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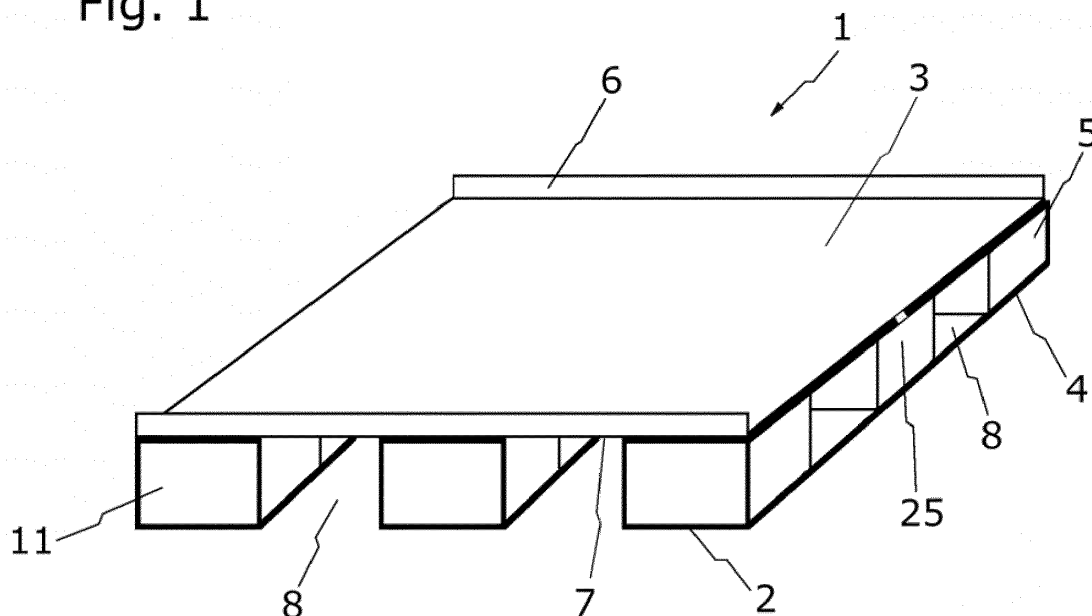
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(54) **PALLET COMPRISING COVER PLATE AND SUPPORT FEET AND METHOD FOR PRODUCING THE PALLET**

(57) The invention relates to a pallet (1, 20) for transporting products, consisting of at least two support feet (2) spaced apart from one another and a cover plate (3) arranged thereon. Each support foot (2) is formed from at least two, preferably three carrier element bodies (5), which are preferably square and spaced apart preferably

uniformly from one another and which are enclosed together by at least one layer of a first cardboard (4) in an arrangement direction F. The cover plate (3) is formed from a second cardboard (23), to the lower face (7) of which the support feet (2) are fixed.

Fig. 1



Description

[0001] The invention relates to a pallet for transporting products, to a cover plate and at least one support foot for the transport pallet, and to a method for producing the pallet.

[0002] Pallets, in particular transport pallets, which are used for transporting products are generally known. The pallets are usually transported in the warehouse or to the dispatch vehicle, along with the products to be transported, using fork-lift trucks, the forks of which drive into the pallets. In general, transport pallets of this type are made of wood. As well as reusable pallets, there are also single-use pallets.

[0003] Single-use pallets are not provided for repeated use, and so the problem of recycling arises at the destination. For this purpose, the pallets have to be tediously separated and the wooden parts and the connectors, which usually consist of metal, have to be disposed of separately. The wooden parts can be recycled to produce new pallets, but at present this is generally the exception.

[0004] It frequently occurs that the wood or equally the pallet is stolen for burning. In the case of reusable pallets, this results in a financial loss, since they are subject to a deposit and the marketer bears the deposit costs.

[0005] A general drawback of wooden pallets is a comparatively high weight; they are often oversized for the weight of the transport unit. Wooden pallets also have the further drawback that they can become infested with pests such as woodworm. This can sometimes lead to a ban on export. Wooden pallets are also comparatively expensive.

[0006] Therefore, in the prior art, various approaches are known for replacing wooden transport pallets with cardboard pallets.

[0007] For example, DE 201 03 902 U1 discloses a cardboard pallet consisting of cardboard or corrugated board. This pallet has feet which consist of a plurality of runners which extend parallel at a distance from one another and are formed integrally with the upper deck. These runners have a triangular or quadrilateral cross section. Finally, WO 95 25672 discloses a pallet system which consists of a flat upper deck provided with tubular runners. These runners are folded from a flat cardboard and provided, for reinforcement, with separate square reinforcement elements, which are formed for example from wound or honeycombed cardboard material.

[0008] By comparison with a wooden pallet, the cardboard pallet has several advantages. Thus, it is significantly lighter, making it easier to transport products and also reducing the transport costs. Usually, standard wooden pallets weigh approximately 20 to 30 kg, whereas a cardboard pallet only weighs around 1 to 3 kg. An additional advantage of cardboard pallets is that they can be recycled.

[0009] However, a drawback of a cardboard pallet formed from pure cardboard is that it is not very stable, and in particular high loads cannot be transported. The

compressive strength is also very low.

[0010] Transport means consisting of a material usable for insulation purposes, such as mineral wool, preferably rock wool, are also known in the art. Thus, DE 42 18 354 A1 discloses a transport unit consisting of overlapping insulating plates which are to be transported as a product, two support bodies provided on the underside of the product and consisting of material usable for insulation purposes, and a film winding. In the art, an advantage of the use of insulating materials as a support body or transport carrier is that the insulating materials can be incorporated at least in parts, for example in a flat roof construction, and can thus be used.

[0011] However, a drawback of DE 42 18 354 A1 is that the two support bodies provided on the lower face of the product block access by fork-lift truck arms from either the end faces or the longitudinal faces, causing the pallet disclosed in the art not to be accessible from all four sides. This is a fundamental disadvantage of this solution.

[0012] Starting from the prior art, an object of the invention is to provide a pallet for transporting products which is cheap in terms of manufacture, has as higher stability than a pallet consisting exclusively of cardboard, is lighter and cheaper than a wooden pallet, and is configured, using simple measures, in such a way that it is reusable and also recyclable without difficulty. In addition, the pallet is intended to have a high compressive strength, in particular being a four-way pallet into which a fork-lift truck can travel from all four sides. The pallets are also intended to be individually adaptable to the requirements of the load situation. A further object of the present invention is to provide a method for producing a pallet of this type which makes it possible to produce cost-effectively a reusable pallet which is recyclable without difficulty.

[0013] The above-mentioned object is achieved according to the invention by the features contained in the characterising parts of claim 1 and claims 8 to 9, expedient developments of the invention being characterised by the features contained in the dependent claims.

[0014] According to the invention, the pallet, in particular transport pallet, is formed from at least two, preferably three support feet, which are spaced apart preferably uniformly from one another, and a cover plate arranged thereon, each support foot being formed from at least two, preferably three carrier element bodies, which are spaced apart preferably uniformly from one another and which are jointly enclosed by at least one layer of a first cardboard. Alternatively, four or five support feet may be provided. The cover plate of the pallet is formed from a second cardboard, to the lower face of which the support feet are fixed. The fixing at the connecting points preferably takes place using an adhesive, so as to enable rapid, simple, and simultaneously reliable fixing of the carrier element body to the first cardboard layer and of the support feet to the cover plate. Each support foot is itself very stable, but also light, as a result of this config-

uration. As a whole, together with the cover plate, a higher compressive strength is achieved than with conventional pallets made exclusively of cardboard. Expediently, the carrier element bodies are square. Thus, an entry for fork-lift truck arms is formed between the preferably square carrier element bodies, which are arranged spaced apart, and simultaneously a lightweight configuration of the support feet is ensured. For support feet without an entry opening, in other words carrier elements which are formed continuous, side entry of fork-lift truck arms would not be possible, and the weight would be higher, increasing the weight of the pallet and making the pallet more expensive because of the higher use of material. Preferably, the pallet has three support feet or support runners and can be engaged with from four sides by fork-lift truck arms. Depending on the load, the number of support feet can be adapted in such a way that sufficient compressive strength and high stability of the pallet are provided for transport.

[0015] The carrier element bodies are enclosed peripherally by the at least one layer of the first cardboard, in a direction as determined by the arrangement of the carrier element bodies side by side (referred to as the arrangement direction). Thus, the carrier elements are not each enclosed individually.

