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(54) **CORRUGATED PAPERBOARD SHIPPING PALLET AND SUPPORT MEMBER**

VERSANDPALETTE UND STÜTZGLIED AUS WELLPAPPE

PALETTE D'EXPEDITION ET ELEMENT SUPPORT EN CARTON ONDULE

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates to support members which can be used as a substitute for wood logs, boards, or planking. The support members are preferably constructed from corrugated paper and are lightweight while having high strength. The support members can be utilized to brace, stabilize, or support various items.

**[0002]** The present invention relates to a pallet or load carrying structure which can be manufactured from corrugated paper or similar materials which are recyclable. The pallets are utilized to carry goods, materials, etc. and are advantageously lightweight, thus saving transportation costs. The structure of the pallet provides excellent stability and yet allows for production costs to be minimized.

### BACKGROUND OF THE INVENTION

**[0003]** Industries such as transportation and manufacturing have for years utilized wood articles such as logs, boards, and planking as supports, braces, and separators for various goods or other materials. While wood articles have been known to be durable, they have numerous drawbacks.

**[0004]** Disadvantages include that wood is relatively dense and thus heavy. The weight of wood articles increases transportation costs and reduces the amount of materials which can be transported. A further disadvantage is that wood surfaces are rough and generally uneven which can damage the finish of materials, especially fragile materials, abutted or supported thereby. Moreover, when exposed to moisture, wood articles can warp, becoming unlevel and not suitable for intended uses.

**[0005]** A pallet is a portable platform generally including a planar horizontal member, which can be used as a base member for stacking, storing, handling and transporting materials or goods. Generally, pallets are constructed from wood and nails or staples. Recently, pallets have also been constructed from paper-based materials and plastics. Pallets generally have openings in the structure thereof to accommodate the forks of a forklift truck, or the like, and allow the pallet to be lifted off a floor.

**[0006]** U.S. Patent No. 5,269,219 relates to a pallet design for transporting loads fabricated from paper products consisting of a load-supporting deck, a top cover sheet with tuck tabs that provides a fastening and link to the runners, a bottom sheet glued to the deck that provides a solid surface to attach the runners, and runners spaced apart and at the appropriate height to provide access to the forks on a forklift or hand jack.

**[0007]** U.S. Patent No. 5,595,125 relates to a lightweight, disposable, corrugated paper pallet formed by a plurality of corrugated paper runners, traversing the length of the pallet, each runner enveloped by a continuous corrugated paper inner sheet, which itself is bonded

to the lower side of a reinforced corrugated paper top deck and to the upper side of a corrugated paper bottom stabilizing deck.

**[0008]** U.S. Patent No. 5,784,971 relates to a collapsible pallet assembly structure which includes at least a pair of lengthwise beam members and at least a pair of crosswise beam members formed of a corrugated paper material. Each lengthwise beam member includes a surface plate portion from which a plurality of folded sidewall portions extend downward and at least one wing piece portion projects in substantially coplanar manner. The surface plate portion has formed therethrough a plurality of upper slot holes which communicate respectively with a plurality of lower slot holes formed through the sidewall portions. Each crosswise beam member includes a top plate portion from which a plurality of folded bracket plate portions extend downward. Each bracket plate portion includes a slotted opening that delineates a pair of bracket plate extending sections. Each crosswise beam member is coupled to the lengthwise beam members in a transverse manner with its top plate portions partially overlaying at least one of the lengthwise beam members surface plate portions and with at least one extending section of each bracket plate portion inserted through an upper slot hole of a lengthwise beam member surface plate portion.

**[0009]** U.S. Patent No. 5,934,202 relates to a paper pallet which includes a bottom deck board made of a corrugated paper board, a top deckboard made of a corrugated paper board, a plurality of paper blocks longitudinally and transversely arranged in rows and connected between the bottom deckboard and the top deckboard, and a plurality of paper packing members respectively adhered between the paper blocks and one of the bottom deckboard and the top deckboard, the packing members each having an elongated base adhered between one of the bottom deckboard and the top deckboard and one row of the paper blocks and pairs of packing flaps bilaterally extended from two opposite long sides of the elongated base and respectively adhered to the corresponding row of blocks at two opposite sides.

**[0010]** U.S. Patent No. 6,357,364 relates to a paper pallet comprising support blocks, a top pad and a wrap. The support blocks are of a comb configuration, e.g., honeycomb or hexacomb. The top pad is of a corrugated material and is positioned above the support blocks. The wrap is also of a corrugated material and wraps, via direct contact, the top and side surfaces of the top pad as well as wrapping, via direct contact, at least two side surfaces of the support blocks.

**[0011]** DE 92 13 681 U1 relates to a paper-based pallet including an upper rectangular deck plate, a plurality of support members attached to the lower side of the deck plate and three bars in parallel glued to the lower side of the support members. The support members comprise an X-shaped reinforcement means and a plurality of additional layers of corrugated sheets wrapped around the X-shaped reinforcement means to form a rectangular hol-

low support member.

**[0012]** EP 0 995 681 discloses a paper-based pallet having an upper deck member formed from a corrugated sheet, a lower deck member formed from a corrugated sheet and a plurality of leg portions formed as hollow four-sided cylinders from an elongated sheet of corrugated paper.

**[0013]** The prior art paper-based pallets present rather complicated designs which are not cost effective to produce and are relatively bulky and heavy. The pallets of the prior art are labor intensive and often not completely recyclable.

## SUMMARY OF THE INVENTION

**[0014]** Support members are disclosed which can be employed as substitutes for wood braces, supports, or the like. The support members are preferably constructed from corrugated paper and have a high strength to weight ratio. The support member is generally formed from single face corrugated which is wound around a central area or core to form an elongated body having dimensions similar to the wood article it can replace.

**[0015]** In a further embodiment, an object of the present invention is to provide a pallet, preferably constructed of corrugated paper, which while being lightweight has sufficient strength to support materials or goods to be transported. Advantageously, the pallet can be recycled and poses no harmful effects on the environment.

**[0016]** A further object of the invention is a pallet structure that is easily customizable and can be manufactured in a vast number of size ranges to suit the varying needs of customers.

**[0017]** According to the invention these objects are achieved by a pallet according to claim 1, a method for forming a pallet according to claim 9 and an elongated support member according to claim 13.

**[0018]** The pallet of the present invention generally comprises an upper deck member, a lower deck member, and a plurality of support members connected therebetween. The upper deck member and the lower deck member, independently, are disposed at a horizontal plane substantially parallel to each other as well as a ground surface. The support members comprise a single continuous wind of corrugated paper linerboard, which is preferably single faced, having a continuous layer of paper with strengthening flutes attached thereto. The continuous wind of the support members provides strength and rigidity to the pallet.

**[0019]** In one embodiment, the pallet is constructed from two or more support members which substantially extend the length or width of the deck members and allow two-way access for a forklift truck. In a further embodiment, the support members include access holes perpendicular to the longitudinal axis thereof so that the pallet can be accessed from all four sides for lifting and/or moving.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** The invention will be better understood and other features and advantages will become apparent by reading the detailed description of the invention, taken together with the drawings, wherein:

FIG. 1 is a perspective view of a corrugated paper pallet of the present invention showing the upper and lower deck members connected by support members.

