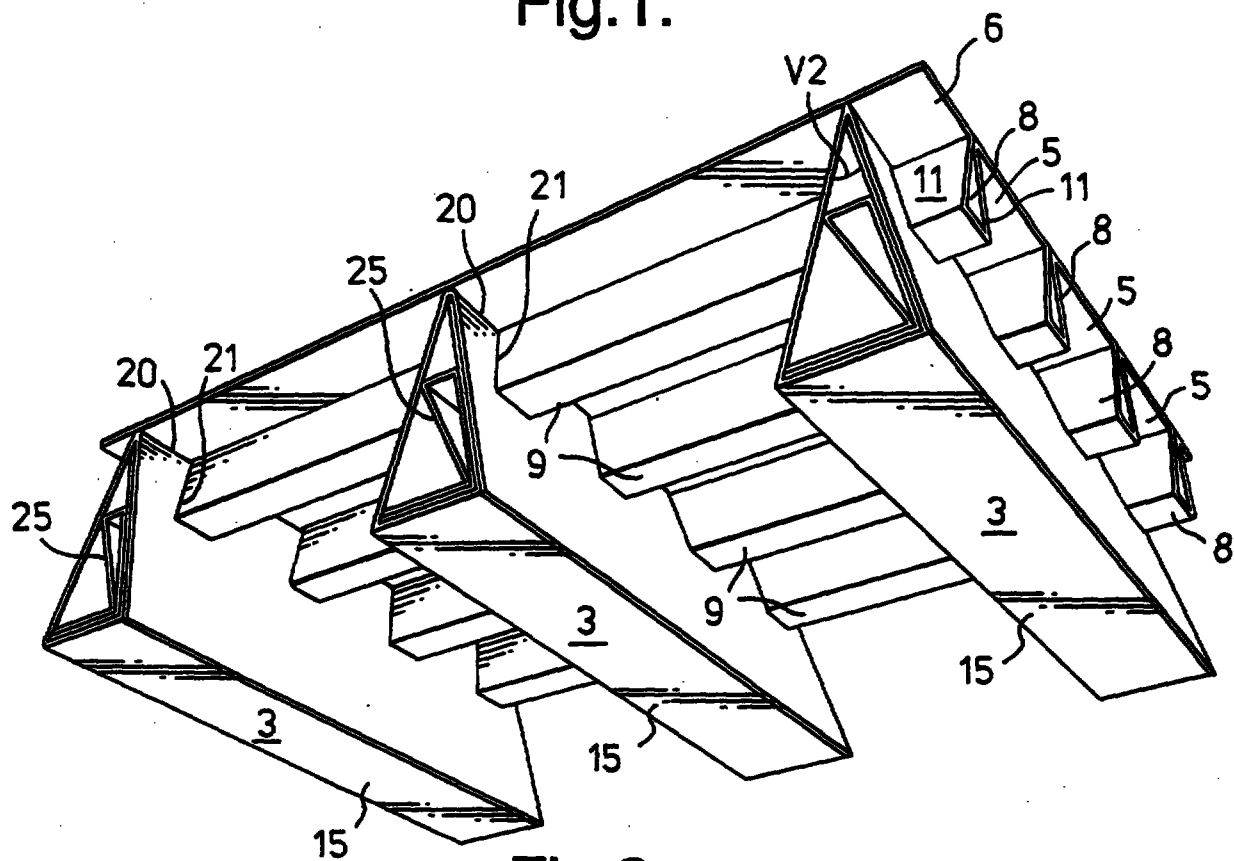


Fig.2.