[0016] The term "enclosed" does not mean that the carrier element bodies are "completely" enclosed together. Rather, after the first cardboard layer is folded around the carrier elements arranged side by side, which are described in greater detail below in relation to the production method and from which the carrier element bodies are cut out, a slight gap remains between the end faces of the folded first cardboard layer.

[0017] The support feet are formed by cutting the carrier elements, which are in the form of a plate and are enclosed by the first layer of cardboard, and which are described in greater detail below in relation to the production method. In this way, a plurality of support feet can be cut out from the plate or from the carrier elements, which are enclosed by only one layer of the first cardboard. Cost-effective production of the pallet with a low material requirement is thus possible. The distance remaining between the carrier element bodies after the pallet is cut out forms a subsequent entry opening for the fork-lift truck arms. This entry region is delimited above and below by the first cardboard layer and laterally by the associated carrier element body.

[0018] In a preferred embodiment of the invention, the carrier element body may be completely enclosed. Only upon complete enclosure in the arrangement direction is the gap closed to form a seam. This may be done using a material connection, for example an adhesive. This may for example be applied directly to the end edges of the cardboard, shortly before the fold is completely finished. This contributes to further stabilising the support foot or support runner construction and thus the pallet. Preferably, this seam extends in the longitudinal direction of the or a centrally positioned carrier element. Complete

enclosure with overlapping of the cardboard is possible but is less preferred.

[0019] Expediently, the carrier element bodies are formed from a pressure-resistant material having a compressive strength of at least 10 kPa, preferably at least 15 kPa, particularly preferably at least 30 kPa. Preferably, mineral wool, expanded polystyrene (EPS) or extruded polystyrene (XPS) is used as the pressure-resistant material. Preferably, the carrier element body and the carrier element are formed from mineral wool as a whole. Expediently, a binder for structurally stabilising the mineral wool, in particular the rock or glass wool, can be received therein to form a rigid carrier element or body of bonded mineral wool.

[0020] An advantage of the use of mineral wool is that it can also be taken from cost-effective remnants from the manufacturing factory. Even non-reusable residues from the building site, for example from façade insulation plates or other mineral wool insulating elements, may be used, as well as insulating materials of biodegradable mineral wool which are removed from an old roof for renovation. Thus, the carrier element bodies and the carrier elements can be produced in a cost-effective and environmentally friendly manner, and this is an advantage over conventional transport pallets. The pallet can also be disposed of in a simple manner at the building site, since containers or receptacles for mineral wool waste and cardboard packaging waste are generally set up on the building site. Disposal is thus also faster, and the pallet can readily be broken down on site.

[0021] If only the cover plate is damaged, the support feet or support runners can be transported back to the pallet manufacturer and subsequently reused for building a partially recycled pallet. Because of weathering conditions, it may be that the cardboard of the support feet or support runners is also not reusable. In this case, advantageously, it is possible for only the mineral wool shaped bodies or the carrier element bodies to be transported back to the manufacturing factory and partially recycled to produce a new pallet.

[0022] A further embodiment of the pallet provides that the raw density of the mineral wool in the carrier element body or carrier element formed from mineral wool is greater than 60 kg/m³. For the practical implementation of the pallet, it is advantageous to work with a raw density in the range of 80 to 150 kg/m³, preferably 100 to 130 kg/m³, in particular rock wool.

[0023] The carrier element bodies according to the invention expediently have a length of between 30 mm and 400 mm, preferably between 50 and 200 mm, preferably 100 mm. The height of the carrier element body expediently comes to between 30 and 250 mm, preferably between 100 and 150 mm. The width is expediently between 30 and 500 mm, preferably between 100 and 250 mm, particularly preferably between 150 and 200 mm. Advantageously, the length and width, in other words the base area of the carrier element body, are defined in accordance with the relevant load situation, in other

words the product load. The height is generally based on the provisions for container heights for storage in stacks, and in particular on the dimensions during transport, predominantly on the loading heights of lorries.

[0024] The binder content in the mineral wool in the carrier element body or carrier element formed from mineral wool, preferably rock wool, is in the range of 2 to 10 % by weight, preferably in a range of 4 to 7 % by weight, based on the fibre mass of the carrier element body or carrier element formed entirely from mineral wool, in particular rock wool. All conventional preferably organic binders are possible as a binder. Because of the low organic binder content by comparison with a wooden pallet, the fire load is thus reduced by a factor of approximately 10, and so in case of fire the pallet does not act as a fire accelerant, but actually even has a high temperature resistance.

[0025] A further feature of the invention provides that the carrier element body and the carrier element are formed from mineral wool lamellae. These have a very high compressive strength, which is expediently at least 10 kPa, preferably at least 15 kPa, particularly preferably at least 30 kPa. Thus, the lamellae of the carrier element body ensure high load relief in the support foot. Alternatively, a laminar formation of the mineral wool is possible. However, for the same compressive strength as the mineral wool lamella, the bulk density of the laminar mineral wool is higher, approximately in a range of at least 120 kg/m³. Meanwhile, the mineral wool lamellae are assumed to have a bulk density of at least 60 kg/m³.

[0026] Preferably, the carrier elements have a length of between 800 mm and 1800 mm, preferably 1200 mm, but are freely adjustable in width and height. The width of the carrier elements is preferably in accordance with the load situation. The height is in accordance with the height requirements, expediently not exceeding a height of 200 mm. The height may be between 30 mm and 200 mm and the width between 50 mm and 500 mm, preferably between 100 mm and 250 mm, particularly preferably between 150 mm and 200 mm.

[0027] Both the layer for the first cardboard and the layer for the second cardboard are preferably formed from a double-wall corrugated cardboard. By comparison with single-wall material, double-wall material advantageously has a higher strength and flexural rigidity. Gluing two single-wall material layers is relatively complex. In a preferred configuration, the corrugations of the first cardboard are orthogonal to the corrugations of the second cardboard, meaning that the waves of the first cardboard enclosing the carrier elements are at a 90° angle to the corrugations of the double-wall second cardboard forming the cover plate. By way of the arrangement of the corrugations of the first cardboard orthogonal to the corrugations of the second cardboard, the flexural rigidity can be increased. This has the advantage that if products are only arranged loosely on the pallet and the fork setting is also too narrow, the pallet cannot sag in the edge region.

[0028] To protect the support feet, in other words in particular the first cardboard layer, which generally comes into contact with the fork-lift truck arms and with the floor, but also the second cardboard layer which forms the cover plate, a specific embodiment of the invention provides that both the first and preferably the second cardboard layer have a water-repellent coating. This is applied at least in part on the outer faces, in other words on the outer faces which come into contact with moisture or dirt. This is expediently the pallet base, in other words the outer faces, positioned on the ground, of the support feet, and preferably the outer face of the side wall of the first cardboard layer. Preferably, the cardboard layers, at least on the outward faces thereof in the finished state of the pallet, are completely coated with the water-repellent coating. The water-repellent coating may be a sizing agent or polyethylene coating, or else a lamination, such as a film lamination. Direct sizing of the cardboard greatly reduces the subsequent water uptake of the cardboard, in such a way that it can be used even in unfavourable weathering conditions. As a result of coating with polyethylene plastics material (PE), the cardboard acquires high protection against external moisture. The cardboard may be coated on one or both sides. In the case of film lamination, a finish of the cardboard is provided, and optically conditions it externally but also provides reliable protection against dirt, dust and moisture. Films of various types are conceivable, in particular scratch-resistant, water-repellent, gloss, matt, semi-matt, metallised, embossed and/or printable films. Coatings are particularly preferred which can be removed easily when the cardboard materials are recycled and which enable high-quality recycling of the cardboard.

[0029] Overall, coating of this type prevents both absorption of moisture into the pallet and transmission of the moisture via the pallet to the carrier element bodies, for example if the pallet is placed in a high-humidity region at the building site. In addition, coating of this type also contributes to a longer service life of the pallet, meaning that it can be reused in multiple passes.

[0030] A further feature of the invention provides that the cover plate has an upwards-projecting side wall at at least one and preferably both of the side edges orthogonal to the support feet.

