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(54) **METHOD FOR PRODUCING A BOARD-SHAPED ELEMENT FROM WHICH, FOR EXAMPLE, A PALLET CHOCK CAN BE FORMED**

(57) This invention relates to a method for forming a board-shaped formed element (1) from a wood mixture comprising wood slabs, wherein the method comprises the following steps: the supply of a wood mixture comprising wood slabs whereof the width lies between 1 and 4 cm, the length lies between 2 and 5 cm, and the thick-

ness lies between 0.2 and 2 cm; the mechanical pressing of the supplied wood mixture so that a wood mixture having a moisture content lying between 30 and 45 % is obtained, and mixing of the pressed-out wood mixture with an adhesive and form-pressing into a board-shaped formed element (1).

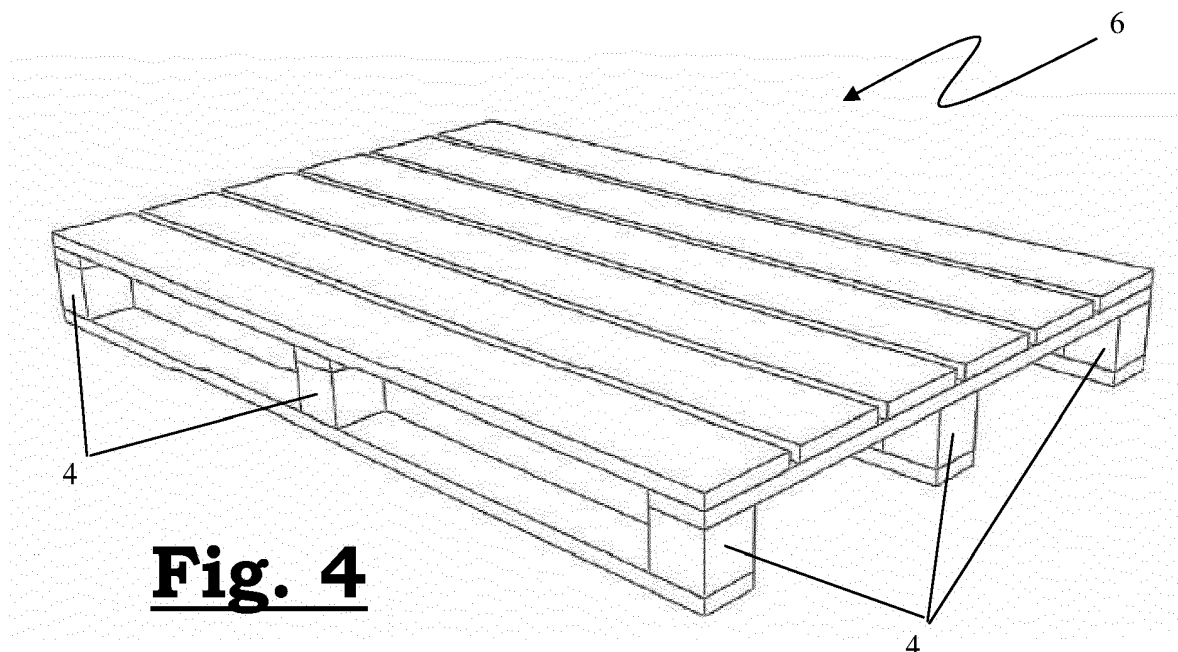


Fig. 4

Description

[0001] This invention relates to a method for producing a board-shaped element from a wood mixture comprising wood slabs whereof the width lies between 1 and 4 cm, the length lies between 2 and 5 cm, and the thickness lies between 0.2 and 2 cm. The invention further relates to the production of a formed element from the formed board-shaped element. The formed element is preferably an intermediate block for a pallet, a beam-formed element for the making of a two-way pallet, or a formed element which can be used to support, for example, packed goods.

[0002] Pallet intermediate blocks, the so-called pallet chocks, are component parts of a pallet. They can be made produced from a solid wooden beam which has been sawn to the appropriate dimension. Solid pallet chocks of this type are generally dearer than pressed chocks. Pressed chocks are produced from a mixture of wood chips and/or sawdust which are pressed into the appropriate shape.