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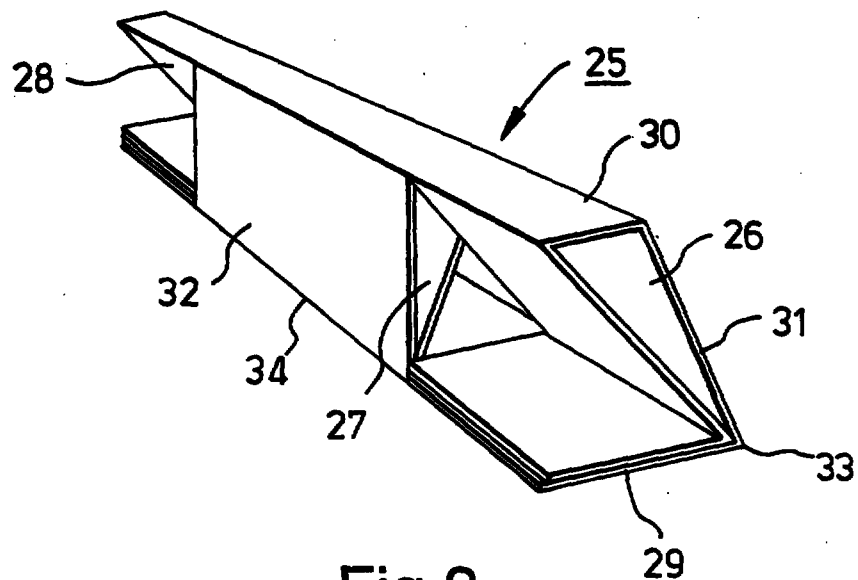