[0031] To achieve the above-mentioned object, the invention additionally provides providing a support foot for the pallet according to the invention. The cover plate and the support foot are interrelated, since the support foot is produced as an individual product and can be placed on the market as such along with a corresponding cover plate, in such a way that the pallet is placed on the market in the smallest possible packaging unit and the purchaser can ultimately assemble his pallet himself in a small number of steps. The support foot of the invention is distinguished in that it is formed from at least two, preferably three square carrier element bodies, which are arranged spaced apart, expediently uniformly, from one another, the two or more carrier element bodies together, and thus

not individually, being enclosed peripherally by at least one layer of a first cardboard in a direction corresponding to the direction of the sequence in which the carrier element bodies are arranged side by side. Expediently, the support foot is cut out from a plate which has four planar faces closed on themselves and which is formed from carrier elements, which are enclosed together with the first cardboard layer. The four planar faces result from the two side walls, the folded flap edge or edges which form an upper face of the pallet, and the lower face of the first cardboard layer, the two remaining side regions of the plate being formed partially open and not having any cardboard. In addition, the invention is distinguished by a simple production method, in which at least two support feet are formed and fixed on a layer of a second cardboard. The support feet are produced in a method step A) from at least two spaced-apart carrier element bodies, which are enclosed peripherally together with the spaced-apart arrangement thereof, and thus not individually, by a first layer of cardboard, and expediently fixed thereto using an adhesive. This method step A) is followed by fixing the support feet to the second cardboard layer, which forms the cover plate, in method step B).

[0032] The first method step A), in other words producing the support feet, takes place in a small number of simple steps. At least two, preferably three carrier elements are produced from pressure-resistant material, preferably mineral wool, expanded polystyrene (EPS) or extruded polystyrene (XPS). This step is cost-effective if defective batches or residues from the production of conventional commercial insulating materials can be diverted, without major expense, and cut out into the shape of the carrier elements. This optional reuse of remnants results in extremely cost-effective production of carrier elements. Alternatively, of course, newly produced carrier elements may also be used. After the carrier elements are formed, they are placed on a first cardboard layer, the two end-face end regions of which each have two fold lines arranged at a distance A from one another, of which the outer fold line in each case extends parallel to the end-face edge of the cardboard at a distance B1 or B2 respectively. The inner fold lines define a lower face, the fold lines spaced apart at a distance A each define two side walls, and the fold lines spaced apart from the end face by a distance B1 or B2 define one or two upper flap walls or flap edges. The carrier elements are subsequently arranged on the region of the first cardboard layer which defines the lower face, with an extension C, specifically expediently at a preferably uniform distance D from one another. In the longitudinal direction thereof, the carrier elements are orientated parallel to the end face of the first cardboard layer, and subsequently fixed to the first cardboard layer, preferably using an adhesive. The fold lines are subsequently folded, while simultaneously fixing the carrier elements, likewise preferably using adhesive, to the inner faces of the first cardboard layer which are correspondingly positioned against the carrier elements, in such a way that the carrier elements

are enclosed peripherally by the first cardboard layer, in the direction of the arrangement thereof side by side, and fixed to the first cardboard layer. For fold lines which are formed from a preformed notch, and in the case of two flap walls, only one fold movement on each of two sides is required, since the preformed flap edges automatically come into the right-angled folded position thereof during the folding movement, meaning that the folding can take place in a rapid and simple manner.

[0033] It should be noted that it is also possible for B1 to be 0 and for B2 to be equal to C. In this case, there is only one upper flap wall, which corresponds to the dimension C of the lower face. In this particular embodiment, it is an advantage that a folding step is omitted, since merely the flap wall B2 has to be folded. The end-face edge of the flap wall defined by the extension B2 can be positioned directly on the end-face edge of the adjacent side wall after folding. Expediently, the distances B1 and B2 are each between 250 mm and 500 mm, preferably 400 mm. However, if B1 is 0, B2 may also be between 500 mm and 1000 mm, preferably 800 mm. The distance C is preferably in the range of between 500 and 1000 mm, particularly preferably being 800 mm.

[0034] If B1 is zero, the first cardboard merely has three fold lines. This is preferably the case if exactly two carrier elements are used for producing the support feet.

[0035] After being enclosed, the carrier elements are cut out in strips extending orthogonal to the longitudinal direction of the carrier elements, expediently in a saw with a stop. Using each cut-out, a support foot made of carrier element bodies enclosed in cardboard is formed. The width of a support foot formed in this manner corresponds to the length of the portion of the plurality of carrier elements, and may preferably be between 50 and 400 mm.

[0036] In a further method step B), a second cardboard layer is provided, which preferably has a fold line at at least one first edge, and preferably also at a second edge opposite this first edge. Each of the fold lines extends parallel to this edge at a distance E and defines a cover plate and at least one upwards-projecting side wall. The at least two support feet formed in method step A) are subsequently arranged on the lower face of the cover plate. Expediently, the support feet are fixed orthogonal to this at least one upwards-projecting side wall, so as significantly to improve the flexural rigidity of the pallets, for which reason this arrangement is preferred.

[0037] The support feet are arranged on the lower face of the cover plate at an expediently uniform distance of between 100 and 800 mm, preferably of between 300 and 600 mm. Thus, the fork of the fork-lift truck can travel in between the support feet and transport the pallet. A distance is also provided between the carrier element bodies within a support foot, in such a way that there is a four-way pallet as a whole.

[0038] For simple mounting of the support feet on the cover plate, it is advantageous according to the invention for the fixing both of the carrier elements to the inner face,

positioned on the carrier elements, of the first cardboard layer and expediently also of the support feet to the lower face of the cover plate to take place by gluing. Polyurethane, hot-melt or acrylate adhesives are conceivable as adhesive, polyurethane-based adhesives being preferred. Unlike acrylate adhesives, these are non-water-soluble. If an acrylate adhesive is used, water-resistant formulations are preferred.

[0039] As a result of the mutually adapted dimensioning of the cover plate and support feet, taking into account the corrugation orientation of the first and second cardboard, mutually orthogonal orientation of the corrugations of the first and second cardboard is almost always automatically ensured. Only in the special case of a square base area of the cover plate, without a fold or folds, is it preferred to provide the mutually orthogonal orientation of the corrugations before fixing the support feet to the cover plate.

[0040] The carrier elements are produced or provided with a length of between 800 and 1800 mm, preferably with a length of 1200 mm. The height thereof corresponds to the height of the carrier element bodies in the range of between 30 mm and 250 mm, preferably between 100 and 150 mm. The width of the carrier elements is between 30 and 500 mm, preferably between 100 and 250 mm, and is particularly preferably between 150 and 200 mm. If the carrier elements are formed from mineral wool, the bulk density is greater than 60 kg/m³ and is in particular in the range of 80 to 150 kg/m³, preferably 100 to 130 kg/m³. The binder content in the mineral wool in the carrier element formed from mineral wool, preferably rock wool, is in the range of 2 to 10 percent by weight, the binder preferably being an organic binder.

[0041] The advantage of the production method is that it leads to a wood-replacement pallet in a rapid, cost-effective and very simple manner, while also preserving the properties, such as flexural rigidity, compressive strength and stability for transporting even heavy loads. Also, reusable materials can be used in the production method, and can also in turn be recycled themselves. In addition, as a result of the small number of method steps, power can be saved in the production of the pallets. The ever increasing requirements on environmental friendliness can be met in this case, and in particular objectives such as CO₂ neutrality can be achieved.

[0042] Expedient embodiments of the invention are described in greater detail in the following with reference to schematic drawings, in which:

Fig. 1 is a perspective view of a first embodiment of a transport pallet according to the invention;

Fig. 2a is a plan view of a first cardboard layer of the pallet according to Fig. 1;

Fig. 2b is a perspective oblique view of three carrier elements, which are shown in the cut-out as carrier element bodies, both in the first embodiment and in

the second embodiment shown in Fig. 6;

Fig. 2c is a plan view of the first cardboard layer of Fig. 2a along with the three carrier elements, as shown in Fig. 2b, arranged thereon;

Fig. 3 is a perspective oblique view of three carrier elements enclosed in the layer of the first cardboard, the flap edges of the first cardboard being shown in an almost completely folded-in position;

Fig. 4a is an oblique view of the carrier elements enclosed in the first layer of cardboard, the flap edges of the first cardboard layer being completely folded together and the first cardboard layer having nine cut lines in total;

Fig. 4b shows a support foot of the transport pallet according to the invention;

Fig. 5 is a plan view of a layer of a second cardboard comprising two fold lines, extending on the longitudinal faces, close to the associated longitudinal edges;

Fig. 6 shows a pallet in accordance with a second embodiment of the invention.

