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(54) **PACKAGING SYSTEM AND METHOD FOR PACKING PRODUCTS USING A PACKAGING SYSTEM**

(57) A packaging system for accommodating products during transportation and storage, comprising:
- an upwardly open thermoformed plastic tray (2) having a base (10) and sidewalls that delimit an interior cavity for receiving one or more products;
- a lid (3) of plastic material, which fits onto the tray (2) so as to cover an upper opening thereof; and
- several elongated support elements (5).

Several first seats (21) are provided on an upper side

(10a) of the base of the tray and several second seats (22) are provided on the underside (3b) of the lid. Each support element has a first end that mates with the first seats (21) and an opposite end that mates with the second seats (22). The support elements are vertically and detachably mountable to the first seats (21) in order to extend through the interior cavity of the tray and provide load bearing support between the lid and the base of the tray.

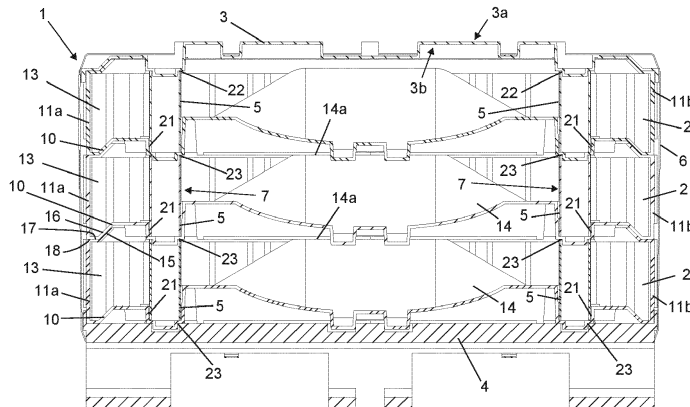


Fig 2

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Description

FIELD OF THE INVENTION AND PRIOR ART

[0001] The present invention relates to a packaging system according to the preamble of claim 1. The invention also relates to a method for packing products using such a packaging system.

[0002] The growing demand for electric vehicles implies that large quantities of electric vehicle lithium-ion batteries have to be transported, for instance from battery production sites to vehicle production sites. It is previously known to accommodate the electric vehicle lithium-ion batteries in plastic trays during transportation and storage, wherein several such trays are stacked on each other and secured to a pallet by means of plastic or metallic straps. In order to save space during transportation and storage, two or more pallets with a respective stack of battery accommodating trays may be stacked on each other. Thus, in order to properly protect the electric vehicle lithium-ion batteries, the trays used for this purpose have to be rather strong and capable of withstanding high vertical loads. These types of trays are therefore normally produced by injection moulding, which is a production technique that makes it easy to adapt the design of the trays to the requirements with respect to strength and stability. A disadvantage with these known plastic trays is that injection moulding is a production technique that is rather complex and costly.

SUMMARY OF THE INVENTION

[0003] The object of the present invention is to achieve a new and favourable packaging system that is suitable for use in the transportation of electric vehicle lithium-ion batteries, server racks, hard drives and other types of essentially rectangular electronic components.

[0004] According to the invention, this object is achieved by means of a packaging system having the features defined in claim 1.

[0005] The packaging system of the present invention comprises:

- at least one upwardly open thermoformed plastic tray having a product supporting base and sidewalls integrally formed with the base and extending upwardly from the base along the circumference thereof, the sidewalls defining an upper opening of the tray, wherein the base and the sidewalls delimit an interior cavity for receiving one or more products and wherein the base has an upper side facing the interior cavity of the tray and an opposite underside;
- a lid of plastic material, which fits onto said at least one tray so as to cover the upper opening of the tray, the lid having an underside configured to face the tray when the lid is mounted onto the tray and an opposite upper side; and
- several elongated support elements.

[0006] Several first seats adapted for connection to a respective one of said support elements are provided on the upper side of the base of said at least one tray, wherein the support elements are vertically and detachably mountable to a respective one of these first seats in order to extend through the interior cavity of the tray between the base of the tray and the lid, when the lid is mounted onto the tray, to thereby provide load bearing support between the lid and the base of the tray. Furthermore, several second seats are provided on the underside of the lid in such positions that each one of these second seats is vertically aligned with one of the first seats on the upper side of the base of said at least one tray when the lid is mounted onto the tray, wherein each support element has a first end adapted to mate with the first seats on the upper side of the base of said at least one tray and an opposite second end adapted to mate with the second seats on the underside of the lid. Thus, each individual support element may be mounted between one of the first seats on the upper side of the base of the tray and one of the second seats on the underside of the lid so as to thereby extend vertically through the interior cavity of the tray between the base of the tray and the lid in order to carry vertical loads and thereby provide load bearing support between the lid and the base of the tray. The number of support elements to be mounted between the base of the tray and the lid may be adapted in dependence on the expected vertical load on the packaging system.