FIG. 2 is an exploded view of a pallet showing the continuous wind or wrap of the support members.

FIG. 3 is a partial perspective view of a pallet with removed portions to particularly illustrate the orientation of the flutes of the corrugated members.

FIG. 4 is a perspective view of a support member which can be utilized as a substitute for wood pieces.

## DETAILED DESCRIPTION OF THE INVENTION

**[0021]** The embodiments of the pallet and associated components thereof according to the present invention will be specifically described, with reference to the drawings wherein like numerals indicate like or corresponding parts throughout the Figures.

**[0022]** FIG. 1 illustrates a pallet 10 of the present invention which comprises an upper or top deck member 20, a lower or bottom deck member 30, and a plurality of support members 40. The support members are secured at predetermined locations between the deck members by a securing means, such as adhesive, tape, fasteners, or the like, with common white glue being preferred.

**[0023]** The upper deck member 10 typically serves as a support or load-bearing surface for the goods or materials adapted to be stored on and/or transported by the pallet. The upper deck member is preferably formed from a single sheet of corrugated linerboard paper. The corrugated paper can be single wall, double wall or triple wall. As known in the art, single wall corrugated sheets are formed from two face sheets, 22, 24 connected by a layer of flutes 26, as shown in FIG. 3. The individual double wall and triple wall corrugated sheets include two and three layers of fluting, respectively, each separated by a single layer of thin paper or sheeting, with a layer of the paper or sheeting covering the outer surfaces of the outer flutes. Accordingly, the double and triple wall corrugated sheets have alternating layers of flutes and thin paper layers, with the paper layers being the outer surface of the sheets. The flutes can be described as having a repeating "S" shaped pattern or wave profile. The height of the flutes, i.e., from peak to trough, can vary as known in the art and can be, but are not limited to, A, B, C, and E grade. When double or greater wall corrugated sheet is utilized, different grade and thus different heights of flutes can be used in a single sheet of the corrugated paper, with B and C grade preferred for double wall

sheets and A, B, and C; or A, C, and C preferred for triple wall. The flutes of the corrugated sheeting form hollow tube or straw-like passageways and connect the remaining layers together.

**[0024]** Top deck member 20 is a planar structure having a predetermined length and width, with sizes for both ranging generally from about 30,48 or 35,56 to about 127 cm (12 or 14 to about 50 inches), and preferably from about 76,2 or 101,6 to about 121,92 cm (30 or 40 to about 48 inches).

**[0025]** The main plane formed by the upper deck member is substantially horizontal and parallel to the lower deck member and adapted to be parallel with a ground surface. The top member is maintained a predetermined distance, usually about 7,62 to about 12,7 or 15,24 cm (3 to about 5 or 6 inches) from the lower deck member 30.

**[0026]** The lower deck member 30 can be formed in the same size, manner and construction as the upper deck member 20. Depending on the intended use of the pallet, the corrugated sheets of the upper and lower deck members can be the same or different such as both being single wall corrugated paper, or one member being single wall and the other triple wall, etc. The lower deck member contacts or rests upon the ground surface. The planes formed by the upper and lower deck members are, as noted, substantially parallel and thus provide a level surface for goods or materials. The support member or stringers 40 of the pallet provide both strength and rigidity to the structure. Each individual support member is formed from a single continuous piece of corrugated paper, such as single face. Alternatively, a plurality of pieces such as generally about 10 or about 8 or less, desirably about 6 or about 4 or less, and preferably about 3 or about 2, can be utilized and the same are butted at their ends to one another, either with or without a fastener such as an adhesive and wound in the same manner as a single continuous piece of corrugated paper. The continuous piece of a predetermined height is wound or wrapped in a direction around itself to form a predetermined length and width or thickness. Support member 40 is preferably formed from single face corrugated paper comprising a single layer of paper with flutes co-extending therewith. Glue or other adhesive is utilized to secure the continuously wound layers to each other. During formation of the support member, the glue is preferably applied to the outer flute edges that will contact the succeeding paper layer. The continuous wind has a continuous nature of alternating layers of flute and liner or paper.

**[0027]** The overall size of a support member 40 can vary with the height ranging generally from about 7.62 cm (3 inches) to about 12.7 cm or about 15,24 cm (5 or about 6 inches), desirably from about 8,89 cm to about 10,16 cm (3.5 to about 4 inches), and preferably about 8,89 cm (3.5 inches); the width ranging generally from about 5.08 cm to about 10,16 cm or about 15,24 cm (2 to about 4 or about 6 inches), desirably from about 5.08 cm to about 7,62 cm (2 to about 3 inches), and preferably

from about 5,08 cm to about 6,35 cm (2 to about 2.5 inches); and the length ranging generally from 30,48 cm or 35,56 cm to about 127 cm (12 or 14 to about 50 inches); desirably from about 101,6 cm to about 121,92 cm (40 to about 48 inches) and preferably from about 116,89 cm to about 121,92 cm (46 to about 48 inches).

**[0028]** The support member flutes are arranged parallel to the height of the support member to provide strength. In this manner, the deck members will cover the open ends of the support member, which are then fully enclosed. The overall dimensions of a support member will vary and depend on the intended use and weight the pallet will be used to support.

**[0029]** The support member extends substantially the entire length of a pallet from one side or end to another. The number of support members utilized between the deck members will also depend on the weight that needs to be supported, and preferably about 2 or about 3 to about 6 support members are utilized in a pallet.

**[0030]** In a preferred embodiment, the flutes 26,36 of the deck members 30,40 are disposed in a direction perpendicular to the longest length (as opposed to the width) of the support members, thus providing strength to the pallet as shown in FIG. 3. Thus, the flutes of the support members are perpendicular to the flutes of the deck members. This configuration is also illustrated in FIG. 2 and has been found to provide a lightweight, recyclable pallet which is strong and sturdy in construction.

**[0031]** As shown at least in FIG. 2, support members 40 have rounded or curved end portions 42. The curved end portions are adapted to guide the forks of a fork lift truck into the pallet. This is, the curved end portions will allow the forks to slide into the passageways formed between adjacent support members.

**[0032]** FIG. 3 is a detailed cross-sectional view of a pallet of the present invention, particularly illustrating the orientation of the flutes of the corrugated members. The flutes 26 of the upper deck member 20 are orientated in a direction perpendicular to the length of support member 40. The upper deck member is a single wall corrugated paper sheet having face paper layers or sheets 22 and 24 connected by flutes 26. In a similar manner, the lower deck member includes face paper layers or sheets 32 and 34 connected by flutes 36, which are also orientated perpendicular to the length of support member 40.

**[0033]** FIG. 4 illustrates a support member 40 which can be utilized to create a four-way entry pallet. Support member 40 includes at least two cut-outs 44 which extend completely through the width of the support member. The size of the orifice or cut-outs can vary and are at least large enough to accommodate a fork of a fork lift truck. The cut-outs 44 enable the pallet of the present invention to be entered from all four sides for lifting and moving the same.

