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(54) **Pallet with friction elements**

Palette mit Reibelementen

Palette avec éléments de friction

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(73) Proprietor: **D.W. PLASTICS N.V.**
3740 Bilzen (BE)

(72) Inventor: **Isenborghs, Francis**
1350 Jauche (BE)

(74) Representative: **Benech, Frédéric et al**
146-150, Avenue des Champs-Élysées
75008 Paris (FR)

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Description

Background

[0001] The present invention relates to a pallet with friction elements, according to the preamble of claim 1.

[0002] Document JP03289444 A discloses a pallet with friction elements.

[0003] A pallet with friction element is disclosed in EP-1.440.893 from the current applicant. This pallet has friction elements which are positioned in openings in the deck for increasing friction between the pallet and prongs of a fork lift. The friction elements do not protrude above the top surface of the deck of the pallet.

Summary of the Invention

[0004] The invention aims to improve current pallets.

[0005] Another object of the invention is to improve the placement of objects on the pallet. The objectives of the invention are achieved as disclosed in the characterizing portion of claim 1.

[0006] The friction elements and friction provisions provide friction between the pallet and articles stacked on the pallet. In particular, these pallets are used for supporting stacks of bottle crates. To that end, the friction elements and friction provisions are provided on the one hand for securing the bottle crates on the surface of the pallet. On the other hand, the friction element on the bottom deck, for instance, is especially designed for also stabilising a pallet with bottle crates on top of an other pallet with bottle crates. To that end, the friction element on the bottom deck extends in such a way that it grips within the circumference of the rim of bottle crates stacked on a pallet below.

[0007] The friction element in the bottom deck further provide a wear-resistant part, for preventing wear on the bottom pallet surface.

[0008] The friction elements inserted in the openings in the top deck comprise an upper collar, a lower collar and a middle portion, the opening comprising a central part and the diameter of the collars being larger than the diameter of the central part near said collars.

[0009] A friction surface of the friction elements in the top deck or the bottom deck is provided with grooves for carrying away water, in an embodiment one or both surfaces being provided with a profiled surface for carrying away water when attained between the surface and a surface resting on it, like a prong surface.

[0010] In an embodiment the friction provisions have a pyramid shape, in an embodiment having a rectangular base plane with sides running parallel to the ribs, in an embodiment the friction provisions having a height of between about 1.5-10 mm.

[0011] In an embodiment, the friction elements in the bottom deck extend beyond the bottom pallet surface.

[0012] In an embodiment, the pallet is substantially rectangular and is provided with the friction elements at or

near its corners.

[0013] In an embodiment, for instance one of the aspects of the invention, a pallet has a central hole running through the top deck and the complete pallet, in an embodiment the hole having a diameter of about 10-20 cm.

[0014] A combination of the features of the aspects of the invention provides a pallet which has friction elements and friction provisions which together secure bottle crates on the pallet, even in case of a shock or a sloped position of a pallet. It furthermore stabilizes a stack of several pallets all loaded with bottle crates. The bottle crates can also be stacked in different patterns on the pallets.

[0015] The invention further pertains to a pallet or parts thereof comprising one or more of the characterising features described in the description and/or shown in the attached drawings, and/or a method comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

[0016] The various aspects discussed in this patent can be combined in order to provide additional advantages, and/or these aspects can form a basis for a divisional patent application.

Description of the Drawings

[0017] The invention will be further elucidated referring to an embodiment of a pallet shown in the attached drawings, showing in:

Figure 1 schematically in perspective the top surface of an embodiment of a pallet;

Figure 2 schematically in perspective the bottom surface of an embodiment of the pallet of figure 1;

Figure 3 a detail of a friction element;

Figure 4 a detail of an opening in the upper deck for a friction element;

Figure 5 a detail of a friction element is the opening of figure 4;

Figure 6 an example of a friction element;

Figure 7 an example showing the openings and other friction provisions on the upper deck, and

Figure 8 an example showing a detail of a friction element provided on the lower deck.

Detailed Description of Embodiments

[0018] The pallet 1 shown merely by way of non-limiting example in Figs. 1 and 2 in perspective view from above and in perspective view from below (as well as subsequent embodiments according to the present invention) is preferably formed of a thermoplastic or other polymeric material and is preferably, but not necessarily, formed by an injection moulding process. Engineered materials may be used, as well as a synthetic resin such as polyethylene or polypropylene with a filler added to stiffen the resin. It is contemplated that the pallet disclosed herein may be manufactured by various other

moulding techniques and manufacturing processes applicable to the design and material selected, including but not limited to blow moulding, thermoforming, vacuum moulding, etc. It is further contemplated that the material from which the pallet according to the present invention is formed may include materials other than plastics and polymer blends, and may include metallic materials, such as aluminium or tin. The pallets have technical aspects and features which form part of the current patent description. Furthermore, the depicted pallet and parts thereof can have design features and/or a specific shape which can be the subject of design protection rights.