[0043] Elements having like construction or functionality are here labelled with like reference signs throughout the drawings.

[0044] Fig. 1 shows a pallet 1 for transporting products, which is constructed from a cover plate 3 and three support feet 2 arranged on the lower face 7 of the cover plate 3. Each support foot 2 is formed from three carrier element bodies 5, which are arranged at a uniform distance from one another. The carrier element bodies are enclosed, peripherally but not completely, in the direction of the arrangement thereof side by side (arrangement direction F as shown in Fig. 2b, 2c and 4b), by a layer of a first cardboard 4 in the longitudinal direction L thereof. A small gap 25 is visible. The first cardboard layer 4 is shown in thick lines in Fig. 1. Each support foot 2 is cut out from a plate 17 comprising at least two, in this case three carrier elements 14, which are enclosed by a layer of a first cardboard 4, as shown in Fig. 4a, and thus forms a cut shaped body. The cut shaped body has good strength properties.

[0045] The carrier element bodies 5 are formed square. The cover plate 3 has, on the two longitudinal faces thereof, a narrow side wall folded vertically upwards or an upwards-projecting fold 6. The distance between the carrier element bodies 5 of the support foot 2 arranged on the lower face 7 of the cover plate 3 and the distance between the support feet functionally correspond to openings 8 in the support foot 2 for the entry of fork-lift truck arms. Thus, a four-way pallet is provided into which it is possible to travel from all four sides. This

ensures high flexibility when the pallet 1 is transported in the warehouse. Thus, in the event of an outwardly protruding load at for example two transverse faces of the pallet 1, the arms can readily travel into the openings 8 in the longitudinal face of the pallet 1 and the pallet 1 can be transported to and from the destination using the fork-lift truck. The carrier element bodies 5 shown in Fig. 1 of the support feet 2 are made of mineral wool, which in the example scenario has a compressive strength of 30 kPa. The support feet 2 themselves are cut from a plate 17, as shown in Fig. 4a, in the form of longitudinal strips. A carrier element body 5 is accordingly a portion of a carrier element 14 shown in Fig. 2b.

[0046] A plan view of the first cardboard layer 4 is shown in Fig. 2 a. The visible face forms an inner face 19, which lies against the carrier elements 14 (not shown here) after the carrier elements 14 are enclosed. In total, four fold lines 9 are shown (dashed) at which the cardboard is folded. These may be a preformed sequence of notches, cuts or pressure points, in such a way that they are easily recognisable and simple to fold. At the two end-face end regions of the first cardboard layer 4, two of the four fold lines 9 are shown in each case, which are arranged at a small distance (distance A) from one another. The region between these two fold lines 9 in each case defines a side wall 11 of the plate 17 shown in Fig. 4a and of the pallet support feet 2 shown in Fig. 1, Fig. 1 only showing a portion of the side wall 11 in accordance with the strip cut-out which is explained in detail with reference to Fig. 4a. The distance A preferably corresponds to the height of the carrier element 14 plus an excess for the flap edge formation, which depends on the thickness of the selected cardboard and is of an order of magnitude of approximately 2 to 10 mm, the height of the carrier element 14 being 100 mm in the embodiment shown. In the case of an embodiment as portrayed in the following (Fig. 2b, Fig. 2c), having three carrier elements 14, in each case the fold line 9 closest to the end-face edge 15 and shown in Fig. 2a is arranged at a distance B1 or B2 respectively from the end-face edge 15 of the cardboard 4 and extends parallel thereto, and the cardboard layer 4 has a symmetrical construction as a whole. The region between the end face 15 and this fold line 9 closest to the end-face edge defines a flap edge or a flap wall 12 of the first cardboard layer 4. In the first embodiment, shown in Fig. 2a to 4a, there are two flap walls, which are labelled with the distances B1 and B2 in Fig. 2a. In this first embodiment, the distances B1 and B2 are each 400 mm. The internal fold lines 16 are in turn spaced apart from one another by a distance C, and, together with the portion positioned between them of the longitudinal face 10 of the first cardboard layer 4, define a lower face 13. The distance C is 800 mm here. This results in the equation $B1 + B2 = C$, which in this case brings about the symmetrical construction of the first cardboard layer 4 because B1 is equal to B2.

[0047] Fig. 2b shows three individuable carrier elements 14 over the entire length thereof, which here purely

by way of example is 1000 mm. The further dimensions of the carrier elements shown here include a height of 100 mm and a width of 100 mm. In this context, the width of the first layer of the first cardboard 4, which encloses the carrier elements 14 as shown in Fig. 4a, preferably corresponds to the aforementioned longitudinal region of 1000 mm. The dimensions are mentioned here purely by way of example. The cut-out carrier element bodies 5 are subsequently formed from the carrier elements 14. They are preferably formed from mineral wool, which expediently has a binder content in the range of between 2 and 10 % by weight. Fig. 2b also shows the arrangement direction F, which extends orthogonal to the longitudinal axis of the carrier elements 14. As a result of the carrier elements 14 being enclosed in this arrangement direction F, the gap between the carrier elements 14 arranged at a distance is delimited above and below by the first cardboard layer, but not the front and rear side region from the viewing perspective of Fig. 3 or 4a, resulting in an opening 8 remaining between the carrier elements enclosed in the first cardboard layer 4, as shown in Fig. 3.

[0048] A plan view of the first cardboard layer 4 is again visible in Fig. 2c, but this time the three carrier elements 14 shown in Fig. 2b (here hatched diagonally) are arranged parallel to the end face of the first cardboard layer 4 and in the region of the lower face 13 defined by the distance C. In the embodiment shown, two of the carrier elements 14 border on the associated internal fold lines 16, the third carrier element 14 being located at the centre thereof. Between the carrier elements 14, there is a distance D in each case, which can be varied flexibly, but is preferably uniform and corresponds to the arrangement of the carrier element bodies 5 with respect to one another in the support foot 2. The carrier elements 14 need not necessarily border on the internal fold lines 16, but may also be arranged somewhat spaced apart therefrom. For high stability of the pallet 1, however, it is expedient, as shown in Fig. 2c, to orientate the two outer carrier elements 14 along the associated internal fold lines 16 in the region of the lower face 13. The inner face 19 of the side wall 11 of the cardboard 4 can thus be positioned against the outer side wall of the associated outer carrier element 14, and secure enclosure of the carrier elements 14 and ultimately high stability of the support feet 2 can thus be ensured. The three carrier elements 14 are expediently formed from mineral wool cross-linked with binder.

[0049] For a central arrangement of the middle carrier element in accordance with Fig. 2c, the symmetrical construction of the cardboard layer 4 of Fig. 2a causes the gap between the end-face edges 15 of the first cardboard layer to be arranged on the upper face of the central carrier element. The gap may be formed closed as a seam, expediently adhesives being used and the two seam regions being glued to the carrier element there. This arrangement increases the stability of the support foot.

[0050] Fig. 3 shows a plate 17 which is almost fully

formed from the carrier elements 14 and the first, now folded cardboard layer 4. The two upper flap edges 12 are not yet laid completely flat, in other words are not yet positioned on the centrally placed carrier element 14, meaning that the plate 17 is not yet completely formed. This only happens when the flap edges 12 are positioned on the central carrier element 14. The first cardboard layer 4 is only shown in part, in thick lines.

[0051] Whilst the openings 8 formed by the distance between the carrier elements 14 are expediently not enclosed by the cardboard layer 4, and nor are the end faces 18 of the carrier element 14, the side walls, facing the side wall 11 of the first cardboard layer 4, of the two outer carrier elements 14, as well as the upper and lower faces of all three carrier elements 14, are preferably glued to the inner face 19 positioned thereon of the first cardboard layer 4, preferably using an adhesive. This adhesive may be a polyurethane, hot-melt or acrylate adhesive. The gluing ensures a stable bonding of the plate 17 thus formed, in particular for holding the carrier elements 14 securely within the cardboard enclosure. The first cardboard layer 4 shown here is formed from a double-wall corrugated cardboard, it being possible for the longitudinal extension of the corrugations to point in the longitudinal direction of the carrier elements 14, but also in the transverse direction thereof. This depends on the relevant field of use of the support feet 2 cut out from the plate 17.