**[0034]** In a further embodiment, as illustrated in FIG. 2, the lower deck member 30 can have jack holes 50 formed therein to accommodate lift wheels of a hand jack. The jack holes 50 can be formed of any shape or size

and are generally at least adapted to be larger than the size of the lift wheels of the hand jack. Jack holes 50 allow the pallets to be utilized and lifted by hand jacks which are generally manually operated.

**[0035]** The hand jacks generally include wheels on the fork portions for rolling movement across the ground surface. The jack holes 50 are adapted to allow the wheels of a hand jack to be freely moved, as the wheels are prevented from contacting the pallet 10 due to the presence of the jackholes.

**[0036]** Additionally, either or both of the upper and lower deck members can be treated with an oil and/or water repellent compositions as known in the art and to the literature to prolong the life of the pallet. The pallets of the present invention being formed of corrugated paper are completely recyclable and are thus beneficial to the environment. The construction of the pallet also renders the same insect resistant.

**[0037]** In a further embodiment, a support member or article can be utilized alone, that is not in a pallet assembly. The support member is used as a wood substitute and is used as, but not limited to, stack separators, supports, spacers, braces, stabilizers, and the like.

**[0038]** As stated hereinabove, the support members 40 are generally elongated in length as shown in at least FIG. 4. In addition to the above-noted size ranges for the support members used in a pallet assembly, support member construction is versatile and thus a support member is sized accordingly to fit an intended application. For example, in one embodiment the support member is used as a brace on the floor of a truck trailer or rail car; or used between adjacent items or rows of items.

**[0039]** The support member 40 is formed in sizes of about 1,27 x about 5,08 x about 5,08 cm (0.50 x about 2 x about 2 inches) to about 20,32 x about 20,32 x about 127 or about 254 cm (8 x about 8 x about 50 or about 100 inches) or from about 2.54 x about 5,08 x about 5,08 cm (1 x about 2 x about 2 inches) to about 15,24 x about 15,24 x about 127 cm (6 x about 6 x about 50 inches). In further embodiments, the support member is also be manufactured to typical wood board specifications similar to 5,08 cm x 10,16 cm (2"x 4"), 10,16 cm x 10,16 cm (4" x 4") or 5,08 cm x 15,24 cm (2" x 6") in substantially any desired length. In one embodiment two or more support members are glued together, i. e., side by side, one on top of the other, or the like if desired to provide a larger surface area.

**[0040]** Although the relative size of the support member can vary, the construction method is generally the same. The support member is formed as a wind or coil of corrugated paper. The wind is considered a spiral wind, more specifically a flattened, elongated wind or coil. As disclosed hereinabove, the support member is preferably formed from single face corrugated paper having a corrugated paper layer of a predetermined thickness and a flute layer attached thereto; typically with an adhesive as known in the art. The assembled flattened, spirally wound or rounded end rectangular support member has alter-

nating layers of paper sheet and fluting.

**[0041]** As stated hereinabove, the flutes can be, but are not limited to, A, B, C, or E grade. The paper layer of the corrugated paper generally ranges from about 0.11 kg / m<sup>2</sup> to about 0.44 kg / m<sup>2</sup> (23 to about 90-pounds per msf (thousand square feet)) in medium or linerboard as known in the art. Advantageously, the weight or thickness of the paper is exactly tailored to fit the desired end use, wherein if more support or strength is needed, a heavier grade of paper is utilized. Thus, the support members can be custom tailored to specific applications.

**[0042]** The support member 40 is generally formed in the following manner. Starting with = a first end 41, corrugated paper of a predetermined height is extended a predetermined length "X" forming a central area or core 42, preferably in a straight line so that when a predetermined number of layers are wrapped or wound around the central core, a support member is formed having a total length L and width W. When the corrugated paper has been extended to length "X," the paper is then bent or folded either clockwise or counter-clockwise and routed back along and adhered to central core 42. When the first end 41 is reached, the corrugated paper is wrapped therearound. The process is repeated until the central area is wrapped with a desired number of layers.

**[0043]** Each layer of paper of the support member is preferably adhered to an adjacent layer with an adhesive. As illustrated in the FIG. 4, the flute layers and sheet layers alternate. End 43 of the corrugated paper can be essentially located at any point along the outside of the support member, and is not limited as shown in FIG. 4. While the support member can be formed from a single piece of corrugated paper, it should be understood that more than one piece can be utilized with ends being abutted or even slightly overlapped.

**[0044]** The support member of the present invention has excellent strength. The wrapped structure provides rigidity and stability to the support member. The curved end portion 45 is very stable and aids in preventing separation between the layers. The support member is used wherever bracing, support or the like are needed. The support member provides cushioning properties and absorbs vibrations which can occur in transit, thereby reducing damage to a product. Moreover, the support member is free of nails, splinters, or other protrusions harmful to products which can be supported thereby. The support members are recyclable and repulpable, thereby reducing waste in landfills.

## EXAMPLES

### Example 1

**[0045]** A two-way entry pallet of the present invention was constructed having an upper deck, a lower deck, and four support members. Both the upper deck and lower deck had dimensions of 101,6 cm (40 inches) wide by 121.92 cm (48 inches) long and were formed from a sin-

gle sheet of single wall corrugated paper, 0,36 kg / m<sup>2</sup> (75-pound) version. The support members were each constructed from a single sheet of single face corrugated paper. Glue was applied to the flute edges and the single piece of single face corrugated paper was wrapped around itself to form a support member 8,89 cm (3½ inches) high, 121,92 cm (48 inches) long and 5.08 cm (2 inches) wide. Two support members were placed at the width ends with the remaining supports being-disposed therebetween at equal distance intervals from the remaining support members. The deck members were adhered to the support members utilizing common white glue.

[0046] 3266 kg (7,200 pounds) of weight was placed on the pallet. The pallet maintained its initial shape and dimensions and did not deform under the pressure of the weight for two weeks when the load was removed.

### Example 2-Compression Test

[0047] A pallet having the above-noted construction and dimensions as in Example 1 was placed in a gauged hydraulic press. Pressure was then applied to the top and bottom deck members of the pallet and increased incrementally. The pallet withstood 7711 kg (17,000 pounds) of pressure before being compressed.

[0048] While in accordance with patent statutes the best mode and preferred embodiment have been set forth, the scope of the invention is not limited thereto, but rather by the scope of the attached claims.

### Claims

1. A pallet (10), comprising;  
an upper deck member (20) formed from a corrugated sheet and having a length and a width;  
a lower deck member (30) formed from a corrugated sheet and having a length and a width; and  
at least two support members (40), said support members connected to both said deck members (20, 30) so that said deck members (20, 30) are substantially parallel to each other,  
**characterized in that** each support member (40) is a solid wind of contiguous layers of one or more corrugated sheets and each said support member (40) having a predetermined height, said support member (40) having an elongated central layer of a predetermined length and additional layers are contiguously wrapped around said central layer, such that adjacent layers of the support member including said central layer are adhered to one another along their lengths, wherein said support members include curved length end portions (42), and wherein each support member length extends substantially the length of said deck members (20, 30).