[0019] As illustrated in Figs. 1 and 2, pallet 1 includes a top deck 2 and a bottom deck 3 which both have an upper surface and a lower surface. The top deck 2 provides an upper pallet surface and bottom deck 3 provides a bottom pallet surface. The decks 2 and 3 preferably have a rectangular shape with rounded corners, but may also take other shapes, including but not limited to a square, circular, triangular or other shapes as desired or required by the use and application. Pallet 1 generally is symmetrical about at least one centreline. The upper surface of top deck 2 is preferably a substantially planar surface on which articles (not shown) can be carried. Top deck 2 and bottom deck 3 are connected by support elements 4, which preferably are integral with both decks. Between the support elements 4 apertures 8 are capable of accepting the prongs of a forklift or similar device.

[0020] As can be seen, the upper surface of top deck 2 is constituted by a structure of interconnected ribs 30, see also figs. 3 and 4 in detail. This provides an open structure which is very strong yet light. In addition, the open structure allows the pallet 1 to be thoroughly cleansed. The pallet 1 may further be provided with a label (not shown).

[0021] The pallet is further provided with friction elements 20 in the top deck 2, which will be discussed further below.

[0022] In the centre of the pallet 1, a through hole or open space 9 may be provided, as shown in this embodiment. This hole 9 can have the following function. Bottle crates can be stacked in pallet 1 in such a way that the central opening 9 is left free. Thus, a free central shaft (in the sense of a chute or tube) remains open. Thus, when several packed pallets are stacked on top of one another, this leaves a free shaft running from top to bottom. The shaft allows material which may get on top of a loaded pallet to fall through and thus not remain on top of the loaded pallet.

[0023] In accordance with the present invention, openings 10 are provided in the (top) deck. Friction elements 20, which will further be explained below with reference to Figs. 3-6, can be accommodated in these openings 10 so as to increase the friction between the pallet 1 and the prongs of a forklift. The increased friction prevents that the pallet moves during transport on a forklift or even slips off the prongs. As can be seen, the openings 10 are in the embodiment shown defined by tubular elements

(Fig. 4) which are integral with the top deck 2. The friction elements protrude above these tubular elements, that is, above the top deck. The openings 10 are arranged in rows which form an acute angle (in the embodiment shown of approximately 45 degrees) relative to the prongs. In this way, the friction elements can be contacted from two substantially orthogonal directions.

[0024] It is noted that a similar arrangement of openings and friction elements could be made in the lower deck 3. This, however, is generally not necessary.

[0025] The exemplary friction element 20 shown in detail in Figs. 5 and 6 has a top portion forming an upper collar 21, a bottom portion forming a lower collar 22 and a relatively narrow middle portion 23. The upper collar 21 is accommodated in a widened portion 11 of a respective opening 10 and extends above the top surface of the deck 2. The upper collar 21 rests with its rim 25 on a flange 12 provided in the opening 10. The friction element 20 is preferably substantially cylindrical, that is, it preferably has a substantially circular cross-section. However, a rectangular, hexagonal or other cross-section would also be feasible.

[0026] As can be seen, the top portion of the friction element 10 extends beyond the opening 10 or above the top surface of the deck, thus helping to prevent sliding or shifting of articles, like bottle crates, stacked on the pallet 1.

[0027] The lower collar 22 of the friction element 20 rests against bottom surface of the deck 2, the bottom portion of the friction element being located beyond, that is below, the opening 10. By resting with its rim 26 against flange 13 in the bottom surface of the deck, the risk of the friction element 20 being pushed into the opening 10 and thus becoming less effective is significantly reduced.

[0028] In the embodiment shown, the lower collar 22 is wider than the upper collar 21. This is advantageous in that the lower collar of the friction element assists in supporting the deck on the prongs and should therefore be relatively large. The upper collar serves to prevent shifting to for instance bottle crates stacked onto the pallet 1. It will be understood, however, that the lower collar and the upper collar could have a substantially equal width, or that the upper collar may even be wider than the lower collar.

[0029] Having a relatively narrow upper collar, however, assists in the insertion of the friction element into the opening 10 from underneath the deck 10. This insertion from underneath, which may be carried out with robot arms or by hand, is particularly suitable for friction elements having a relatively wide bottom portion. To further facilitate said insertion, the (top part of the) friction element may be provided with a layer of grease or soap. In fact, the diameter of the upper collar 21 in an embodiment shown in fig. 6 is almost equal to the diameter of the tapered middle portion 23 near the lower collar 22. Thus, the friction element 20 can be inserted in opening 10 as illustrated in figs. 4 and 5 and stay positioned, even under heavy use.

[0030] The embodiment of the friction element shown in Fig. 6 is similar to the one of Fig. 5 with grooves 24 provided in the friction surface provided for resting on the prongs. Thus, water which may be between the friction element 20 and a prong will not result in a slippery water film.

[0031] In the embodiment of the pallet according to the invention shown in Fig. 1, friction provisions 31 are provided on the top deck 2 so as to retain bottle crates on the surface of the top deck and prevent them from sliding.

[0032] The height of the friction provisions 31 may be adapted to the particular articles to be carried on the pallet. For example, the height of the friction provisions 31 may be approximately about 1.5-10 mm. In this embodiment, the friction provisions are pyramid shaped. This proved to provide a reasonable trade off between vulnerability and providing sufficient grip. The friction provisions are arranged at crossings of ribs 30. Thus, the provisions are ridged. They are integrally injection moulded with remaining pallet 1. Providing these friction provisions at such a regular spacing allows them to cooperate with different sizes of bottle crates stack on the pallet in different ways and in different patterns.