[0003] The wood chips are generally derived from wood slabs, which are firstly reduced in size via, for example, a hammer mill or knife mill. These wood chips can possibly also be mixed with sawdust. The wood slabs are residual products of timber mills or lumber mills, have an irregular shape, with a size (w x l) of 1 - 4 cm by 2 - 5 cm, and a thickness of 0.2 - 2 cm. Depending on the season and the degree of drying out, the wood slabs have a moisture content which can range between 25 and 100 %.

[0004] In order now to obtain pressed pallet chocks, the wood chips and/or sawdust are thermally dried, so that the particular mixture still has a moisture content of 2 - 3%. After this, the dried mixture is mixed with glue and pressed into chocks. The pressing is realized with a forming press, an impact press, or with the aid of a (press) extruder. Heat should additionally be applied during the pressing in order thereby to make the glue set.

[0005] By proceeding to produce the chocks in this way, a stable end product having a moisture content of maximally 12% is obtained. The described method has a number of drawbacks, however, namely: energy necessary to reduce wood slabs into wood chips, thermal energy necessary to dry the wood chips, and thermal energy necessary to set the glue.

[0006] The object of this invention is now to provide a method for proceeding to produce a board-shaped formed product from a wood mixture comprising wood slabs, from which various end products, such as, for example, a pallet chock, can be formed, which method requires much less energy than the known method.

[0007] The object of the invention is achieved by providing a method for forming a board-shaped formed element from a wood mixture comprising wood slabs whereof the width lies between 1 and 4 cm, the length lies between 2 and 5 cm, and the thickness lies between 0.2 and 2 cm, wherein the supplied wood mixture is me-

chanically pressed, so that a wood mixture having a moisture content lying between 30 and 45 % is obtained, after which the pressed-out wood mixture is mixed with an adhesive and is form-pressed into a board-shaped formed element, and this without any prior heating of the wood mixture to be pressed.

[0008] The supplied wood slabs have a natural moisture content which can range from 25% to 100%, this depending on the season, the air humidity in the environment of the storage site, etc. As a result of the mechanical pressing, some of the water present in the material (free water) will be removed and a wood mixture having a uniform moisture content is obtained. An advantage of the method according to the invention is that only mechanical pressing, and not thermal heat, is used to achieve the intended moisture content (30 - 45 %), which is much more advantageous and more environmentally friendly. Moreover, in the method according to the invention, there is no heat emission and no emission of particulate matter. Some of the remaining moisture from the wood mixture will subsequently be used to react with the glue. The board form-pressing will preferably be realized with either a forming press (flat press), which operates discontinuously, or a continuous press, wherein the formed board comes endlessly out of the press. Where a continuous press is used, no thermal heat will be added, of course, during the board form-pressing. The board-shaped formed element which is obtained via the method preferably has a thickness lying between 50 and 150 mm.

[0009] In a preferred embodiment of the method according to the invention, the obtained board-shaped formed element is further naturally dried at ambient temperature. In this way, some of the water which is present is removed and, depending on the environmental conditions, the moisture content of the formed element can be reduced to about 20 - 25%, in case of external application or use, and to about 10 - 20%, in case of internal application or use.

[0010] In a more preferred embodiment of the method in accordance with the invention, the supplied wood mixture is not further reduced in size with the aid of a crusher. This in contrast to the known techniques, in which the supplied wood mixture either substantially consists of chips (of match size or smaller) and/or sawdust or wherein the supplied mixture is first reduced to sawdust and/or chips (of match size or smaller).

[0011] In a preferred method according to this invention, the wood slabs of the supplied wood mixture derive from the side of a tree in a sawmill and/or chopped small round wood and/or round logs and/or recycled wood. The dimensions (w x l x d) of the wood slabs are approximately 1 - 4 cm x 2 - 5 cm x 0.2 - 2 cm. Smaller fractions which are present in the wood slabs can possibly be removed therefrom, for example, by screening.