2. A pallet (10) according to claim 1,

**characterized in that** said support member corrugated sheet comprises a single paper layer to which a layer of flutes are attached, and wherein said flutes are arranged in a substantially perpendicular direction to the plane of said deck members (20, 30).

3. A pallet (10) according to claim 2,  
**characterized in that** said support member (40) is connected to said deck members (20, 30) with an adhesive or fastener, and wherein each support members (40), independently, is a wind of about 6 or less of said corrugates sheets.

4. A pallet (10) according to any of claims 2 or 3,  
**characterized in that** said corrugated sheets of said deck members (20, 30) comprise single wall, double wall, or triple wall corrugated sheets.

5. A pallet (10) according to any of claims 2 to 4,  
**characterized in that** said deck member flutes (26) are arranged in a direction perpendicular to the longest length of said support member (40).

6. A pallet (10) according to any of claims 2 to 5,  
**characterized in that** each support member (40), independently, is a continuous wind of 2 or less corrugated sheets, and wherein said flutes (26) of said deck members (20, 30) are arranged perpendicular to the flutes of said support members (40).

7. A pallet (10) according to any of claims 1 to 6,  
**characterized in that** said support members (40) are formed from a single sheet of corrugated paper.

8. A pallet (10) according to any of claims 1 to 7,  
**characterized in that** a) said upper deck member (20) and said lower deck member (30) lengths are of from about 30,48 to about 127 cm (about 12 to about 50 inches) and widths are from about 30.48 to about 127 cm (about 12 to about 50 inches), and wherein said support members (40) have a height of from about 7,62 to about 15,24 cm (about 3 to about 6 inches); or b) wherein said lower deck member (30) includes a plurality of jack holes (50) and wherein each said support member (40) includes at least two cut-outs (44) which extend completely through the width of the support member (40); or both a) and b).

9. A method for forming a pallet (10), comprising the steps of:

forming at least two support members (40) having a predetermined height, width, and length; and  
connecting an upper deck member (20) having a length and a width and a lower deck member (30) having a length and a width to said support

members (40) with said support members (40) being disposed between said deck members (20, 30), said deck members being formed from corrugated sheets,

**characterized in that** said at least two support members (40) are formed in a solid wind from a single sheet of corrugated paper by continuously wrapping a predetermined number of contiguous layers around a central layer, such that adjacent layers of the support member including said central layer are adhered to one another, wherein said support members include curved length end portions, and wherein each support member length extends substantially the length of said deck members.

10. A method according to claim 9, **characterized in that** said support member corrugated paper comprises a single paper layer having a layer of flutes attached thereto, and wherein said support member flutes are arranged in a substantially vertical direction with respect to at least one said deck member (20, 30), and wherein said support member (40) is connected to said deck members (20, 30) with an adhesive or fastener.

11. A method according to claim 10, **characterized in that** said deck members (20, 30) comprise single wall, double wall, or triple wall corrugated sheeting, and wherein said deck member flutes (26) are arranged in a direction substantially, perpendicular to the length of said support member (40).

12. A method according to claim 11, **characterized in that** a plurality of jack holes (50) are formed in said lower deck member (30), and wherein each said support member (40) includes at least two cut-outs (44) which extend completely through the width of the support member (40).

13. An elongated support member (40), comprising:

one or more pieces of corrugated paper comprising a) a layer of paper having a length, a width, and a height, and b) flutes connected to said layer of paper, said flutes arranged parallel to the paper height, **characterized in that** said support member (40) has an elongated central layer of a predetermined length formed from said corrugated paper, said corrugated paper further wrapped in a clockwise or counterclockwise direction around said central layer in one or more layers to form said support member (40) having a solid wrap of contiguous layers, and a predetermined length, height, and width such that adjacent layers of the support members including said central layer are adhered to one another

along their length, and wherein the support article has curved length end portions.

14. A support member (40) according to claim 13, **characterized in that** said layer of paper is from about 0.11 to about 0.44 kg / m<sup>2</sup> (about 23-pounds to about 90-pounds per thousand square feet).

15. A support member (40) according to claim 13, **characterized in that** said support member width, height, and length respectively is from about 1.27 cm (0.5 inch) by about 5.08 cm (2 inches) by about 5.08 cm (2 inches) to about 20.32 cm (8 inches) by about 20.32 cm (8 inches) by about 127 cm (50 inches).

16. A support member (40) according to claim 15, **characterized in that** said support member width, height, and length respectively is from about 2.54 cm (1 inch) by about 5.08 cm (2 inches) by about 5.08 cm (2 inches) to about 15.24 cm (6 inches) by about 15.24 cm (6 inches) by about 127 cm (50 inches).

17. A support member (40) according to claim 15, **characterized in that** one piece of corrugated paper is utilized to construct said support member (40).

## Patentansprüche

1. Palette (10) mit:

einem oberen Deckelement (20), das aus einem Wellbogen gebildet wird und eine Länge und eine Breite aufweist;

einem unteren Deckelement (30), das aus einem Wellbogen gebildet wird und eine Länge und eine Breite aufweist; und

mindestens zwei Trägerelementen (40), wobei die Trägerelemente mit beiden Deckelementen (20, 30) derart verbunden sind, dass die Deckelemente (20, 30) im Wesentlichen parallel zueinander ausgerichtet sind;

**dadurch gekennzeichnet, dass**

jedes Trägerelement (40) aus einer stabilen Wicklung aus zusammenhängenden Lagen aus einem oder mehreren Wellbögen besteht und jedes der Trägerelemente (40) eine vorgegebene Höhe hat, wobei das Trägerelement (40) eine langgestreckte mittlere Lage mit einer vorgegebenen Länge aufweist und weitere Lagen zusammenhängend um die mittlere Lage gewickelt sind, so dass benachbarte Lagen des Trägerelements, einschließlich der mittleren Lage, entlang ihren Längen aneinander anhaften, wobei die Trägerelemente gebogene Endabschnitte (42) aufweisen, und wobei die Länge jedes