[0033] It is also possible to provide these friction provisions 31 on the bottom deck 3. Thus they can be provided in the same way as illustrated. Thus, the friction provisions 31 extend beyond the bottom pallet surface. It then adds in securing a pallet on top of a lower pallet stacked with bottle crates.

[0034] A further friction provision is shown in fig. 8. In this embodiment, at the corners of the rectangular pallet 1 friction elements 40 are provided. These friction elements 40 are made from a rubbery material, like natural, or artificial rubber. It is also possible to make these friction elements 40 from another material. These materials prevent sliding of a pallet 1 on a surface. A part 41 of the friction element 40 extends beyond the bottom pallet surface of bottom deck 3. The friction elements 40 are usually separate elements which are snapped into place. They can be made similar to the friction elements 20. In another embodiment, they can be produced in a 2K moulding process, in a separate moulding step after moulding of the rest of the pallet. In another moulding process, the friction elements 40 are co-moulded in the same mould. An advantage of snapping or clamping the friction elements 40 in the bottom deck is that it is possible to replace them when they become worn. In fact, the friction elements 40 prevent wear due to abrasion of the bottom surface of pallet 1 against the street surface. Furthermore, the extending part is positioned to fall within the walls of a bottle crate stacked on an identical, lower pallet. Thus, a stack of packed pallets is more stable.

[0035] It will also be clear that the above description and drawings are included to illustrate some embodiments of the invention, and not to limit the scope of protection. Starting from this disclosure, many more embodiments will be evident to a skilled person which are within the scope of protection and the essence of this invention

and which are obvious combinations of prior art techniques and the disclosure of this patent.

5 Claims

1. A pallet (1) formed of a plastics material, the pallet (1) comprising a substantially planar top deck (2) for carrying articles and support elements (4) for supporting the top deck (2), friction elements (20) being mounted in openings (10) in the top deck (2) for increasing the friction between the pallet (1) and any prongs of a fork lift, wherein each friction elements (20) extends below the top deck (2) and comprises a top portion forming an upper collar (21), a bottom portion and a relatively narrow middle portion (23) between said top portion and said bottom portion, said bottom portion forming a lower collar (22), each opening (10) comprises an upper part having a widened portion (11) with a bottom flange (12), and each upper collar (21) of each friction element (20) is accommodated in said respective widened portion (11) of said openings (10) and comprises a rim (25) which rests on said flange (12),

characterized in that

each opening (10) comprises a central part having a tapered form arranged to cooperate with a respective middle portion of a friction element (20), **in that** the upper collar (21) has a top portion which extends beyond the opening (10) or above the top surface of the top deck, and the lower collar (22) rests with a rim (26) against a flange (13) provided in the bottom surface of the deck, and comprises a friction surface with grooves (24) for carrying away water or a profiled surface for carrying away water.

2. A pallet according to claim 1, **characterised in that** the diameter of the upper collar (21) being almost equal to the diameter of the tapered middle portion near the lower collar (22).

3. A pallet according to any of the preceding claims, **characterised in that** it comprises friction provisions (31) integrally formed from injected plastic material of the pallet.

4. A pallet according to claim 3, **characterized in that** the top deck (2) is constituted by a plurality of interconnected ribs (30), and the friction provisions (31) comprise pointed extensions extending above the substantially planar deck and are formed at crossings of the interconnected ribs (30).

5. A pallet according to any of claims 3 and 4, wherein said friction (31) provisions have a pyramid shape, having a height of between about 1.5-10 mm.

6. A pallet according to claim 4, wherein said friction

provisions (31) have a rectangular base plane with sides running parallel to the ribs (30).

7. A pallet according to any of the preceding claims **characterized in that** it is substantially rectangular and is provided with the friction elements at or near its corners. 5
8. A pallet according to any of the preceding claims, **characterized in that** it further has a central hole (9) running through the top deck and the complete pallet. 10
9. A pallet according to claim 8 **characterized in that** the central hole (9) has a diameter of about 10-20 cm. 15
10. A pallet according to any of the preceding claims, **characterized in that** it comprises a substantially planar bottom deck (3) for providing a bottom pallet surface, said bottom deck (3) being coupled to the top deck (2) by the support elements (4) and comprising friction elements (20) being mounted in openings (10) in the bottom deck (3) for increasing the friction between the pallet (1) and any prongs of a fork lift, wherein each friction elements (20) extend above the bottom deck (3), said friction elements (20) comprises a top portion forming an upper collar (21), a bottom portion forming a lower collar (22) and a relatively narrow middle portion (23) between said top portion and said bottom portion, each opening (10) comprises an upper part having a widened portion (11) with a bottom flange (12), and **in that** each upper collar (21) of each friction element (20) is accommodated in said respective widened portion (11) of said openings (10) and comprises a rim (25) which rests on said flange (12). 20 25 30
11. A pallet according to any of the preceding claims, **characterized in that** is formed by moulded injection. 35 40