[0012] In a more preferred method according to this invention, the pressed-out wood mixture comprises 5 - 20 % by weight adhesive. Preferably, 5 - 15 % by weight

glue is added. The adhesive will ensure that the (damp) wood slabs adhere to one another. The glue which is used will proceed to react with the pre-existing moisture in the wood slabs and will in this way bond everything together during the pressing. The adopted glue is preferably a PU glue, because a PU glue is ideal for bonding damp wood. PU glue namely has a certain quantity of moisture necessary to be able to react. Naturally, other suitable types of glues for bonding a damp wood mixture can also be considered.

Since the wood mixture of slabs having a size of about 1 - 4 cm x 2 - 5 cm and a thickness of about 0.2 - 2 cm, there is also much more contact surface than, for example, a wood mixture of wood chips and/or sawdust, whereby the overall quantity of glue can be limited.

The thus formed board-shaped formed element can be used as a wall or floor panel. The dimensions are chosen according to the applications, but standardly lie (w x l) between 500 - 1000 mm and 1500 - 2500 mm. Naturally, dimensions which differ herefrom are perfectly possible.

[0013] According to a particular method according to this invention, the board-shaped formed element is further cut up into a beam-shaped formed element having a length lying between 50 and 200 cm and a width lying between 30 and 120 mm. A formed element of this type is preferably used in the production of a so-called two-way pallet.

[0014] The beam-shaped formed element is preferably provided with a, preferably slot-shaped, recess suitable for receiving a binding material. A formed element of this type can perfectly well be used for placement under packages.

[0015] In a more particular method according to this invention, the board-shaped formed element is further cut up into a pallet chock having a length lying between 70 and 150 mm, a width lying between 30 and 150 mm, and a height lying between 60 and 120 mm. Pallet chocks of this type are used in the production of so-called four-way pallets.

[0016] This invention is now explained in greater detail on the basis of the hereinafter following detailed description of the method according to the invention and a number of formed products produced according to this method. The aim of this description is solely to provide an illustrative example and to indicate further advantages and particularities of this invention, and can thus in no way be interpreted as a limitation of the scope of the invention or of the patent rights claimed in the claims.

[0017] In this detailed description, reference is made by means of reference numerals to the accompanying drawings, wherein:

- **Figure 1:** is a perspective representation of a board-shaped formed element produced in accordance with the method according to the invention;
- **Figure 2:** is a perspective representation of a two-way pallet;
- **Figure 3:** is a representation of a formed element

provided with a slot-shaped recess for receiving a binding material;

- **Figure 4:** is a perspective representation of a four-way pallet with pallet chocks.

[0018] This invention relates to a method for forming a board-shaped formed element (1) from a wood mixture comprising wood slabs whereof the width lies between 1 and 4 cm, the length lies between 2 and 5 cm, and the thickness lies between 0.2 and 2 cm. Preferably at least 95 % of the supplied wood mixture herein consists of wood slabs whereof the dimensions lie within the said limits. The slabs have a natural moisture (free water) content from 25 to 100 % and are derived from the chopping of round wood or from a sawmill (residual product) or from recycling wood. They are totally irregular in shape.

[0019] The slabs of the wood mixture are subjected to a mechanical pressing operation in order to press the (free) water out of them. By the mechanical pressing of the supplied wood mixture, a wood mixture having a moisture content lying between 30 and 45 % is obtained. The pressing will be realized with a known (mechanical) pressing device.

[0020] Following the pressing (in order to reduce the moisture content to 30 - 45%), the slabs are mixed with a defined quantity of adhesive, preferably a polyurethane glue (PU glue) and subsequently form-pressed into a board-shaped formed element (1). Preferably, 5 - 20 % by weight glue is used. During the production of the board-shaped formed element (1), at no single moment is thermal heat used. The form-pressing can be realized with the aid of a forming press or a continuous press. During the trials, use was made of a trough-shaped press, comprising a hydraulic ram which is movable up and down. The press had the following dimensions: 400 mm x 160 mm x 300 mm (l x w x h). In the adopted forming press, the pressed-out wood mixture which is mixed with the adhesive can be filled to 250 - 300 mm high so as subsequently to be pressed to about 80 mm high. A bonded board, 400 mm long x 160 mm wide and 80 mm thick, is hereby obtained. To this, a pressure of between 30 and 40 bar was applied with the ram over a certain period. The applied pressure is dependent on the quantity (density) of the wood stock which needs to be compressed.