- Trägerelements der Länge der Deckelemente (20, 30) im Wesentlichen gleicht.
2. Palette (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Wellbogen eines Trägerelements eine einzelne Papierschicht aufweist, an der eine Wellenschicht befestigt ist, und wobei die Wellen im Wesentlichen senkrecht zur Ebene der Deckelemente (20, 30) angeordnet sind. 5
  3. Palette (10) nach Anspruch 2, **dadurch gekennzeichnet, dass** das Trägerelement (40) durch einen Klebstoff oder ein Befestigungsmittel mit den Deckelementen (20, 30) verbunden ist, wobei jedes der Trägerelemente (40) unabhängig aus einer Wicklung aus etwa 6 oder weniger der Wellbögen besteht. 10
  4. Palette (10) nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** die Wellbögen der Deckelemente (20, 30) einen einwandigen, zweiwandigen oder dreiwandigen Wellbogen aufweisen. 15
  5. Palette (10) nach einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** die Deckelementwellen (26) senkrecht zur längsten Länge der Trägerelemente (40) angeordnet sind. 20
  6. Palette (10) nach einem der Ansprüche 2 bis 5, **dadurch gekennzeichnet, dass** jedes Trägerelement (40) unabhängig aus einer kontinuierlichen Wicklung aus 2 oder weniger Wellbögen besteht, wobei die Wellen (26) der Deckelemente (20, 30) senkrecht zu den Wellen der Trägerelemente (40) angeordnet sind. 25
  7. Palette (10) nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Trägerelemente (40) aus einem einzelnen Bogen Wellpappe hergestellt sind. 30
  8. Palette (10) nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass**
    - a) die Längen des oberen Deckelements (20) und des unteren Deckelements (30) etwa 30,48 bis etwa 127 cm (etwa 12 bis etwa 50 Zoll) und die Breiten etwa 30,48 bis etwa 127 cm (etwa 12 bis etwa 50 Zoll) betragen, und wobei die Trägerelemente (40) eine Höhe von etwa 7,62 bis etwa 15,24 cm (etwa 3 bis etwa 6 Zoll) aufweisen; und/oder 35
    - b) das untere Deckelement (30) mehrere Eingriffsöffnungen (50) aufweist und jedes Trägerelement (40) mindestens zwei Ausschnitte (44) aufweist, die sich vollständig durch die Breite des Trägerelements (40) erstrecken. 40
  9. Verfahren zum Herstellen einer Palette (10) mit den Schritten:
 

Ausbilden mindestens zweier Trägerelemente (40) mit einer vorgegebenen Höhe, Breite und Länge; und

Verbinden eines oberen Deckelements (20) mit einer Länge und einer Breite und eines unteren Deckelements (30) mit einer Länge und einer Breite mit den Trägerelementen (40), wobei die Trägerelemente (40) zwischen den Deckelementen (20, 30) angeordnet sind, wobei die Deckelemente aus Wellbögen hergestellt sind; **dadurch gekennzeichnet, dass** mindestens zwei Trägerelemente (40) als eine stabile Wicklung aus einem einzelnen Bogen Wellpappe ausgebildet werden durch kontinuierliches Wickeln einer vorgegebenen Anzahl zusammenhängender Lagen um eine mittlere Lage derart, dass benachbarte Lagen des Trägerelements, einschließlich der mittleren Lage, aneinander anhaften, wobei die Trägerelemente gebogene Endabschnitte aufweisen, und wobei die Länge jedes Trägerelements der Länge der Deckelemente im Wesentlichen gleicht. 45
  10. Verfahren nach Anspruch 9, **dadurch gekennzeichnet, dass** die Wellpappe der Trägerelemente eine einzelne Papierschicht mit einer daran befestigten Wellenschicht aufweist, und wobei die Wellen der Trägerelemente bezüglich mindestens eines der Deckelemente (20, 30) im Wesentlichen senkrecht angeordnet sind, und wobei das Trägerelement (40) durch einen Klebstoff oder ein Befestigungsmittel mit den Deckelementen (20, 30) verbunden ist. 50
  11. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** die Deckelemente (20, 30) einen einwandigen, zweiwandigen oder dreiwandigen Wellbogen aufweisen, und wobei die Wellen (26) der Deckelemente im Wesentlichen senkrecht zur Länge der Trägerelemente (40) angeordnet sind. 55
  12. Verfahren nach Anspruch 11, **dadurch gekennzeichnet, dass** mehrere Eingriffsöffnungen (50) im unteren Deckelement (30) ausgebildet sind, wobei jedes der Trägerelemente (40) mindestens zwei Ausschnitte (44) aufweist, die sich vollständig durch die Breite des Trägerelements (40) erstrecken.
  13. Längliches Trägerelement (40) mit:
 

einem oder mehreren Wellpappestücken mit (a) einer Papierschicht mit einer Länge, einer Breite und einer Höhe und (b) mit der Papierschicht verbundenen Wellen, wobei die Wellen parallel

zur Papierhöhe angeordnet sind,  
**dadurch gekennzeichnet, dass**  
 das Trägerelement (40) eine aus der Wellpappe gebildete langgestreckte mittlere Lage mit einer vorgegebenen Länge aufweist, die Wellpappe in einer oder mehreren Lagen im Uhrzeigersinn oder im Gegenuhrzeigersinn um die mittlere Lage gewickelt ist, um das Trägerelement (40) mit einer stabilen Wicklung zusammenhängender Lagen und mit einer vorgegebenen Länge, Höhe und Breite zu bilden, so dass benachbarte Lagen der Trägerelemente, einschließlich der mittleren Lage, entlang ihren Längen aneinander anhaften, und wobei die Trägerelemente gebogene Endabschnitte aufweisen.

14. Trägerelement (40) nach Anspruch 13, **dadurch gekennzeichnet, dass** die Papierschicht ein Flächengewicht von etwa 0,11 bis etwa 0,44 kg/m<sup>2</sup> (etwa 23 Pfund bis etwa 90 Pfund pro 1000 ft<sup>2</sup>) aufweist.

15. Trägerelement (40) nach Anspruch 13, **dadurch gekennzeichnet, dass** die Breite, Höhe bzw. Länge des Trägerelements von etwa 1,27 cm (0,5 Zoll) x etwa 5,08 cm (2 Zoll) x etwa 5,08 cm (2 Zoll) bis etwa 20,32 cm (8 Zoll) x etwa 20,32 cm (8 Zoll) x etwa 127 cm (50 Zoll) betragen.

16. Trägerelement (40) nach Anspruch 15, **dadurch gekennzeichnet, dass** die Breite, Höhe bzw. Länge des Trägerelements von etwa 2,54 cm (1 Zoll) x etwa 5,08 cm (2 Zoll) x etwa 5,08 cm (2 Zoll) bis etwa 15,24 cm (6 Zoll) x etwa 15,24 cm (6 Zoll) x etwa 127 cm (50 Zoll) betragen.

17. Trägerelement (40) nach Anspruch 15, **dadurch gekennzeichnet, dass** zum Aufbauen des Trägerelements (40) ein einzelnes Wellpappestück verwendet wird.

## Revendications

1. Palette (10) comprenant :

un élément de pont supérieur (20) formé à partir d'une feuille ondulée et ayant une longueur et une largeur ;  
 un élément de pont inférieur (30) formé à partir d'une feuille ondulée et ayant une longueur et une largeur ; et  
 au moins deux éléments de support (40), lesdits éléments de support étant raccordés aux deux desdits éléments de pont (20, 30) de sorte que lesdits éléments de pont (20, 30) sont sensiblement parallèles entre eux,  
**caractérisée en ce que** chaque élément de support (40) est un enroulement massif de cou-

ches contiguës d'une ou de plusieurs feuilles ondulées et chacun desdits éléments de support (40) a une hauteur prédéterminée, ledit élément de support (40) ayant une couche centrale allongée d'une longueur prédéterminée et des couches supplémentaires sont enroulées de manière contiguë autour de ladite couche centrale, de sorte que les couches adjacentes de l'élément de support y compris ladite couche centrale sont fixées les unes aux autres le long de leurs longueurs, dans laquelle lesdits éléments de support comprennent des parties d'extrémité de longueur incurvées (42), et dans laquelle chaque longueur d'élément de support s'étend sensiblement sur la longueur desdits éléments de pont (20, 30).