Patentansprüche

1. Eine Palette (1) aus einem Kunststoffmaterial, **wobei** die Palette (1) eine im Wesentlichen planare Deckfläche (2) zum Tragen von Gegenständen und Stützelementen (4) zum Abstützen der Deckfläche (2) aufweist, **wobei** Reibungselemente (20) in Öffnungen (10) in der Deckfläche (2) zur Erhöhung der Reibung zwischen der Palette (1) und Gabeln eines Gabelstaplers angebracht sind, **wobei** alle Reibungselemente (20) sich unterhalb der Deckfläche (2) erstrecken und einen oberen Bereich, der einen oberen Kragen (21) ausbildet, einen unteren Bereich und einen vergleichsweise engen mittleren Bereich (23) zwischen dem oberen Bereich 45 50 55

und dem unteren Bereich aufweisen, **wobei** der untere Bereich einen unteren Kragen (22) ausbildet, **wobei** jede Öffnung (10) einen oberen Teil aufweist, der einen erweiterten Bereich (11) mit einem unteren Flansch (12) hat, und **wobei** jeder obere Kragen (21) von jedem Reibungselement (20) in dem entsprechenden erweiterten Bereich (11) der Öffnungen (10) aufgenommen ist und einen Rand (25) aufweist, der auf dem Flansch (12) ruht, **dadurch gekennzeichnet, dass** jede Öffnung (10) einen zentralen Teil aufweist, der eine konische Form hat und so angeordnet ist, **dass** er mit dem entsprechenden mittleren Bereich eines Reibungselements (20) zusammenwirkt, **dass** der obere Kragen (21) einen oberen Bereich hat, der sich über die Öffnung (10) hinaus oder oberhalb der oberen Oberfläche der Deckfläche erstreckt, und **dass** sich der untere Kragen (22) mit einem Rand (26) auf einem Flansch (13) abstützt, der in der Bodenfläche der Deckfläche vorgesehen ist, und eine Reibungsfläche mit Rillen (24) zum Ableiten von Wasser oder eine profilierte Oberfläche zum Ableiten von Wasser aufweist.

2. Palette nach Anspruch 1, **dadurch gekennzeichnet, dass** der Durchmesser des oberen Kragens (21) annähernd gleich dem Durchmesser des konischen mittleren Bereichs nahe des unteren Kragens (22) ist. 30
3. Palette nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Reibungsvorrichtungen (31) aufweist, die integral aus dem spritzgegossenen Kunststoffmaterial der Palette ausgebildet sind. 35
4. Palette nach Anspruch 3, **dadurch gekennzeichnet, dass** die Deckfläche (2) aus einer Vielzahl von miteinander verbundenen Rippen (30) aufgebaut ist, und die Reibungsvorrichtungen (31) spitzzulaufende Fortsätze aufweisen, die über die im Wesentlichen planare Fläche hinausragen und an Kreuzungen der miteinander verbundenen Rippen (30) ausgebildet sind. 40
5. Palette nach einem der Ansprüche 3 oder 4, **wobei** die Reibungsvorrichtungen (31) eine pyramidenförmige Gestalt mit einer Höhe zwischen etwa 1,5 bis 10 mm haben. 45
6. Palette nach Anspruch 4, **wobei** die Reibungsvorrichtungen (31) eine rechteckige Basisebene mit Seiten haben, die parallel zu 50

den Rippen (30) verlaufen.

7. Palette nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie im Wesentlichen rechteckig ist und an ihren Ecken oder in der Nähe der Ecken Reibungselemente aufweist. 5
8. Palette nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie zudem ein zentrales Loch (9) hat, das durch die Deckfläche und die gesamte Palette verläuft. 10
9. Palette nach Anspruch 8, **dadurch gekennzeichnet, dass** das zentrale Loch (9) einen Durchmesser von etwa 10 bis 20 cm hat. 15
10. Palette nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine im Wesentlichen planare Bodenfläche (3) für eine Unterseite der Palette hat, wobei die Bodenfläche (3) mit der Deckfläche (2) über die Stützelemente (4) verbunden ist und Reibungselemente (20) aufweist, die in Öffnungen (10) in der Bodenfläche (3) angebracht sind, um die Reibung zwischen der Palette (1) und Gabeln eines Gabelstaplers zu erhöhen, **wobei** sich alle Reibungselemente (20) oberhalb der Bodenfläche (3) erstrecken, wobei die Reibungselemente (20) einen oberen Bereich, der einen oberen Kragen (21) bildet, einen unteren Bereich, der einen unteren Kragen (22) bildet, und einen vergleichsweise engen mittleren Bereich (23) zwischen dem oberen Bereich und dem unteren Bereich aufweisen, **wobei** jede Öffnung (10) einen oberen Teil mit einem erweiterten Bereich (11) mit einem unteren Flansch (12) aufweist, und **dass** jeder obere Kragen (21) von jedem Reibungselement (20) in diesem entsprechenden erweiterten Bereich (11) der Öffnungen (10) aufgenommen ist und einen Rand (25) aufweist, der auf dem Flansch (12) ruht. 20
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11. Palette nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie mittels Spritzguss hergestellt ist. 45