Fig.3.

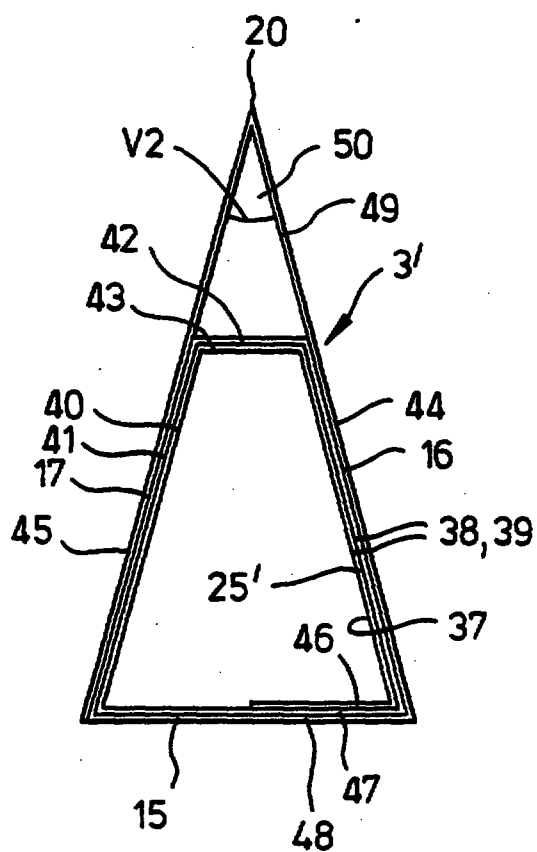
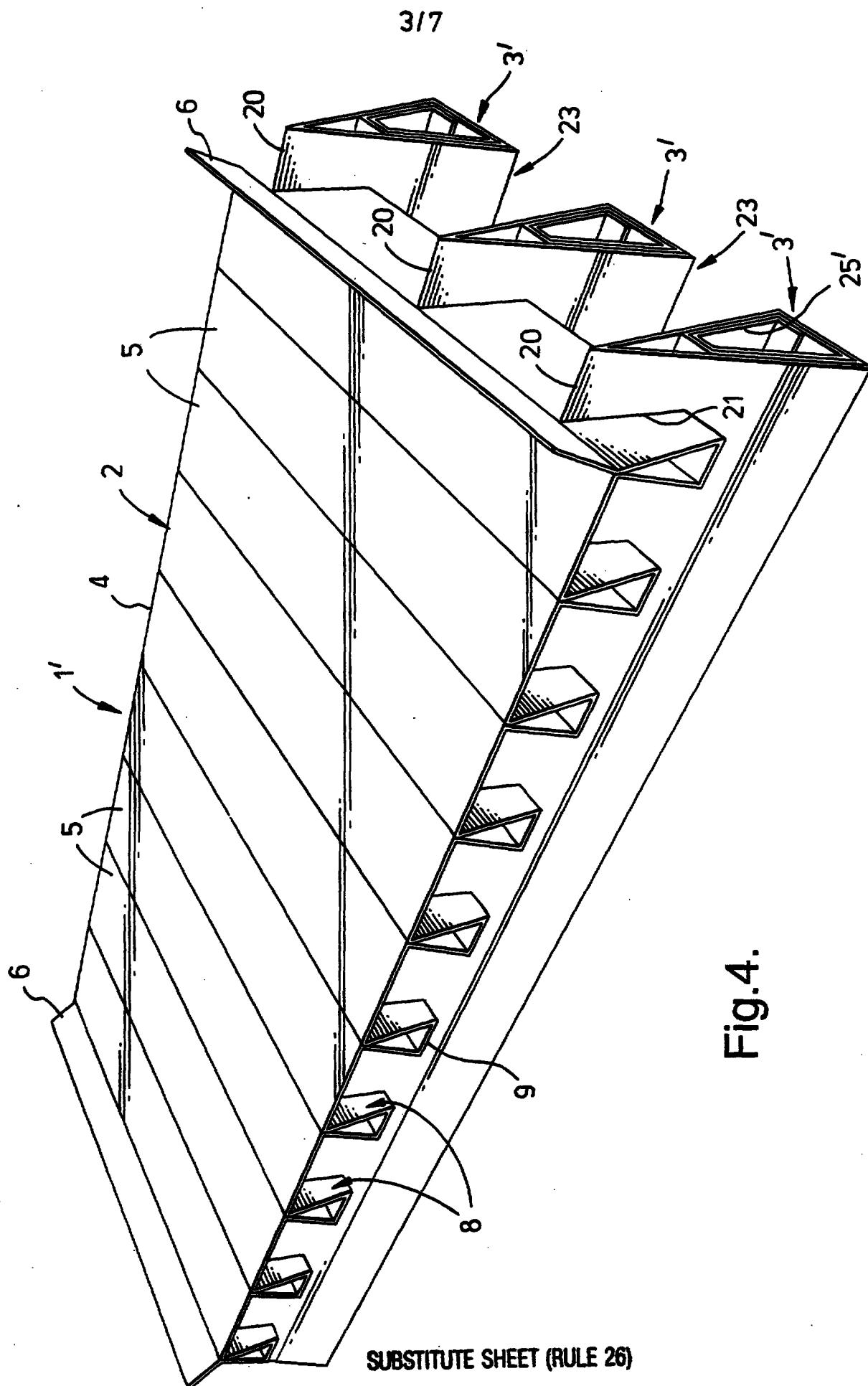