2. Palette (10) selon la revendication 1, **caractérisée en ce que** ladite feuille ondulée d'élément de support comprend une seule couche de papier à laquelle une couche de cannelure est fixée, et dans laquelle lesdites cannelures sont agencées dans une direction sensiblement perpendiculaire au plan desdits éléments de pont (20, 30).

3. Palette (10) selon la revendication 2, **caractérisée en ce que** ledit élément de support (40) est raccordé auxdits éléments de pont (20, 30) avec un adhésif ou une fixation, et dans laquelle chaque élément de support (40), indépendamment, est un enroulement d'environ 6 desdites feuilles ondulées ou moins.

4. Palette (10) selon l'une quelconque des revendications 2 ou 3, **caractérisée en ce que** lesdites feuilles ondulées desdits éléments de pont (20, 30) comprennent des feuilles ondulées à simple paroi, à double paroi ou à triple paroi.

5. Palette (10) selon l'une quelconque des revendications 2 à 4, **caractérisée en ce que** lesdites cannelures (26) d'élément de pont sont agencées dans une direction perpendiculaire à la plus longue longueur dudit élément de support (40).

6. Palette (10) selon l'une quelconque des revendications 2 à 5, **caractérisée en ce que** chaque élément de support (40), indépendamment, est un enroulement continu de 2 feuilles ondulées ou moins, et dans laquelle lesdites cannelures (26) desdits éléments de pont (20, 30) sont agencées perpendiculairement aux cannelures desdits éléments de support (40).

7. Palette (10) selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** lesdits éléments de support (40) sont formés à partir d'une seule feuille de papier ondulé.

8. Palette (10) selon l'une quelconque des revendications 1 à 7, **caractérisée en ce que** a) les longueurs dudit élément de pont supérieur (20) et dudit élément de pont inférieur (30) sont de l'ordre d'environ 30,48 cm à environ 127 cm (d'environ 12 à environ 50 pouces), et les largeurs sont de l'ordre d'environ 30,48 cm à environ 127 cm (d'environ 12 à environ 50 pouces), et dans laquelle lesdits éléments de support (40) ont une hauteur de l'ordre d'environ 7,62 cm à environ 15,24 cm (d'environ 3 à environ 6 pouces) ; ou b) dans laquelle ledit élément de pont inférieur (30) comprend une pluralité de trous de vérin (50) et dans laquelle chacun desdits éléments de support (40) comprend au moins deux découpes (44) qui s'étendent complètement à travers la largeur de l'élément de support (40) ; ou à la fois a) et b).

9. Procédé pour former une palette (10), comprenant les étapes consistant à :

former au moins deux éléments de support (40) ayant une hauteur, une largeur et une longueur prédéterminées ; et

raccorder un élément de pont supérieur (20) ayant une longueur et une largeur et un élément de pont inférieur (30) ayant une longueur et une largeur, auxdits éléments de support (40) avec lesdits éléments de support (40) qui sont disposés entre lesdits éléments de pont (20, 30), lesdits éléments de pont étant formés à partir de feuilles ondulées,

**caractérisé en ce que** lesdits au moins deux éléments de support (40) sont formés selon un enroulement solide à partir d'une seule feuille de papier ondulé en enroulant de manière continue un nombre prédéterminé de couches contiguës autour d'une couche centrale, de sorte que les couches adjacentes de l'élément de support comprenant ladite couche centrale sont fixées les unes aux autres, dans lequel lesdits éléments de support comprennent des parties d'extrémité de longueur incurvées, et dans lequel chaque longueur d'élément de support s'étend sensiblement sur la longueur desdits éléments de pont.

10. Procédé selon la revendication 9, **caractérisé en ce que** ledit papier ondulé de l'élément de support comprend une seule couche de papier ayant une couche de cannelures fixées à celle-ci, et dans lequel lesdites cannelures d'élément de support sont agencées dans une direction sensiblement verticale par rapport à au moins l'un desdits éléments de pont (20, 30), et dans lequel ledit élément de support (40) est raccordé auxdits éléments de pont (20, 30) avec un adhésif ou une fixation.

11. Procédé selon la revendication 10, **caractérisé en**

**ce que** lesdits éléments de pont (20, 30) comprennent une feuille ondulée à simple paroi, à double paroi ou à triple paroi, et dans lequel lesdites cannelures (26) d'élément de pont sont agencées dans une direction sensiblement perpendiculaire à la longueur dudit élément de support (40).

12. Procédé selon la revendication 11, **caractérisé en ce qu'**une pluralité de trous de vérin (50) est formée dans ledit élément de pont inférieur (30), et dans lequel chacun desdits éléments de support (40) comprend au moins deux découpes (44) qui s'étendent complètement à travers la largeur de l'élément de support (40).

13. Élément de support allongé (40), comprenant :

une ou plusieurs pièces de papier ondulé comprenant a) une couche de papier ayant une longueur, une largeur et une hauteur, et b) des cannelures raccordées à ladite couche de papier, lesdites cannelures étant agencées parallèlement à la hauteur du papier, **caractérisé en ce que** ledit élément de support (40) a une couche centrale allongée d'une longueur prédéterminée formée à partir dudit papier ondulé, ledit papier ondulé étant en outre enroulé dans le sens des aiguilles d'une montre ou dans le sens inverse des aiguilles d'une montre autour de ladite couche centrale en une ou plusieurs couches afin de former ledit élément de support (40) ayant un enroulement massif de couches contiguës, et une longueur, une hauteur et une largeur prédéterminées de sorte que les couches adjacentes des éléments de support comprenant ladite couche centrale sont fixées les unes aux autres le long de leur longueur, et dans lequel l'article de support a des parties d'extrémité de longueur incurvées.

14. Élément de support (40) selon la revendication 13, **caractérisé en ce que** ladite couche de papier est de l'ordre d'environ 0,11 à environ 0,44 kg/m<sup>2</sup> (d'environ 23 livres à environ 90 livres par millier de pieds carrés).

15. Élément de support (40) selon la revendication 13, **caractérisé en ce que** lesdites largeur, hauteur et longueur respectivement de l'élément de support sont de l'ordre d'environ 1,27 cm (0,5 pouce) par environ 5,08 cm (2 pouces) par environ 5,08 cm (2 pouces) à environ 20,32 cm (8 pouces) par environ 20,32 cm (8 pouces) par environ 127 cm (50 pouces).

16. Élément de support (40) selon la revendication 15, **caractérisé en ce que** lesdites largeur, hauteur et longueur respectivement de l'élément de support sont de l'ordre d'environ 2,54 cm (1 pouce) par en-

viron 5,08 cm (2 pouces) par environ 5,08 cm (2 pouces) à environ 15,24 cm (6 pouces) par environ 15,24 cm (6 pouces) par environ 127 cm (50 pouces).