[0021] The two trials which are specified below were conducted in the above-described forming press. Important to note: the wood mixture supplied to the forming press is already a mixture of wood slabs whereof the width lies between about 1 and 4 cm, the length lies between about 2 and 5 cm, and the thickness lies between about 0.2 and 2 cm, and which have already been pressed, via a known (mechanical) press, in order to reduce the fixed water content to about 35%.

Trial 1:

[0022]

- wood stock, is assumed equivalent to 600 kg/m³, i.e. 3070 gram
- PU glue: 15% = 460 gram
- pressing time: 90 minutes
- pressing pressure: 37 bar (instantaneous reading)
- theoretical weight: 3553 gram
- after pressing: 3500 gram (that is 680 kg/m³) - this weight will reduce during natural drying-out according to the environmental conditions

Trial 2:

[0023]

- wood stock, is assumed equivalent to 500 kg/m³, i.e. 2560 gram
- PU glue: 18.5% = 477 gram
- pressing time: 80 minutes
- pressing pressure: 34 bar (instantaneous reading)
- theoretical weight: 3034 gram
- after pressing: 2971 gram (that is 580 kg/m³) - this weight will reduce during natural drying-out according to the environmental conditions

[0024] The boards obtained in trial 1 and 2 were subsequently sawn into pallet chocks (according to standard dimensions) and stored for about 3 months in an environment shielded from precipitation, so as to be able to dry naturally. Following inspection, it turned out that the formed pallet chocks exhibit no deformations and react in much the same way as pallet chocks formed from solid wood.

[0025] In accordance with the method according to the invention, only the free water is removed from the wood slabs, with the aid of a mechanical press. A wood mixture which will have about 35% fixed water is hereby obtained. This mixture is subsequently mixed with an adhesive and pressed into the correct shape. Since only mechanical pressing, and not thermal heat, is used to achieve the intended moisture content (30 - 45 %), an energy saving will be realized with this method.

[0026] The below example illustrates the thermal energy saving which might be realized with this method:

- volume of supplied wood mixture (nat): 200 m³ wood or 139,500 kg.
- water percentage present: 55% (annual average)
- the supplied mixture is mechanically pressed, so that the free water is removed and the mixture still has a moisture content of about 35% → about 18,000 litres of water were removed;
- the pressed-out wood mixture is subsequently mixed with glue and pressed by form-pressing into a board-shaped element;
- the obtained board-shaped element will subsequently further dry naturally at ambient temperature
- should the supplied mixture be thermally dried, as in the prior art, until only 2% water remains, then about

47,700 litres of water has to be evaporated via thermal energy. The cost price hereof amounts to: 47,700 x 1.1 kwh/kg x 0.025 €/kwh = 1,312 € (gas price based on 25 €/MWh)

- if we assume that this example is a representation of a daily production, and we convert this into an annual production, then the method according to the invention results in an energy saving of 301,760 € (1,312 x 230 days).

[0027] Figure 1 shows a possible embodiment of a board-shaped formed element (1). A formed element (1) of this type can be used as floor or wall panel.

[0028] As can be seen from the accompanying figures, various other products can be produced from the formed board-shaped formed element (1). For example, the board-shaped formed element (1) can be further cut up into a beam-like formed element (2) having a length lying between 50 and 200 cm, and a width lying between 30 and 120 mm. A formed element of this type is preferably used in the production of a so-called two-way pallet (5) as depicted in Figure 2.

[0029] The beam-like formed element (2) can be provided with a slot-shaped recess (3) suitable for receiving a binding material (8) (for example binding tape). A formed element of this type is depicted in Figure 3 and can perfectly well be used as a support (7) for placement under a packed material (9).