Revendications 50

1. Palette (1) formée d'une matière plastique, la palette (1) comprenant un tablier supérieur sensiblement plan (2) pour supporter des articles et des éléments de support (4) pour supporter le tablier supérieur (2), des éléments à friction (20) étant montés dans des ouvertures (10) dans le tablier supérieur (2) pour augmenter la friction entre la palette (1) et de quel-

conques dents d'un chariot élévateur à fourche, dans laquelle chaque élément à friction (20) s'étend en dessous du tablier supérieur (2) et comprend une portion supérieure formant un collier supérieur (21), une portion inférieure et une portion médiane relativement étroite (23) entre ladite portion supérieure et ladite portion inférieure, ladite portion inférieure formant un collier inférieur (22), chaque ouverture (10) comprend une partie supérieure possédant une portion élargie (11) avec une bride inférieure (12), et chaque collier supérieur (21) de chaque élément à friction (20) est logé dans ladite portion élargie respective (11) desdites ouvertures (10) et comprend un pourtour (25) qui repose sur ladite bride (12), **caractérisée en ce que** chaque ouverture (10) comprend une partie centrale présentant une forme effilée agencée pour coopérer avec une portion médiane respective d'un élément à friction (20), **en ce que** le collier supérieur (21) comporte une portion supérieure qui s'étend au-delà de l'ouverture (10) ou au-dessus de la surface supérieure du tablier supérieur, et le collier inférieur (22) repose avec un pourtour (26) contre une bride (13) prévue dans la surface inférieure du tablier, et comprend une surface à friction avec des rainures (24) pour évacuer de l'eau ou une surface profilée pour évacuer de l'eau.

2. Palette selon la revendication 1, **caractérisée en ce que** le diamètre du collier supérieur (21) étant presque égal au diamètre de la portion effilée médiane près du collier inférieur (22). 30
3. Palette selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend des organes à friction (31) formés d'une seule pièce à partir de matière plastique injectée de la palette. 35
4. Palette selon la revendication 3, **caractérisée en ce que** le tablier supérieur (2) est constitué par une pluralité de nervures mutuellement raccordées (30), et les organes à friction (31) comprennent des extensions pointues s'étendant au-dessus du tablier sensiblement plan et sont formés à des croisements des nervures mutuellement raccordées (30). 40
5. Palette selon l'une quelconque des revendications 3 et 4, dans laquelle lesdits organes à friction (31) présentent une forme pyramidale, possédant une hauteur d'entre environ 1,5 et 10 mm. 45
6. Palette selon la revendication 4, dans laquelle lesdits organes à friction (31) possèdent un plan de base rectangulaire avec des côtés parallèles aux nervures (30). 50
7. Palette selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle est sensi-

blement rectangulaire et est pourvue des éléments à friction dans ou près de ses coins.

8. Palette selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comporte en outre un trou central (9) à travers le tablier supérieur et la palette complète. 5
9. Palette selon la revendication 8, **caractérisée en ce que** le trou central (9) possède un diamètre d'environ 10 à 20 cm. 10
10. Palette selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend un tablier inférieur sensiblement plan (3) pour fournir une surface de palette inférieure, ledit tablier inférieur (3) étant accouplé au tablier supérieur (2) par les éléments de support (4) et comprenant des éléments à friction (20) montés dans des ouvertures (10) dans le tablier inférieur (3) pour augmenter la friction entre la palette (1) et de quelconques dents d'un chariot élévateur à fourche, dans laquelle chaque élément à friction (20) s'étend au-dessus du tablier inférieur (3), lesdits éléments à friction (20) comprennent une portion supérieure formant un collier supérieur (21), une portion inférieure formant un collier inférieur (22) et une portion médiane relativement étroite (23) entre ladite portion supérieure et ladite portion inférieure, chaque ouverture (10) comprend une partie supérieure possédant une portion élargie (11) avec une bride inférieure (12), et **en ce que** chaque collier supérieur (21) de chaque élément à friction (20) est logé dans ladite portion élargie respective (11) desdites ouvertures (10) et comprend un pourtour (25) qui repose sur ladite bride (12). 15
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11. Palette selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle est formée par injection moulée. 40