17. Élément de support (40) selon la revendication 15, 5  
**caractérisé en ce qu'**une pièce de papier ondulé  
est utilisée pour construire ledit élément de support  
(40).

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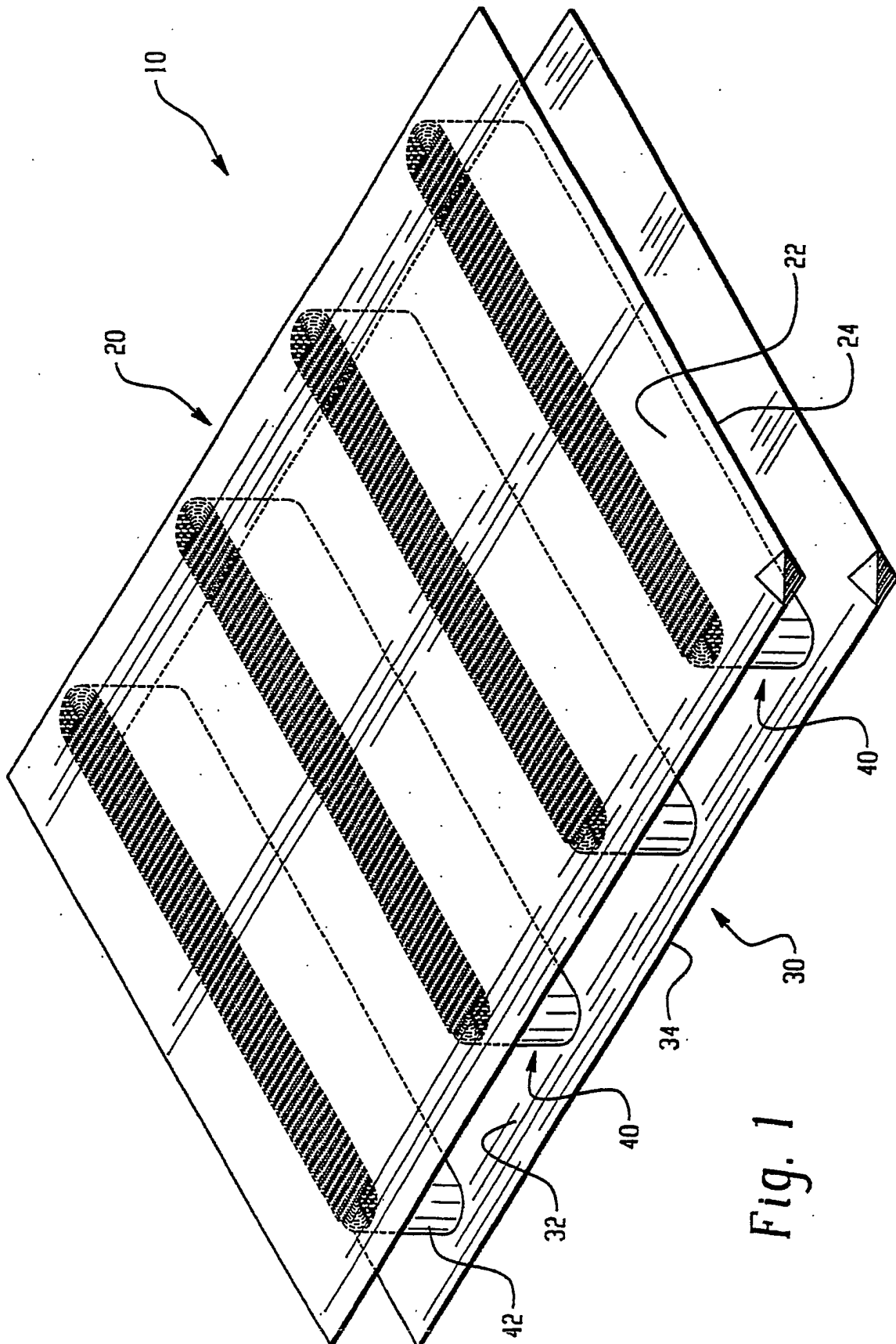