[0030] The board-shaped formed element (1) is further cut up into a pallet chock (4) having a length lying between 70 and 150 mm, a width lying between 30 and 150 mm, and a height lying between 60 and 120 mm. Pallet chocks of this type are used in the production of so-called four-way pallets (6) (see Figure 4).

Claims

1. Method for forming a board-shaped formed element (1) from a wood mixture comprising wood slabs whereof the width lies between 1 and 4 cm, the length lies between 2 and 5 cm, and the thickness lies between 0.2 and 2 cm, **characterized in that** the supplied wood mixture is mechanically pressed, so that a wood mixture having a moisture content lying between 30 and 45 % is obtained, after which the pressed-out wood mixture is mixed with an adhesive and is form-pressed into a board-shaped formed element (1), and this without any prior heating of the wood mixture to be pressed.
2. Method according to Claim 1, **characterized in that** the obtained board-shaped formed element (1) is further naturally dried at ambient temperature.
3. Method according to Claim 1 or 2, **characterized in that** the supplied wood mixture is not further reduced in size with the aid of a crusher.

4. Method according to one of the preceding claims, **characterized in that** the pressed-out wood mixture comprises 5 - 20 % by weight adhesive.
5. Method according to one of the preceding claims, **characterized in that** the wood slabs of the supplied wood mixture are derived from the side of a tree and/or round logs and/or recycled wood. 5
6. Method according to one of the preceding claims, **characterized in that** the board-shaped formed element (1) has a thickness lying between 50 and 150 mm. 10
7. Method according to one of the preceding claims, **characterized in that** the board-shaped formed element (1) is further cut up into a beam-shaped formed element (2) having a length lying between 50 and 200 cm, and a width lying between 30 and 120 mm. 15 20
8. Method according to Claim 7, **characterized in that** the beam-shaped formed element (2) is provided with a recess (3) suitable for receiving a binding material (8). 25
9. Method according to one of Claims 1 to 6, **characterized in that** the board-shaped formed element (1) is further cut up into a pallet chock (4) having a length lying between 70 and 150 mm, a width lying between 30 and 150 mm, and a height lying between 60 and 120 mm. 30

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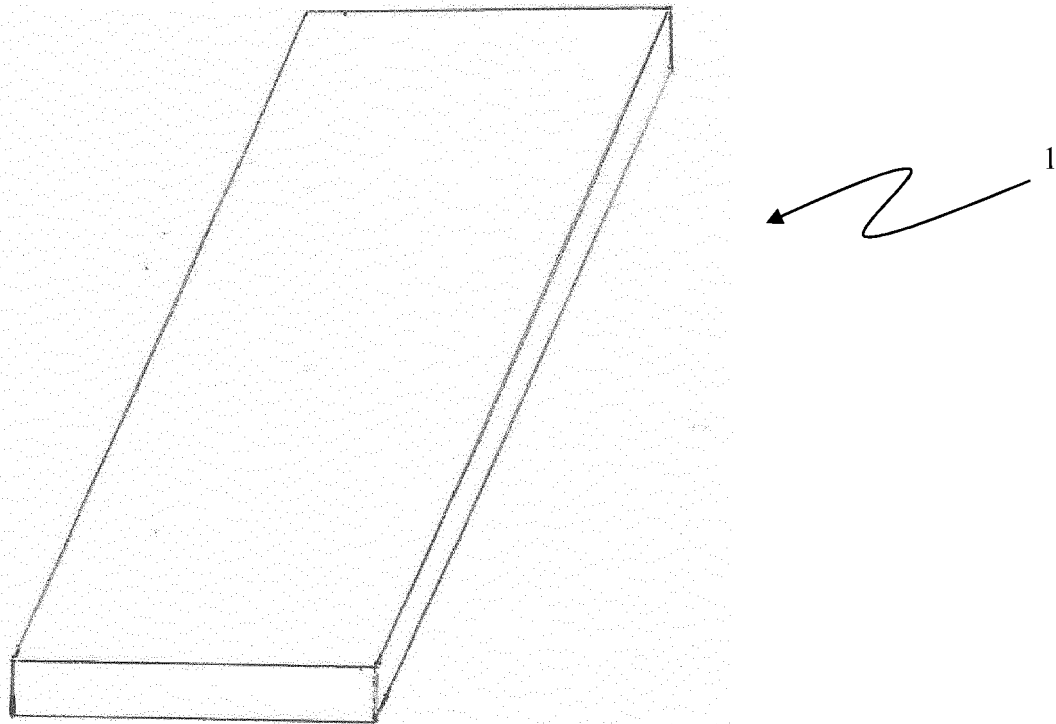