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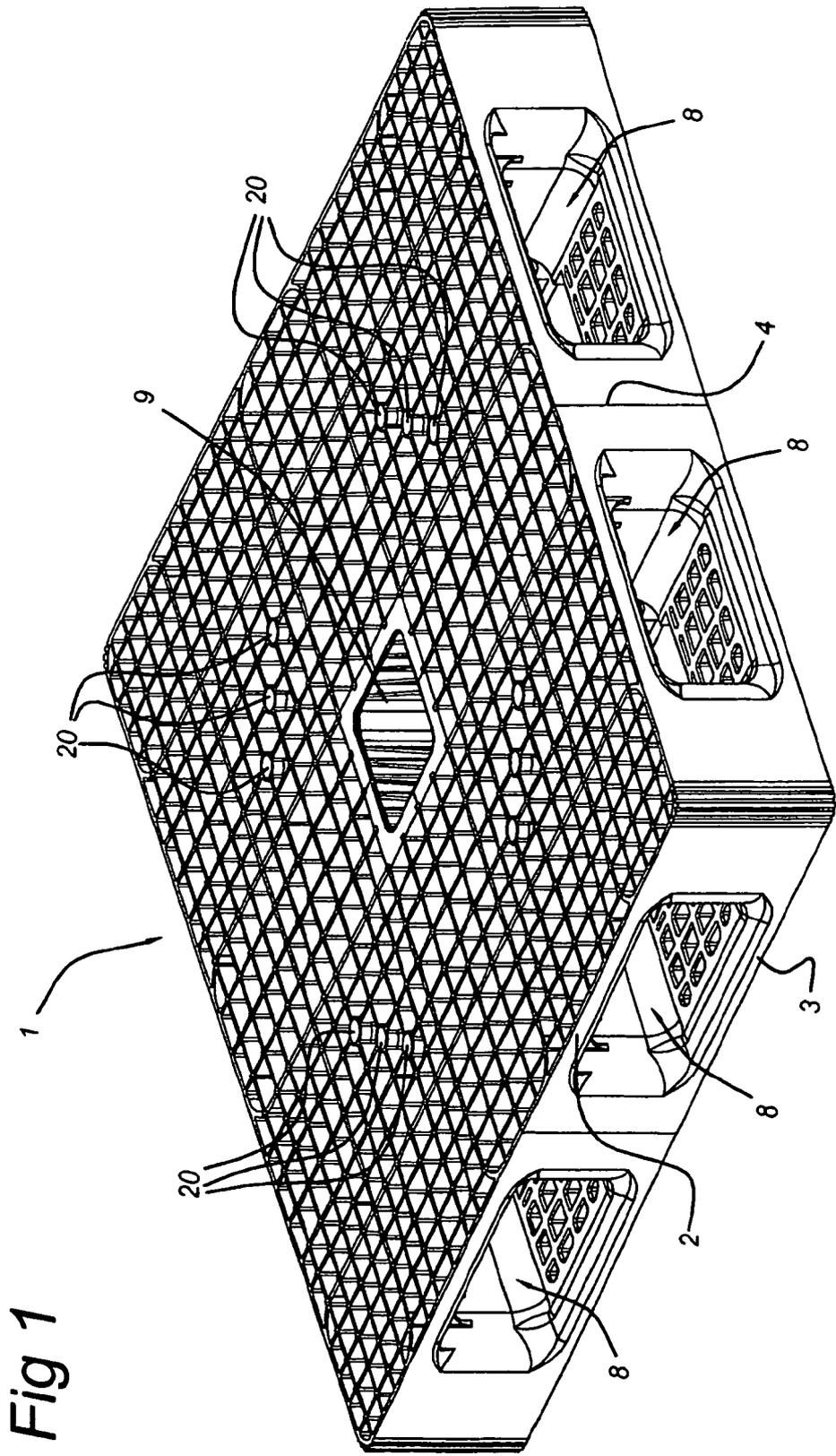