[0052] A first cardboard layer 4 in the fully folded state is shown in Fig. 4a. The three spaced-apart carrier elements 14 are enclosed peripherally in the longitudinal direction L, starting from the as yet unfolded first cardboard layer 4 as shown in Fig. 2a or in the arrangement direction F thereof as shown in Fig. 2c. This results in a plate 17 having four planar, preferably closed surfaces, namely having a lower face of the first cardboard layer, an upper face thereof consisting of the two folded-together flap edges, and two side walls. The two remaining front and rear side regions from the viewing perspective of Fig. 4a are formed partially open and do not have any cardboard. By comparison with cardboard pallets having a U-shaped support foot formation by way of the pallet cover plate itself, this pallet 1 has the advantage that because of the simple formation of a plate 17 having four planar surfaces the support feet 2 can be cut out very easily. There is no snagging on edges of bulges with the sawing or cutting tool, such as when cutting out at for example U-shaped bulges of a cardboard, meaning that the support feet according to the invention can be cut out in a swift and simple manner. It should be noted that the carrier elements 14 are orientated orthogonal to the longitudinal direction L of the first cardboard layer in the as yet unfolded state. Cut lines 24 are indicated transverse to the longitudinal direction of the carrier elements 14 on the first cardboard layer. The number thereof and the distance thereof from one another can be selected as desired. In the embodiment shown here, nine cut lines 24 are shown purely by way of example. Thus, in this

case ten support feet 2 can be cut out from the plate 17. The spacing of the individual cut lines 24 which extend mutually parallel may be between 50 and 400 mm and is 100 mm in the first embodiment. In the case of a plate 17 having dimensions of for example 1200 mm × 800 mm × 144 mm (length, width, height), there may be a total of twelve cut-outs in the form of strips which form the support feet 2. The cut lines 24 are preferably formed dashed as a coloured marking, notches or a slit in the cardboard. This makes it easier to form the support feet 2, since the strip-formed cutting-out can take place without taking measurements again.

[0053] Fig. 4b shows a strip or cut-out which has been cut from the plate 17 shown in Fig. 4a and which forms a support foot 2. Three cut carrier element bodies 5 consisting of mineral wool, preferably cross-linked using binder, are shown, and are enclosed together, and thus not individually, and completely by a first cardboard layer 4. The openings 8 for the entry of the fork-lift truck arms are flanked laterally by the carrier element bodies 5 and above and below by the first cardboard layer 4.

[0054] In Fig. 5, the cover plate 3 is shown with, in each case, a fold line (dashed) which extends parallel to the longitudinal edge 22 and which is spaced apart therefrom at a distance E. Thus, a layer of a second cardboard 23 is shown, the lower face 7 of which can be fixed to the upper face of the support feet 2. Preferably, adhesives are used, in particular polyurethane, hot-melt or acrylate adhesives, and expediently are applied exclusively to the connection surfaces. The fold line may be shown marked in colour on the cardboard. Expediently, the second cardboard layer or cover plate 3 is arranged on the support feet 2 in such a way that the corrugation extension of the second cardboard layer is orthogonal to the corrugation extension of the first cardboard layer 4.

[0055] Fig. 6 shows a pallet 20 in accordance with a second embodiment of the present invention. In total, four support feet 2 are arranged orthogonal to the longitudinal direction of the cover plate 3, the support feet 2 which are external or positioned at the end faces of the cover plate 3 ending flush with the end-face edge 21 of the cover plate 3. This is not compulsory. Alternatively, the outer support feet 2 may be somewhat indented. Expediently, the support feet 2 are fixed to the lower face 7 of the cover plate 3 at a uniform distance from one another.

List of reference signs

[0056]

1	Pallet
2	Support foot or support runner
3	Cover plate
4	Layer of a first cardboard
5	Carrier element body
6	Side wall of cover plate
7	Lower face of cover plate

8	Openings	
9	Fold line	
10	Longitudinal faces of first cardboard layer	
11	Side wall of first cardboard layer	
12	Flap edge of first cardboard layer	5
13	Lower face of first cardboard layer	
14	Carrier elements	
15	End-face edge of first cardboard layer	
16	Internal fold lines	
17	Plate consisting of cardboard-enclosed carrier elements	10
18	End face of carrier element	
19	Inner face of first cardboard layer	
20	Pallet in accordance with a second embodiment	15
21	End-face edge of second cardboard layer	
22	Longitudinal edge of second cardboard layer	
23	Second cardboard	
24	Cut lines	
25	Gap	20
A	Distance between fold lines 9 delimiting side wall 11	
B1, B2	Distance between fold line 9 closest to end face and end-face edge 15	
C	Distance between internal fold lines 16	25
D	Distance between adjacent carrier elements 14	
E	Distance of fold line 9 from longitudinal edge 22	
F	Arrangement direction	30
L	Longitudinal direction of first cardboard layer	

Claims

1. Pallet (1, 20) for transporting products, consisting of at least two support feet (2) spaced apart from one another and a cover plate (3) arranged thereon, **characterised in that** each support foot (2) is formed from at least two, preferably three carrier element bodies (5), which are preferably square and spaced apart preferably uniformly from one another and which are enclosed together by at least one layer of a first cardboard (4) in an arrangement direction F, and the cover plate (3) is formed from a second cardboard (23), to the lower face (7) of which the support feet (2) are fixed, preferably using binder.
2. Pallet (1, 20) according to claim 1, **characterised in that** the at least one layer of the first cardboard (4) completely peripherally encloses the carrier element bodies (5) in an arrangement direction F.
3. Pallet (1, 20) according to either claim 1 or claim 2 **characterised in that** the carrier element bodies (5) are formed from a

pressure-resistant material having a compressive strength of at least 10 kPa, preferably at least 15 kPa, particularly preferably at least 30 kPa, in particular from mineral wool, expanded polystyrene (EPS) or extruded polystyrene (XPS).

4. Pallet (1, 20) according to claim 3, **characterised in that** the bulk density of the mineral wool in the carrier element bodies (5) formed from mineral wool is greater than 60 kg/m³, in particular in a range of 80 to 150 kg/m³, preferably 100 to 130 kg/m³, and/or the binder content of the mineral wool is in a range of 2 to 10 % by weight, preferably 4 to 7 % by weight.
5. Pallet (1, 20) according to any of the preceding claims **characterised in that** the first and preferably also the second cardboard (4, 23) are formed from a preferably double-wall corrugated cardboard, and **in that** the corrugations of the first cardboard (4) are preferably arranged orthogonal to the corrugations of the second cardboard (23).
6. Pallet (1, 20) according to any of the preceding claims **characterised in that** the first cardboard (4) and preferably also the second cardboard (23) have a water-repellent coating, preferably a sizing or polyethylene coating and/or a lamination, preferably a film lamination, for protection from moisture, wetness, scratches, dust and/or dirt.
7. Pallet (1, 20) according to any of the preceding claims **characterised in that** the cover plate (3) has an upwards-projecting side wall (6) at at least one and preferably both of the side edges orthogonal to the support feet.
8. Support foot (2) for a pallet (1, 20) according to any of claims 1 to 7, **characterised in that** it is formed from at least two, preferably three carrier element bodies (5), which are preferably square and are spaced apart from one another, and which are peripherally enclosed together in the arrangement direction F thereof, preferably completely, by at least one layer of a first cardboard (4), preferably as a cut-out support foot from a plate (17).
9. Method for producing a pallet (1, 20) comprising at least two support feet (2) and a cover plate (3) for transporting and storing products, the method comprising the following method steps:

A) producing at least two, preferably three sup-

port feet (2), each formed from at least two, preferably three carrier elements (5), which are spaced apart from one another and which are peripherally enclosed together side by side in the arrangement direction F thereof by a first layer of cardboard (4) and fixed thereto;

B) arranging and fixing the support feet (2) on a second layer of cardboard which forms a cover plate (3).