Fig. 1

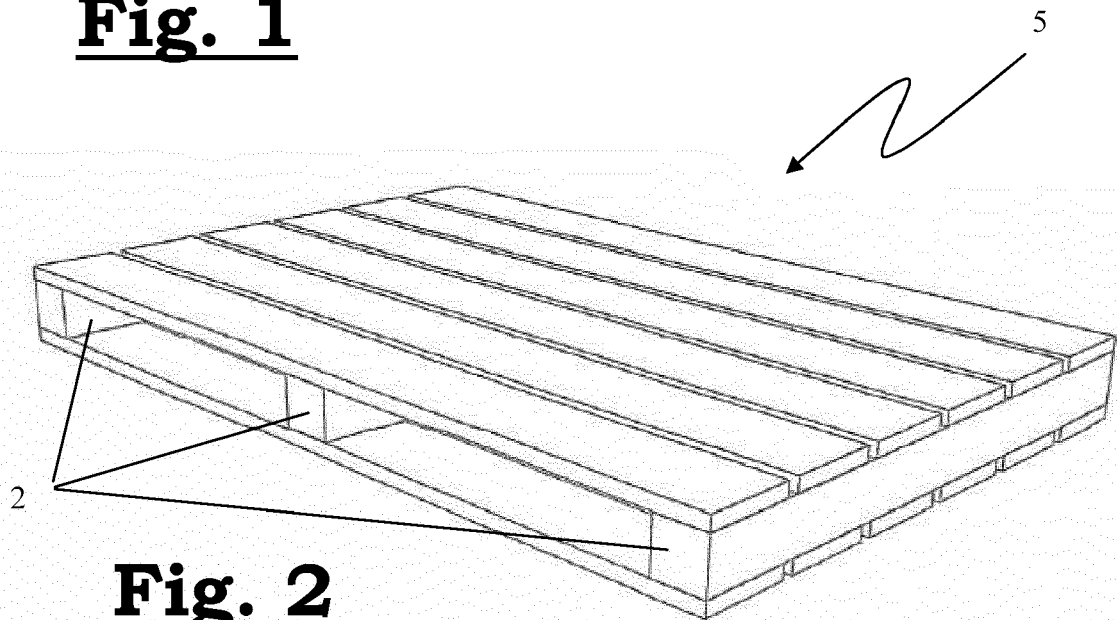


Fig. 2

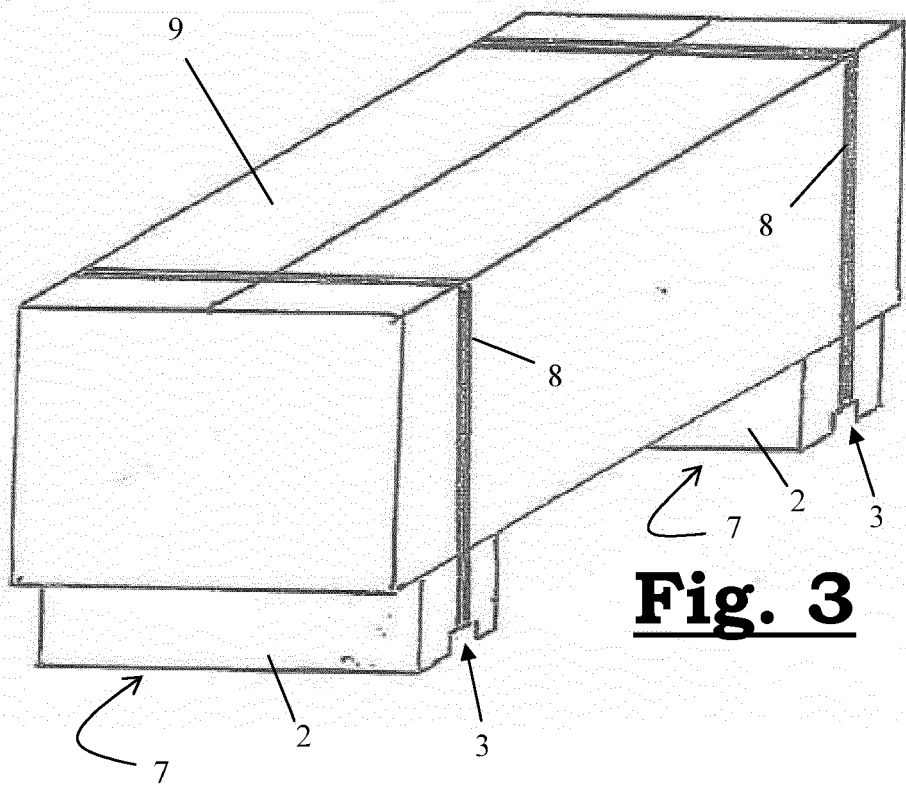