Fig.5.



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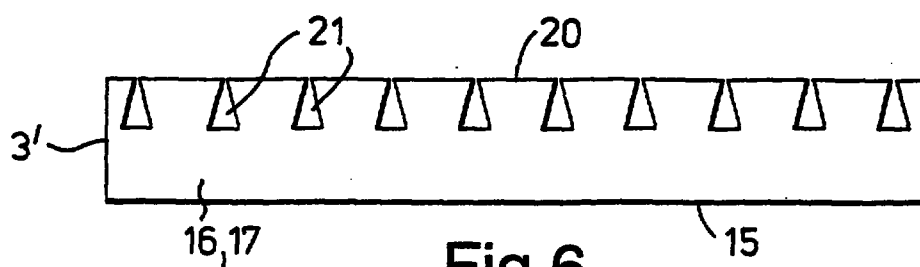


Fig. 6.

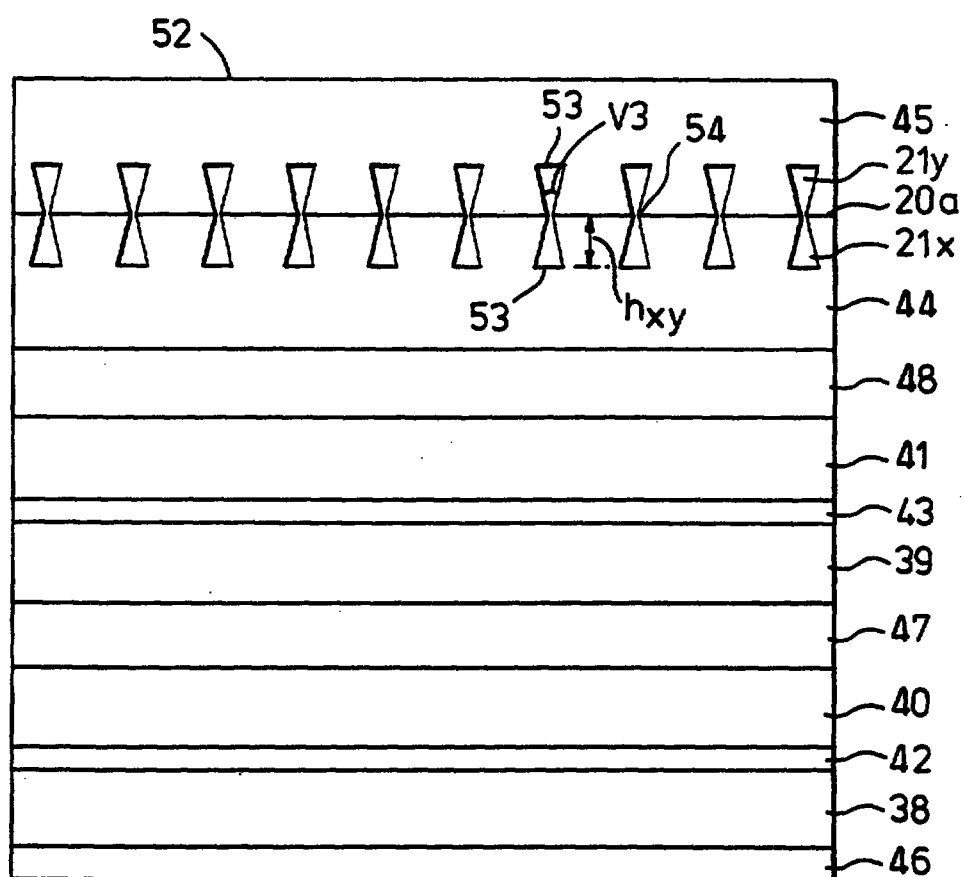


Fig. 7.