10. Method according to claim 9, in which method step A) is characterised in that

- at least two, preferably three carrier elements (14) are produced from a pressure-resistant material having a compressive strength of at least 10 kPa, preferably at least 15 kPa, particularly preferably at least 30 kPa, in particular from mineral wool, expanded polystyrene (EPS) or extruded polystyrene (XPS),

- a first cardboard layer (4) is provided, the two end-face end regions of which each have two fold lines (9) arranged at a distance A from one another, the two fold lines (9) positioned at the end face of the cardboard layer (4) each extending parallel to the end-face edge (15) of the cardboard, at a distance B1 and at a distance B2, and the in total four fold lines (9) defining a lower face (13), two side walls (11) and two upper flap edges (12);

- the carrier elements (14) are arranged on the first cardboard layer (4) defining the lower face (13), at a distance D from one another and parallel in the longitudinal direction thereof to the end-face edge (15) of the first cardboard layer, and fixed thereto,

- the fold lines (9) are folded while simultaneously fixing the carrier elements (14) to the inner face (19), correspondingly positioned on the carrier elements (14), of the first cardboard layer (4), in such a way that the carrier elements (14) are enclosed peripherally together in the arrangement direction F thereof by the first cardboard layer (4) and fixed to the first cardboard layer (4), and

- the carrier elements (14) enclosed by the first cardboard layer (4) are cut out in strips extending orthogonal to the longitudinal direction of the carrier elements, preferably at a length in a range of between 30 and 400 mm, preferably between 50 and 200 mm, preferably 100 mm, so as to form the support feet (2) with cardboard-enclosed carrier element bodies (5).

11. Method according to claim 9, in which method step A) is characterised in that

- at least two, preferably exactly two carrier el-

ements (14) are produced from a pressure-resistant material having a compressive strength of at least 10 kPa, preferably at least 15 kPa, particularly preferably at least 30 kPa, in particular from mineral wool, expanded polystyrene (EPS) or extruded polystyrene (XPS),

- a first cardboard layer (4) is provided, the first end-face end region of which has, at a distance A from the first end-face edge (15), a fold line (9), and the second end-face end region of which has two fold lines (9) arranged at a distance A from one another, the fold line (9) positioned at the end face of the second end-face end region of the cardboard layer (4) extending parallel to the end-face edge (15) of the second end face of the cardboard at a distance B2, and in total three fold lines (9) defining a lower face (13), two side walls (11) and an upper flap wall (12);
- the carrier elements (14) on the first cardboard layer (4) which defines the lower face (13) being arranged at a distance D from one another and, in the longitudinal direction thereof, parallel to the end-face edge (15) of the first cardboard layer, and being fixed thereto,

- the fold lines (9) are folded while simultaneously fixing the carrier elements (14) to the inner face (19), correspondingly positioned on the carrier elements (14), of the first cardboard layer (4), in such a way that the carrier elements (14) are enclosed peripherally together in the arrangement direction F thereof by the first cardboard layer (4) and fixed to the first cardboard layer (4), and

- the carrier elements (14) enclosed by the first cardboard layer (4) are cut out in strips extending orthogonal to the longitudinal direction of the carrier elements, preferably at a length in a range of between 30 and 400 mm, preferably between 50 and 200 mm, preferably 100 mm, so as to form the support feet (2) with cardboard-enclosed carrier element bodies (5).

12. Method according to claim 9, wherein method step B) is characterised in that

- a second cardboard layer is provided, which preferably has a fold line at at least one first edge (22), and preferably also at a second edge (22) opposite this first edge (22), which extend parallel to the first and/or second edge (22) of the second cardboard layer at a distance E and define the at least one cover plate (3) and preferably at least one side wall (6), and

- at least two, preferably three of the support feet (2) formed in method step A) are arranged on the lower face (7) of the cover plate (3), preferably orthogonal to the longitudinal direction of the cover plate (3), and fixed thereto.

13. Method according to any of claims 9 to 12,
characterised in that
the support feet (2) are arranged on the lower face
(7) of the cover plate (3) at a distance of between
100 and 800 mm, preferably of between 300 and 600
mm, particularly preferably of 450 mm from one an- 5
other.
14. Method according to any of claims 9 to 13, 10
characterised in that
the fixing of the carrier elements (14) to the inner
face (19), positioned against the carrier elements
(14), of the first cardboard (4), and of the support
feet (2) to the lower face (7) of the cover plate (3)
takes place by gluing, preferably using a poly- 15
urethane adhesive, hot-melt adhesive or acrylate ad-
hesive.
15. Method according to any of claims 9 to 14, 20
characterised in that
before the support feet (2) are fixed to the cover plate
(3) the corrugations of the first cardboard layer (4)
are orientated orthogonal to the corrugations of the
second cardboard layer of the cover plate (3), and
subsequently the support feet (2) are fixed to the 25
cover plate (3).
16. Method according to any of preceding claims 9 to 15,
characterised in that
the carrier element (14) has a length of between 800 30
mm and 1800 mm, preferably 1200 mm, a height of
between 30 mm and 250 mm, preferably between
100 mm and 150 mm, and a width of between 30
mm and 500 mm, preferably between 100 mm and
250 mm, particularly preferably between 150 mm 35
and 200 mm.
17. Method according to any of preceding claims 9 to 16,
characterised in that
the carrier element (14) has the features of the pre- 40
ceding claim 4.