Fig 1

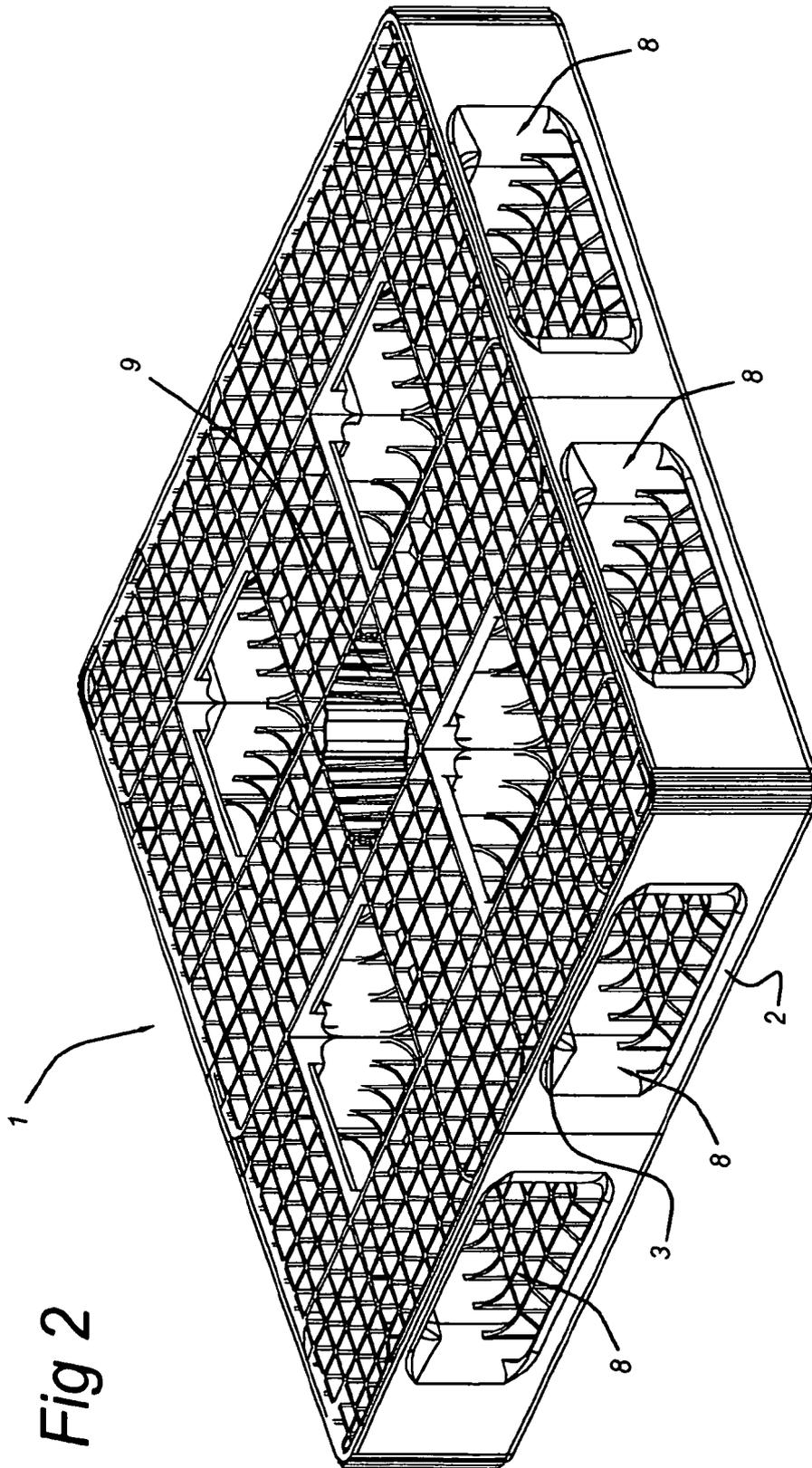


Fig 3

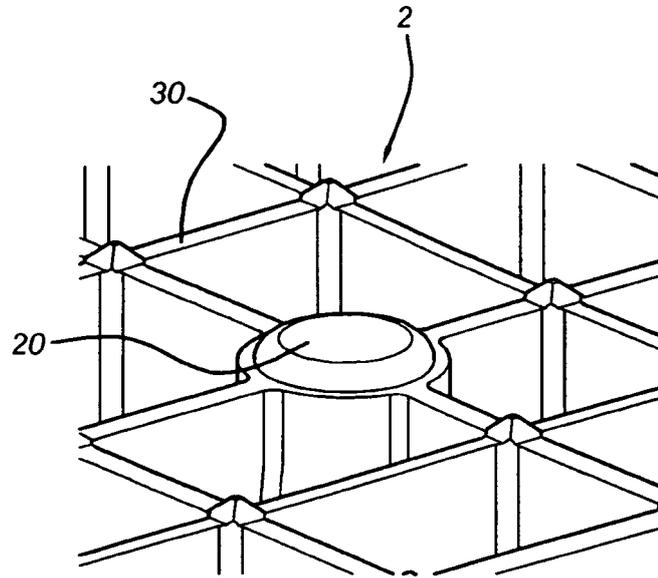


Fig 4

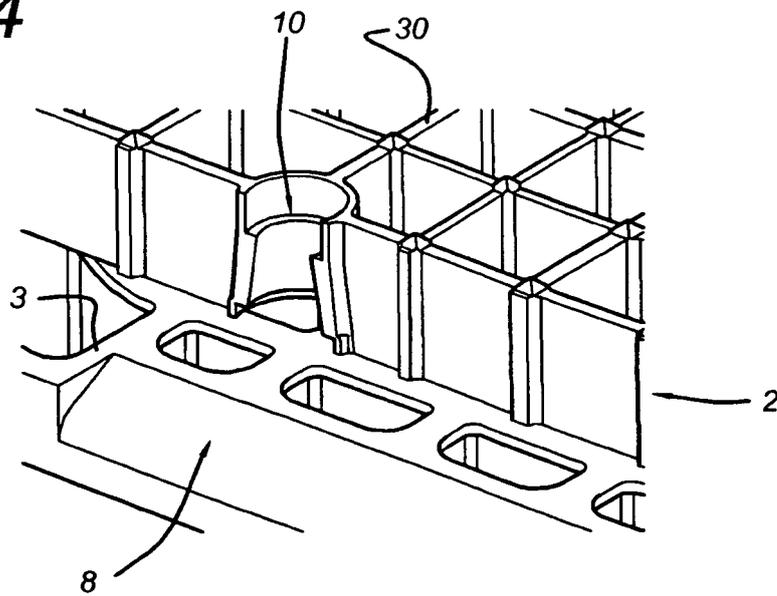


Fig 5

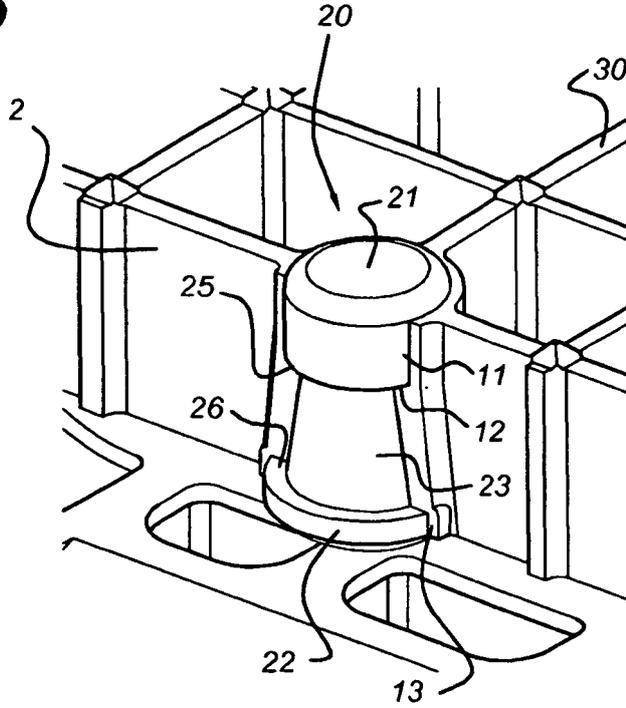


Fig 6