Fig. 3

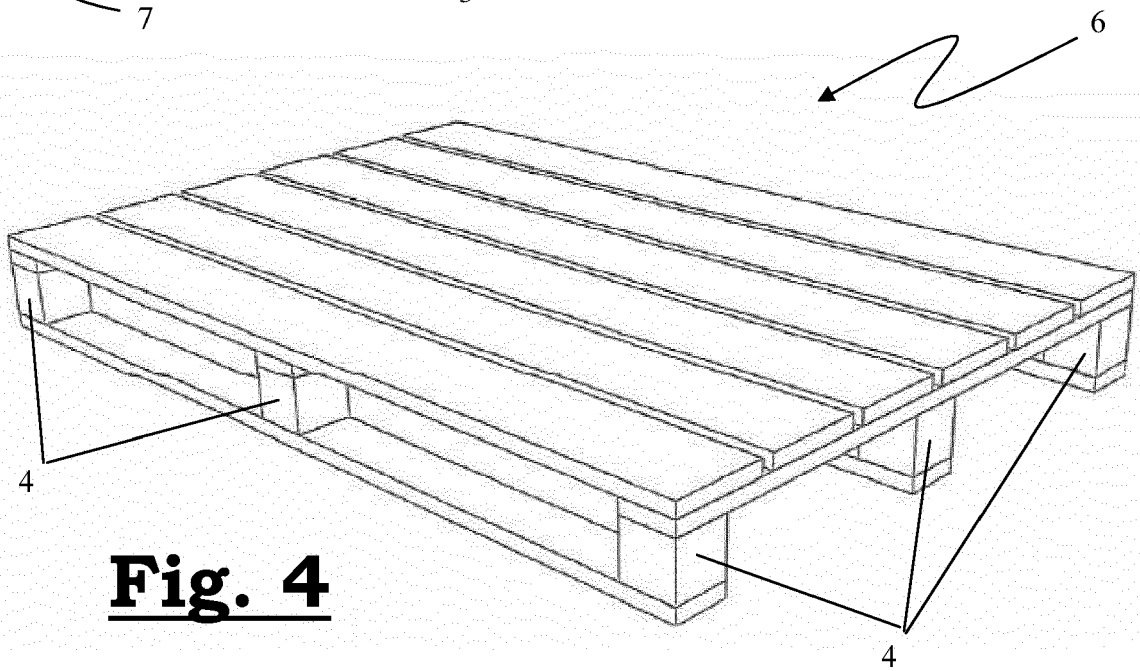


Fig. 4