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Fig. 1

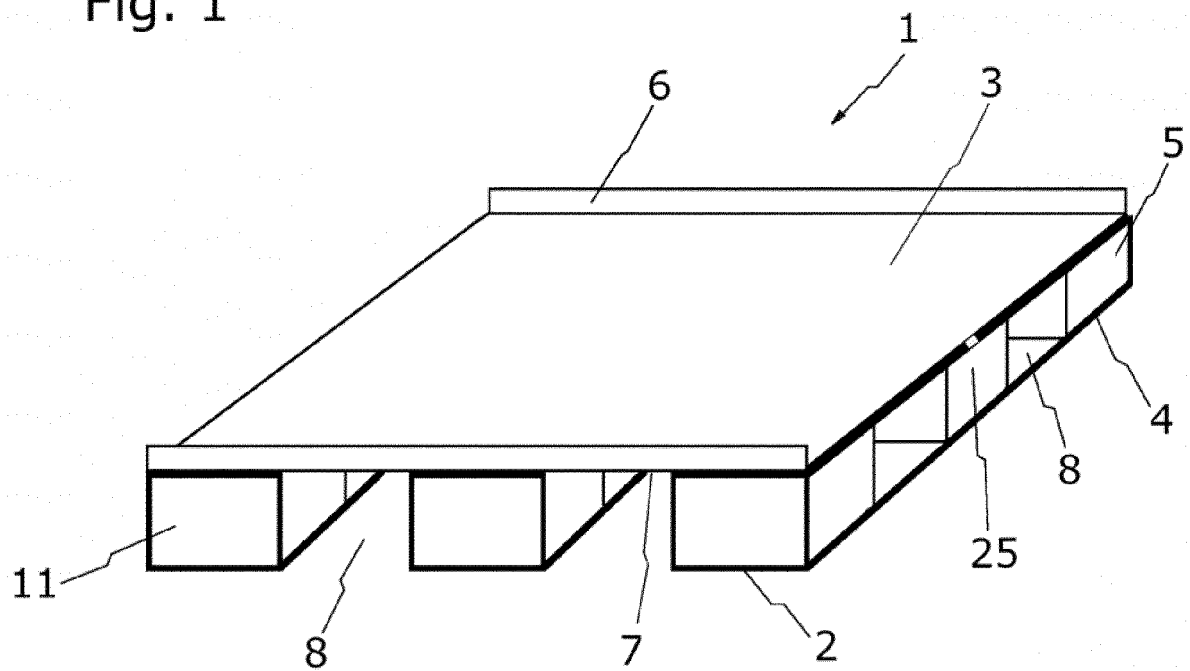


Fig. 2a

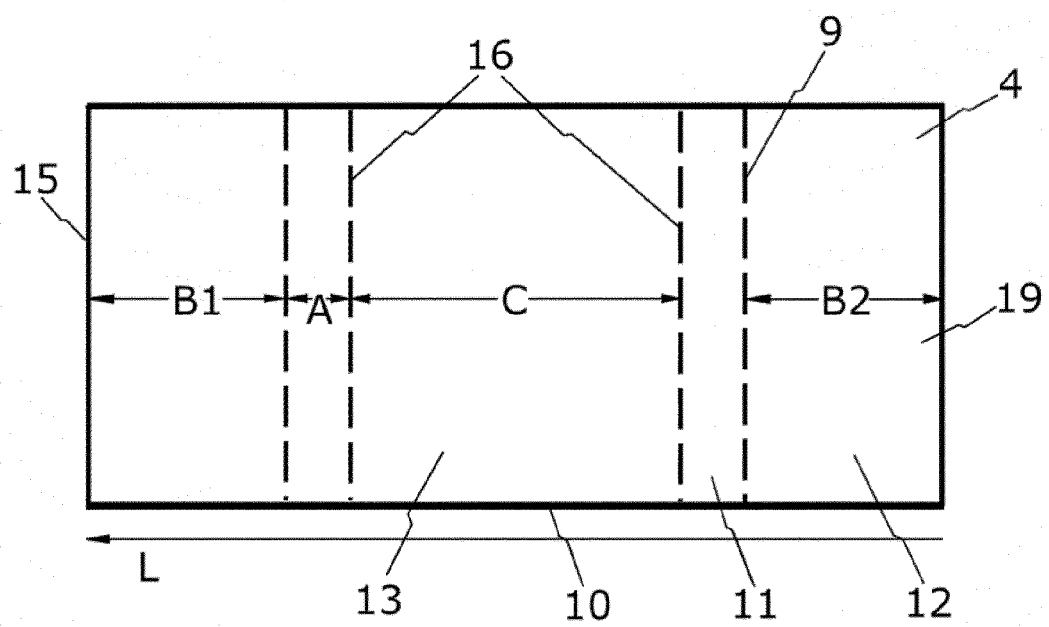


Fig. 2b

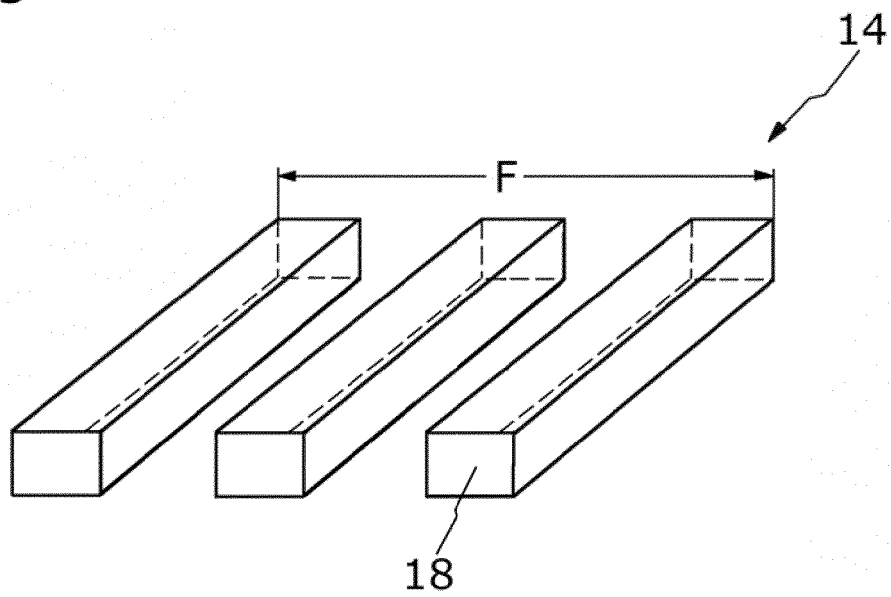


Fig. 2c

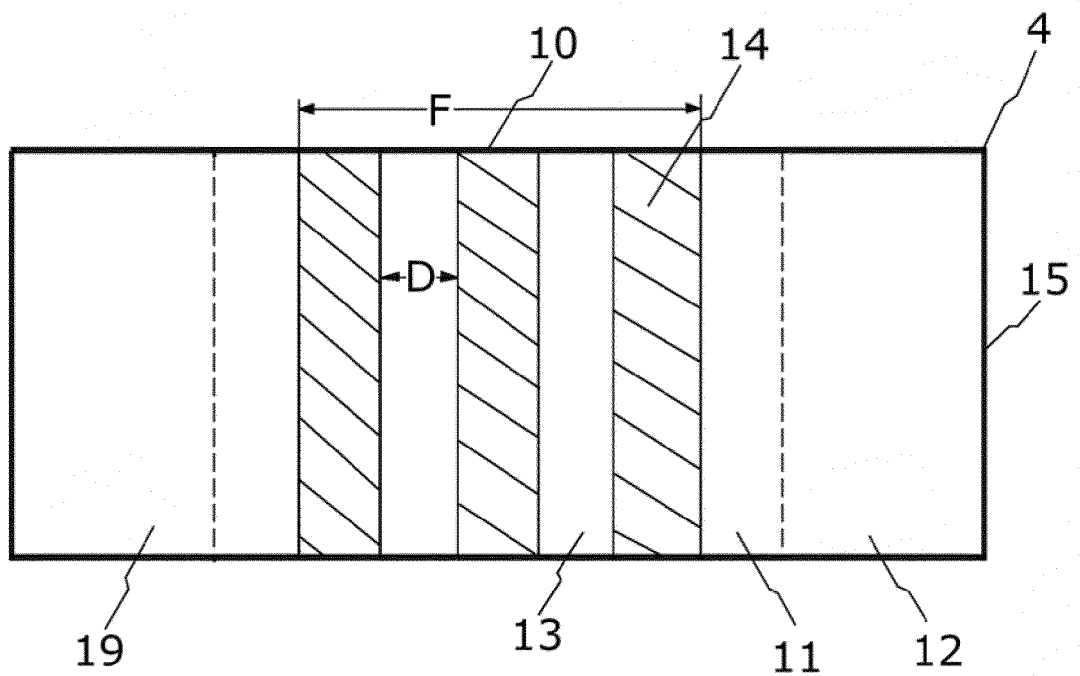


Fig. 3