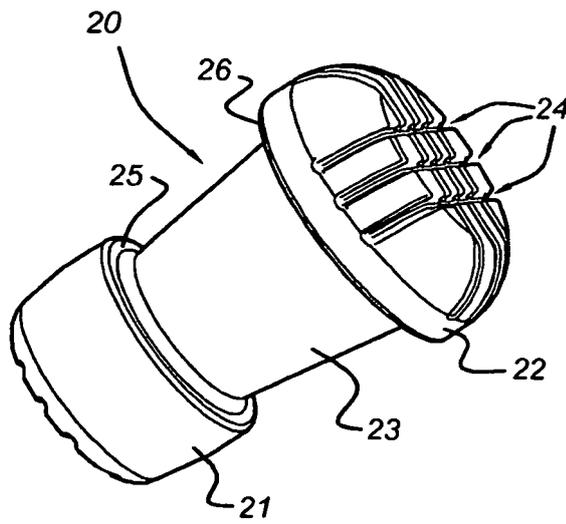


Fig 7

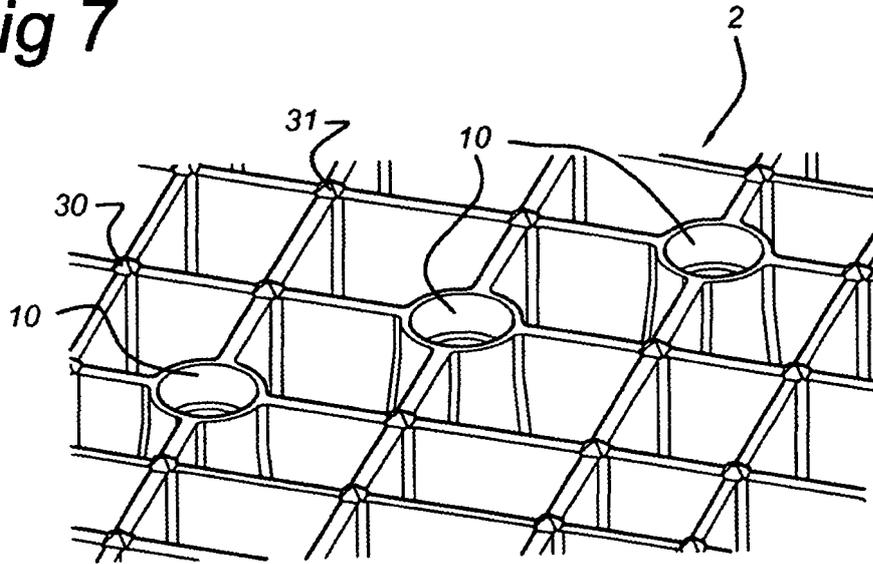
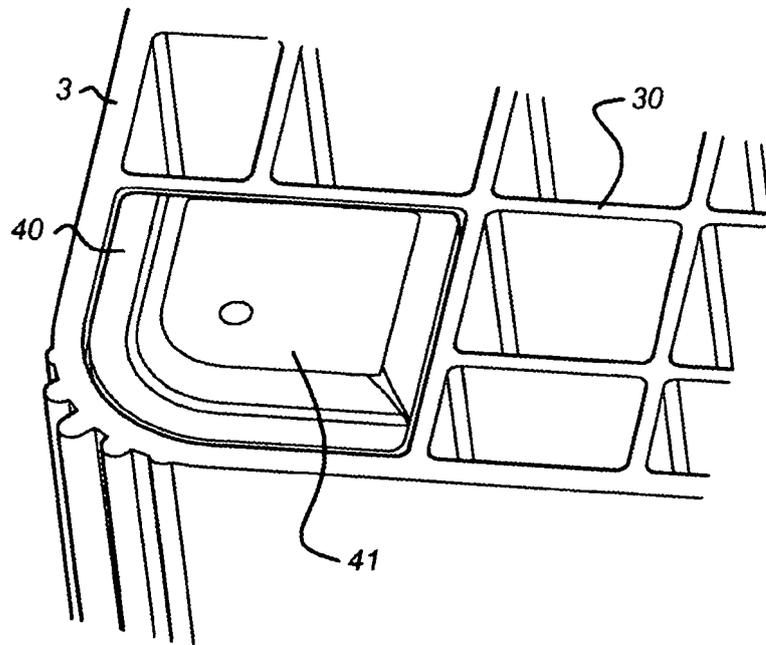


Fig 8



REFERENCES CITED IN THE DESCRIPTION

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