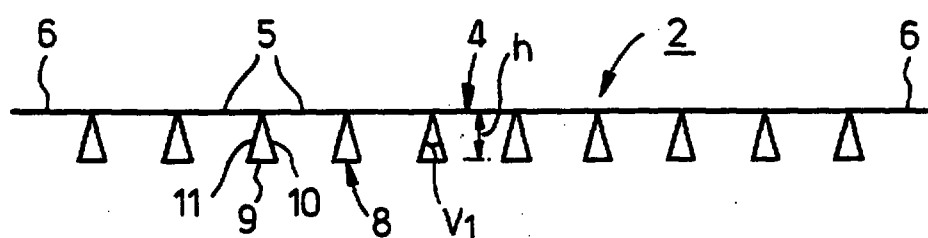


Fig. 8.

SUBSTITUTE SHEET (RULE 26)

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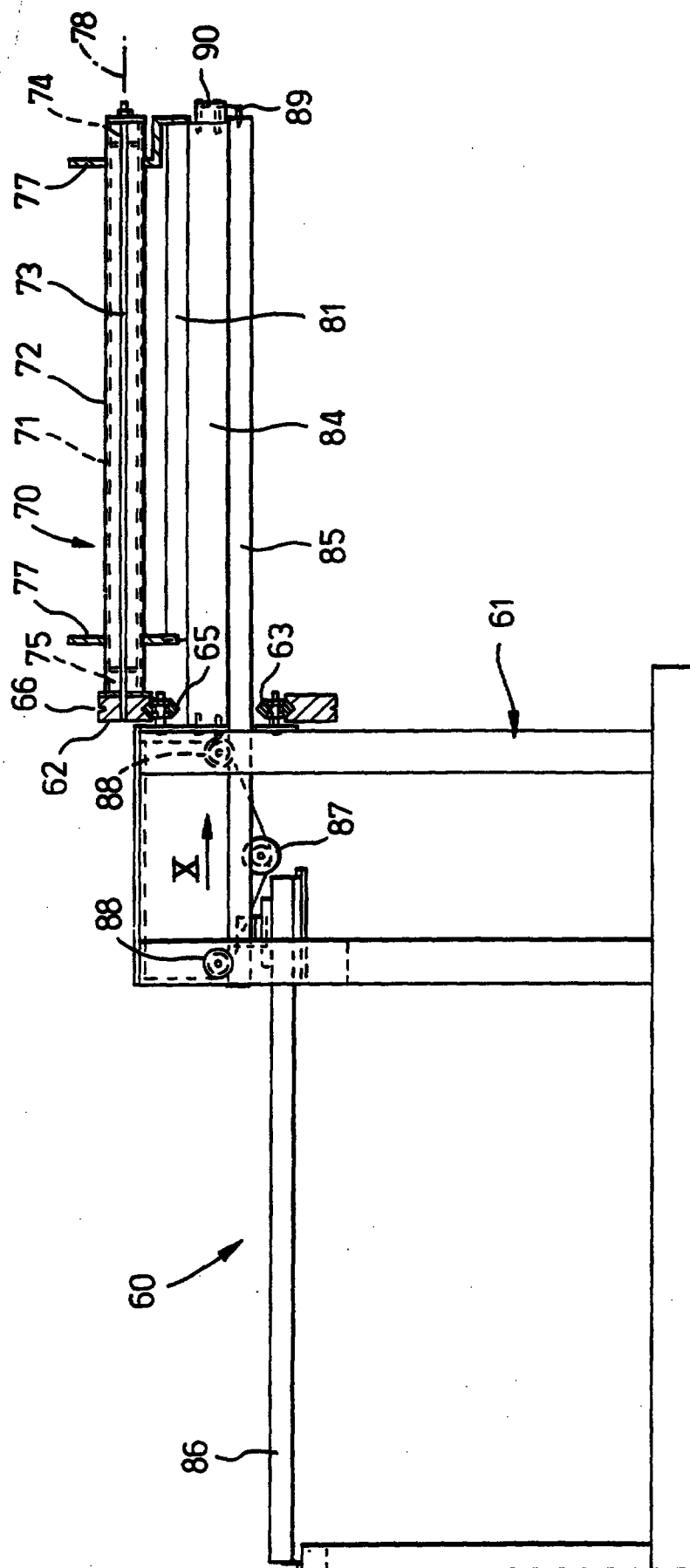