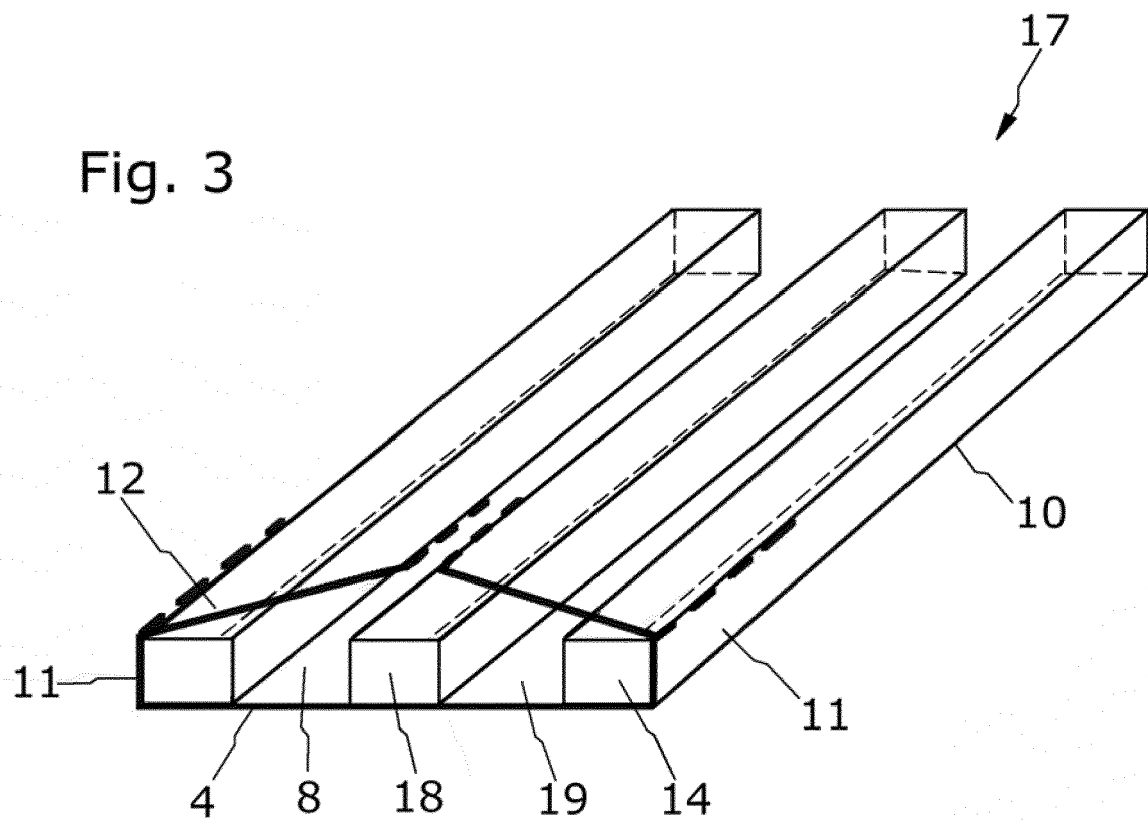


Fig. 4a

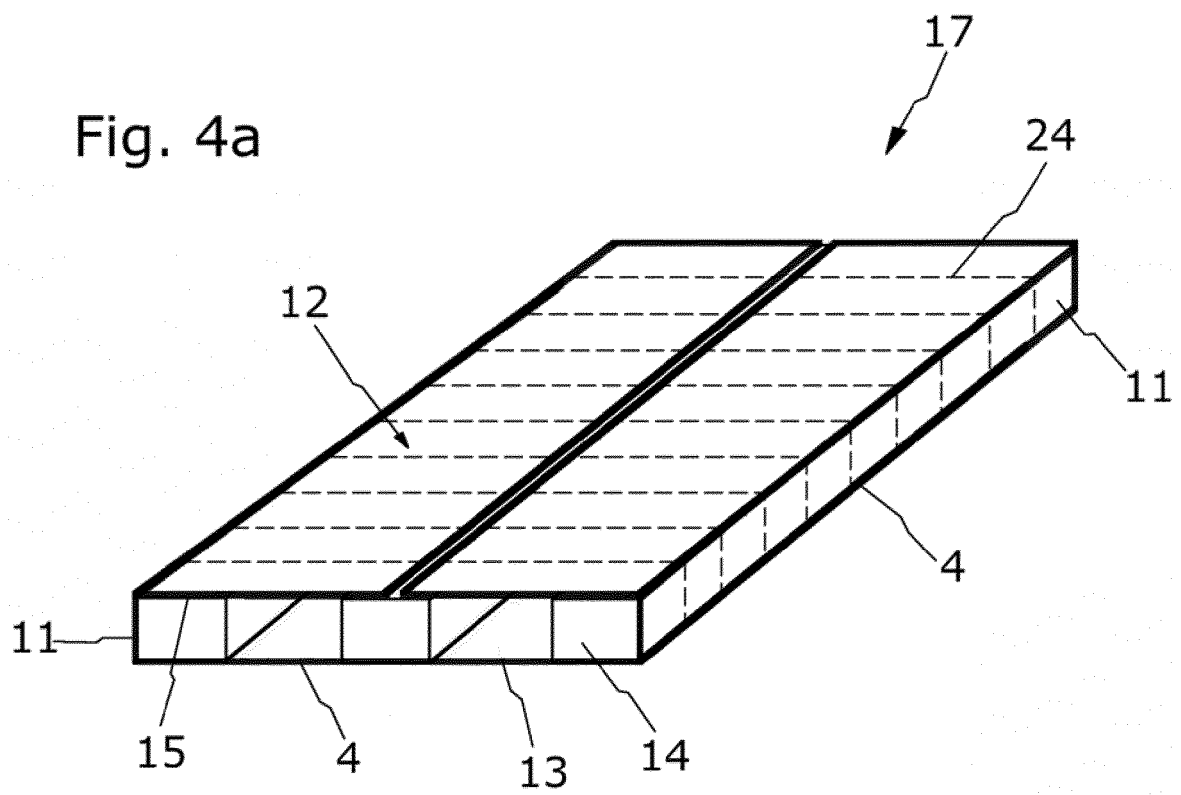


Fig. 4b

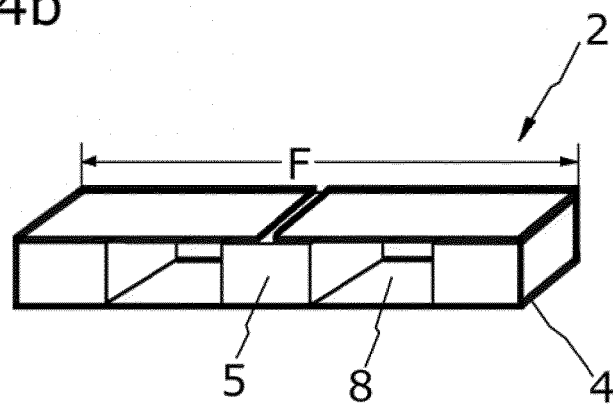


Fig. 5

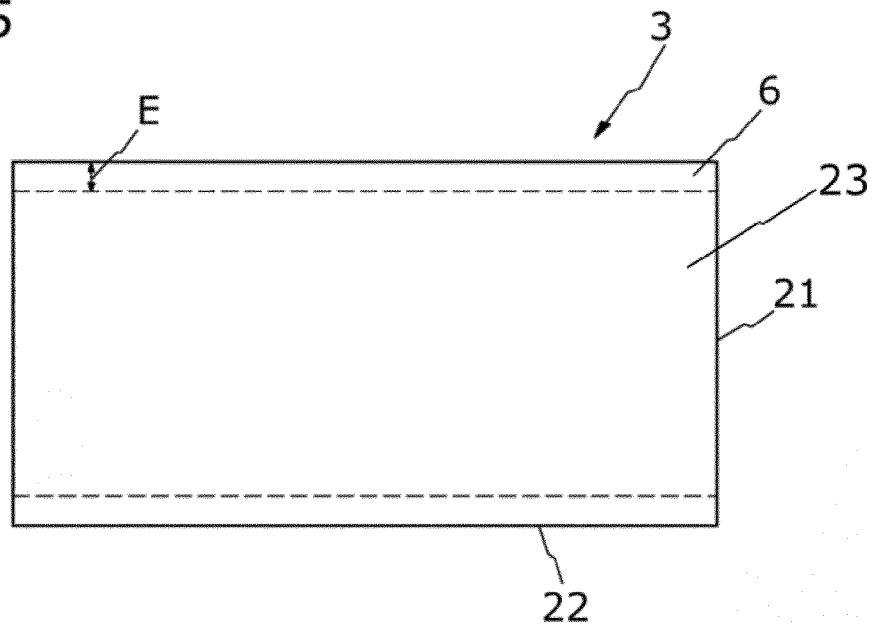
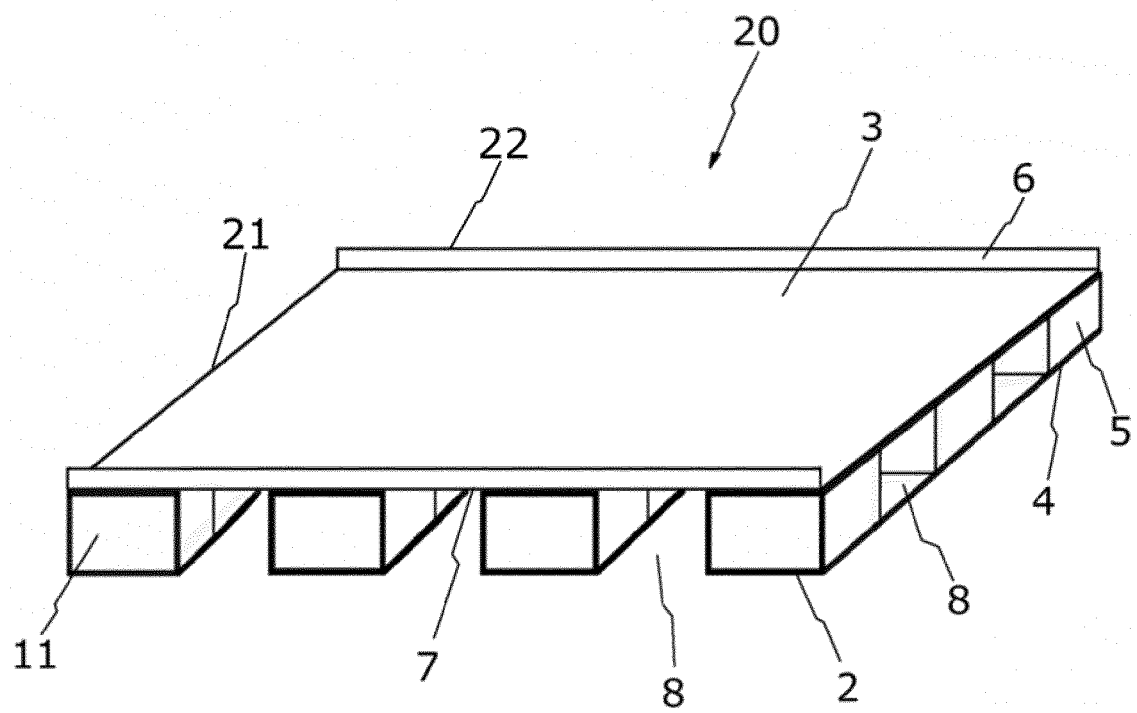


Fig.6





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