[0007] By providing load bearing support, the support elements relieve the pressure on the sidewalls of the tray, which in its turn implies that it will be possible to use a thermoformed plastic tray. It is easier and more cost-effective to produce plastic trays by thermoforming as compared to injection moulding. However, the possible wall thickness of the tray and the possibility to integrate strengthening design features in the tray are restricted when the plastic tray is produced by thermoforming instead of injection moulding. Thus, a plastic tray of a given size will normally be weaker when produced by thermoforming as compared to injection moulding. According to the invention, this drawback associated with the use of thermoformed plastic trays is compensated for by the introduction of the support elements.

[0008] The elongated support elements mainly carry axial loads and it will therefore be possible to use support elements of simple design that can be produced in a cost-effective manner. Despite the introduction of additional support elements, the packaging system according to the present invention may be produced in a simpler and more cost-effective way as compared to a corresponding packaging system of previously known type with injection moulded trays. Furthermore, the strength of the packaging system may easily be adapted as required by varying the number of support elements in each tray.

[0009] The first end of the support elements has preferably the same design as the second end of the support elements, to thereby allow an individual support element

to be mounted with any of its two ends facing the base of the tray. However, the first and second ends of the support elements may as an alternative have mutually different designs.

[0010] According to an embodiment of the invention, each first seat on the upper side of the base of said at least one tray has the form of a pocket in the base, wherein the first end of the support elements is adapted to fit into this pocket. Hereby, the support elements may be mounted to the base of the tray in a simple and quick manner by insertion into a respective pocket in the base.

[0011] As an alternative, each first seat on the upper side of the base could be formed as an upwardly projecting protuberance configured to fit into a recess or cavity at the first end of the support elements.

[0012] According to another embodiment of the invention, each second seat on the underside of the lid comprises a protuberance, wherein each support element has a recess or cavity at its second end that mates with this protuberance. Said protuberance is configured to project downwards and face the interior cavity of a tray when the lid is mounted onto the tray. When a support element is connected to one of the second seats, the protuberance of the seat is at least partly received in the recess or cavity at the second end of the support element. As an alternative, each second seat on the underside of the base could have the form of a pocket in the lid adapted to receive the second end of the support elements.

[0013] Another embodiment of the invention is characterized in:

- that several third seats are provided on the underside of the base of said at least one tray opposite to a respective one of the first seats on the upper side of the base, wherein the second end of the support elements is adapted to mate with these third seats; and
- that the packaging system comprises several such trays, wherein each tray fits onto each one of the other trays with the base of the tray covering the upper opening of the other tray such that the trays are stackable on each other for the formation of a stack consisting of two or more trays, a lid on the uppermost tray in the stack and support elements vertically extending through the interior cavity of each tray in the stack between a respective first seat and a respective second or third seat. Hereby, stacks of varying height and with a varying number of trays may be formed with the packaging system, wherein the pressure on the sidewalls of all the trays in the stack may be relieved by providing a suitable number of support elements in the interior cavity of each tray in the stack. Each tray in the stack located below the tray at the top of the stack is provided with support elements that extend in vertical direction between the upper side of the base of the tray and the underside of the base of the next tray covering the opening of the tray in question, wherein these support elements provide load bearing support between the

trays. Due to the engagement between the support elements and the seats at the opposite ends of the support elements, the support elements will counteract lateral displacements between the trays in a stack when one or more of the trays in the stack are subjected to lateral forces. Thus, in addition to providing load bearing support between the trays in a stack, the support elements will contribute to increased lateral stability of the stack.