Fig. 1

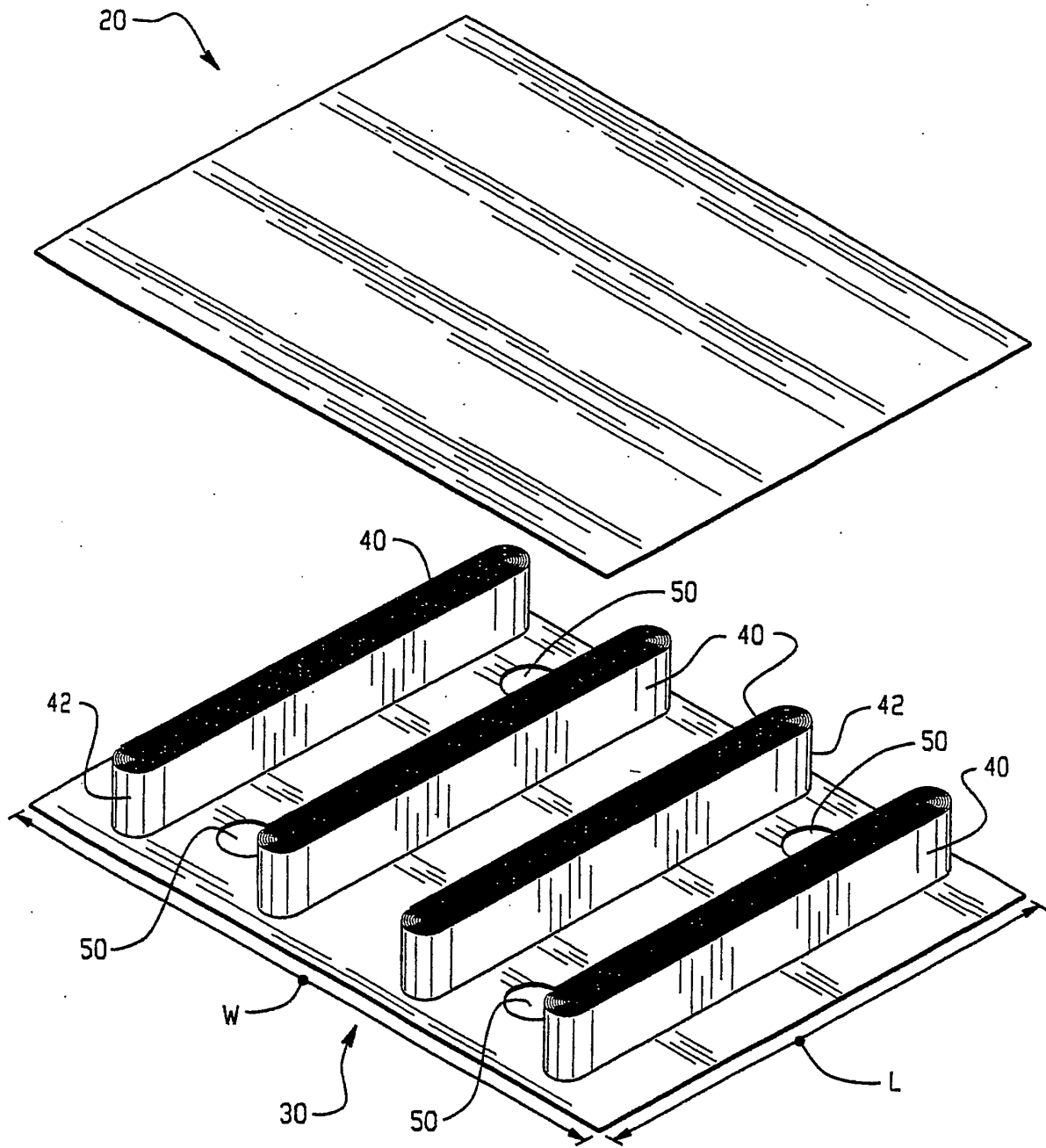
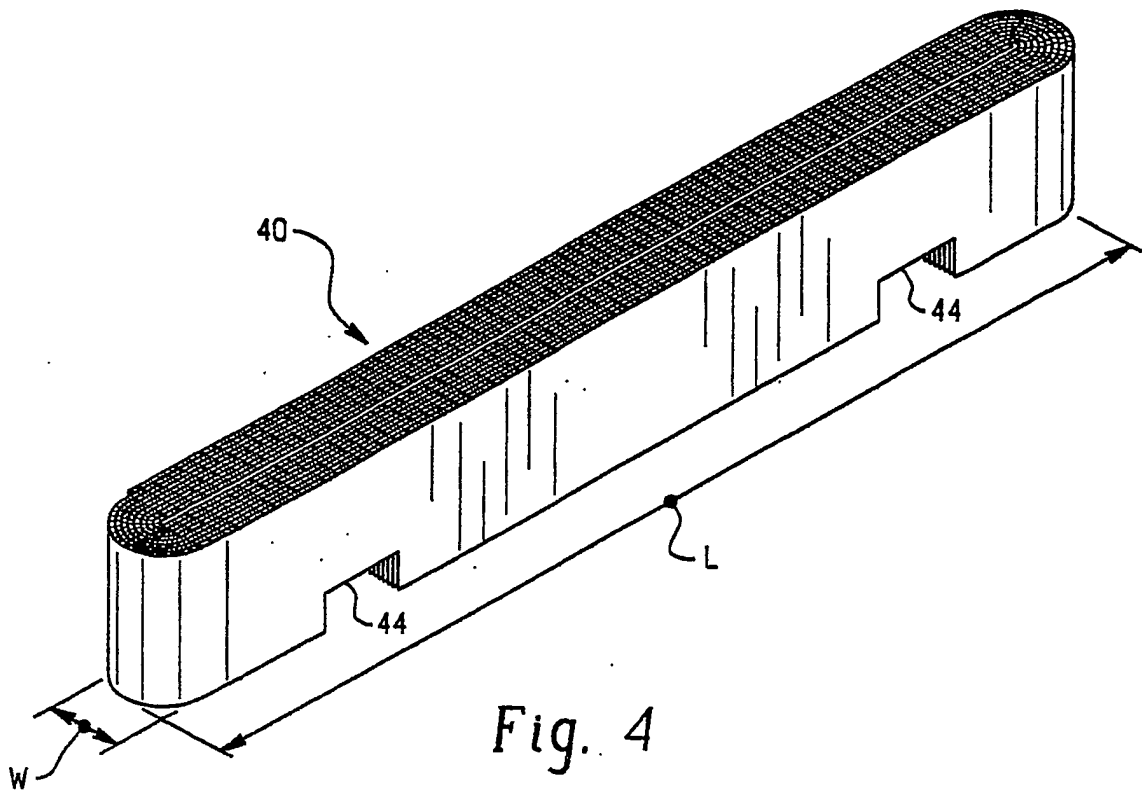
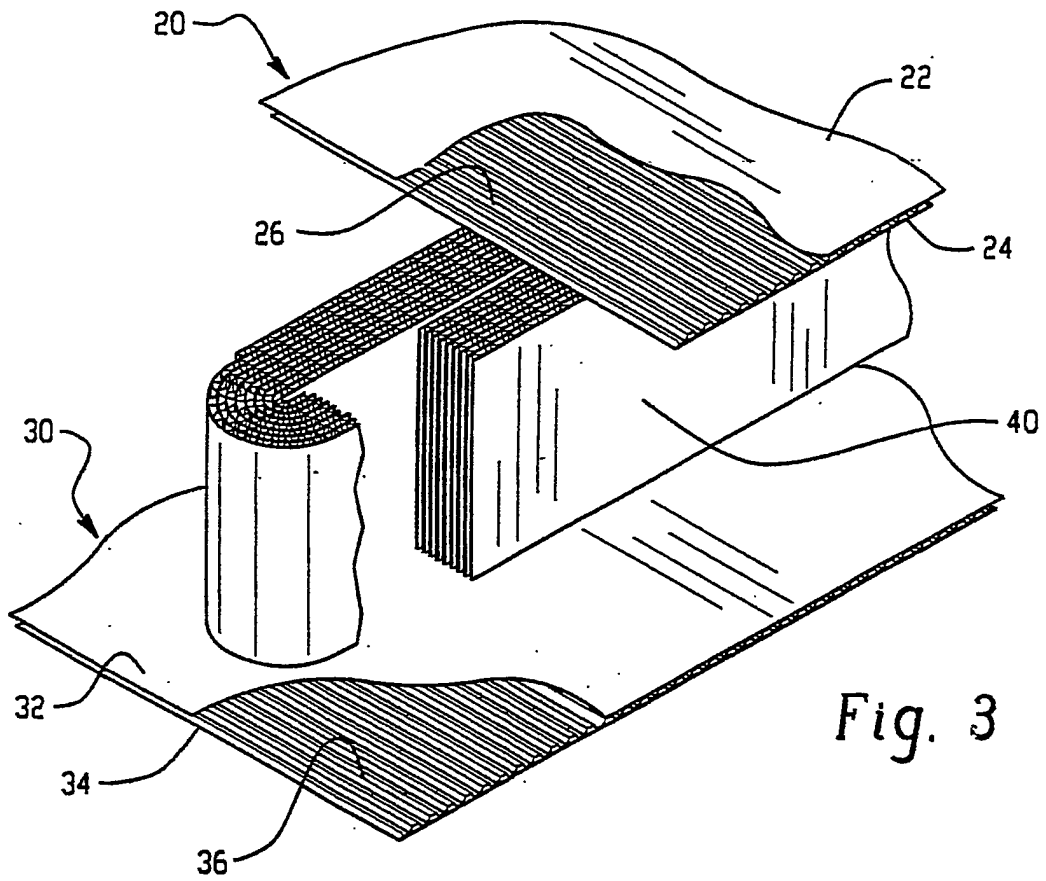


Fig. 2



**REFERENCES CITED IN THE DESCRIPTION**

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