Fig. 9.

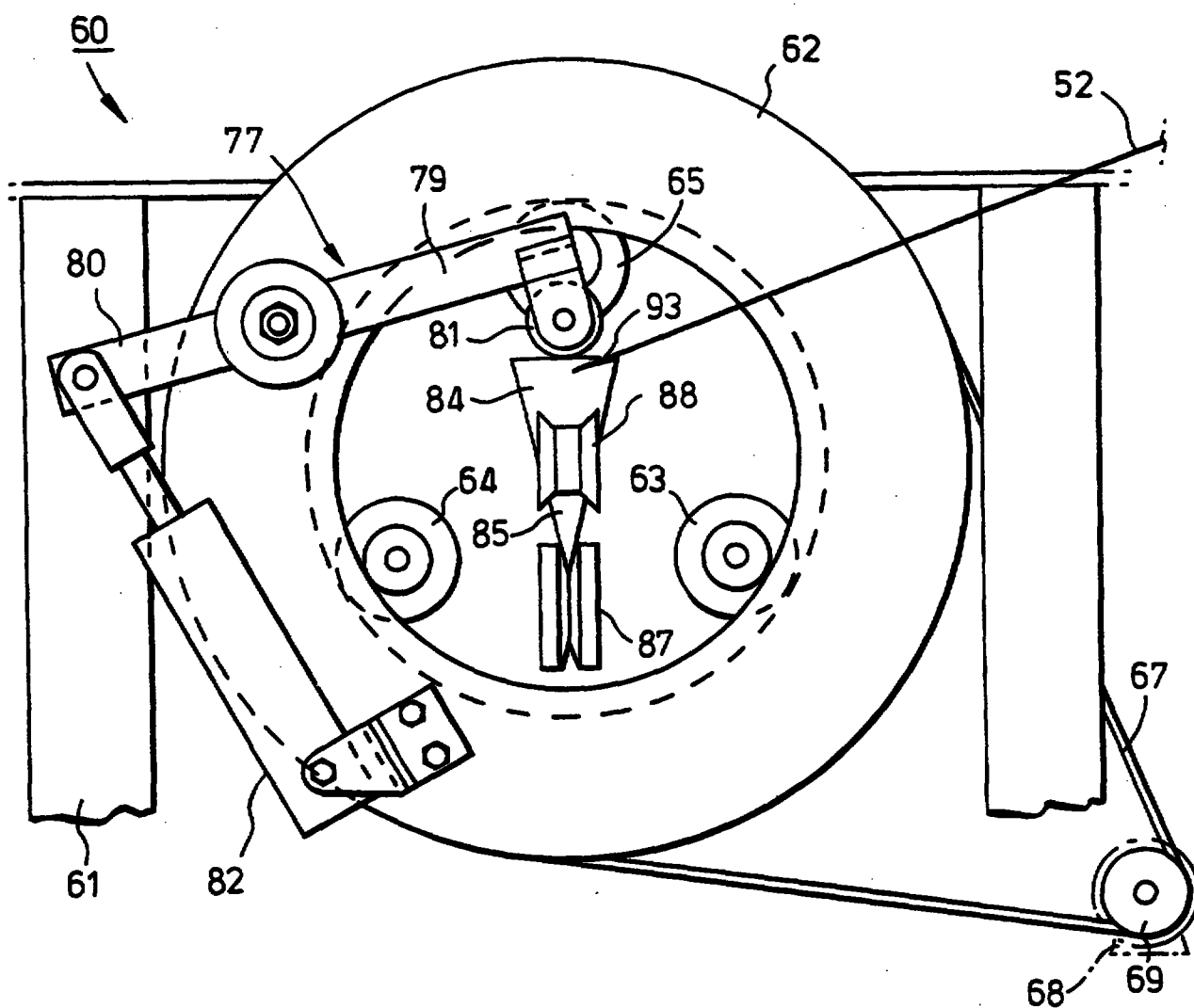


Fig.10.

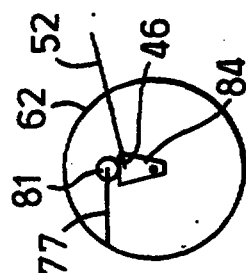


Fig. 11A.

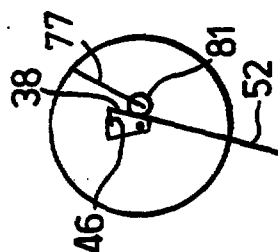


Fig. 11B.

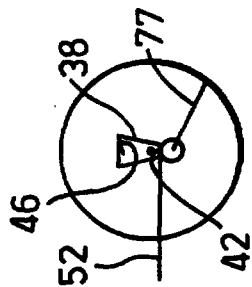


Fig. 11C.

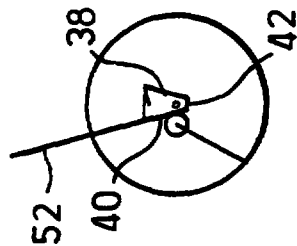


Fig. 11D.

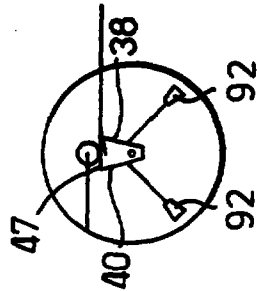


Fig. 11E.

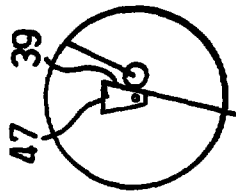


Fig. 11F.

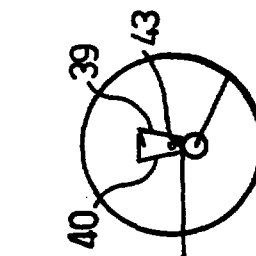


Fig. 11G.

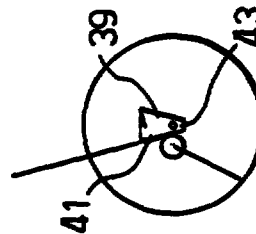


Fig. 11H.

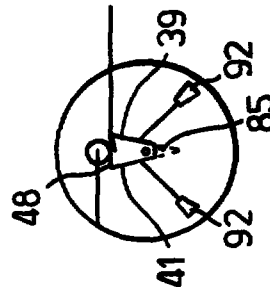


Fig. 11I.

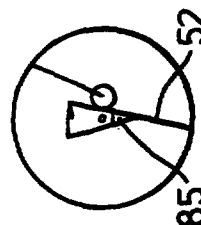


Fig. 11J.

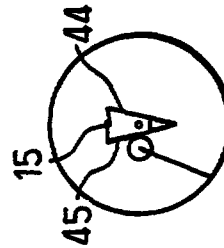


Fig. 11K.

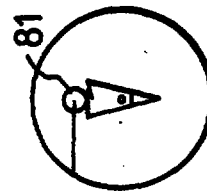


Fig. 11L.