[0014] According to another embodiment of the invention, each third seat on the underside of the base of each tray comprises a protuberance, wherein each support element has a recess or cavity at its second end that mates with this protuberance. Said protuberance is configured to project downwards and face the interior cavity of another tray when the tray in question is mounted onto the other tray. When a support element is connected to one of the third seats, the protuberance of this seat is at least partly received in the recess or cavity at the second end of the support element. As an alternative, if each first seat on the upper side of the base comprises an upwardly projecting protuberance, each third seat on the underside of the base could have the form of a pocket in the base adapted to receive the second end of a support element.

[0015] According to another embodiment of the invention, the interior cavity of each tray is divided into separate compartments by means of at least one partition, which is integrally formed with the base of the tray and extends upwardly from the base, wherein an upper part of the partition of a tray located immediately below another tray in a stack is configured to be in contact with the underside of the base of the other tray to thereby allow the partition to provide support between the bases of the trays.

[0016] According to another embodiment of the invention, the first end of each support element is adapted to fit with press fit to each first seat on the upper side of the base of each tray. Hereby, each support element may remain in an erect position on the base of a tray after having been brought into engagement with one of the first seats on the base, which facilitates the handling of the packaging system.

[0017] The sidewalls of each tray preferably comprise two opposite longer sidewalls and two opposite shorter sidewalls. In this case, each tray may comprise a first group of first seats arranged on the upper side of the base of the tray in a first row along a first one of the two longer sidewalls and a second group of first seats arranged on the upper side of the base of the tray in a second row along the other longer sidewall.

[0018] The support elements are preferably made of plastic material, but may as an alternative be made of any other suitable material.

[0019] The support elements are with advantage tubular and open at both ends, which implies that they can be produced in a very simple and cost-effective manner, for instance by extrusion. However, the support elements may as an alternative be formed as solid elements or as

hollow elements with closed ends. Furthermore, the support elements are with advantage cylindrical.

[0020] Each tray is with advantage provided with at least four, preferably at least six, and more preferably at least eight first seats on the upper side of the base of the tray. However, base of the trays may as an alternative be provided with any other suitable number of first seats.

[0021] Each tray is preferably thermoformed from a sheet of plastic material having a thickness of 8-12 mm. However, the trays may as an alternative be thermoformed from a sheet of plastic material having any other suitable thickness.

[0022] According to preferred embodiment of the invention, also the lid is thermoformed from a sheet of plastic material, preferably from a sheet of plastic material having a thickness of 8-12 mm. However, the lid may as an alternative be produced in any other suitable manner or thermoformed from a sheet of plastic material having any other suitable thickness.

[0023] Further advantageous features of the packaging system according to the present invention will appear from the description following below and the dependent claims.

[0024] The invention also relates to a method having the features defined in claim 15.

[0025] Further advantageous features of the method according to the present invention will appear from the description following below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] With reference to the appended drawings, a specific description of embodiments of the invention cited as examples follows below. In the drawings:

- Fig 1 is a perspective view of a stack of trays formed by means of a packaging system according to an embodiment of the present invention, as seen with the stack secured to a pallet,
- Fig 2 a longitudinal cut through the stack of trays and the pallet of Fig 1,
- Fig 2a a detail enlargement of a part of Fig 2,
- Fig 3 is a perspective view from above of a tray included in the stack of trays of Fig 1,
- Fig 4 is a perspective view from below of the tray of Fig 3,
- Fig 5 is perspective view from above of the tray of Fig 3 with support elements mounted to the base of the tray,
- Fig 6 is a planar view from above of the tray and the support elements of Fig 5,
- Fig 7 is an exploded perspective view of the tray and the support elements of Fig 5,
- Fig 8 is a perspective view from below of a lid included in the stack of trays of Fig 1,
- Fig 9a is a perspective view of a support element according to a first variant,
- Fig 9b is planar view from above of the support ele-

- ment of Fig 9a,
- Fig 10a is a perspective view of a support element according to a second variant,
- Fig 10b is planar view from above of the support element of Fig 10a,
- Fig 11a is a perspective view of a support element according to a third variant,
- Fig 11b is planar view from above of the support element of Fig 11a,
- Fig 12a is a perspective view of a support element according to a fourth variant, and
- Fig 12b is planar view from above of the support element of Fig 12a.

15 DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0027] A stack of trays 1 formed by means of a packaging system according to an embodiment of the present invention is illustrated in Figs 1 and 2. The illustrated stack 1 comprises three trays 2 of the type illustrated in Figs 3-7 and one lid 3 of the type illustrated in Fig 8, wherein the trays 2 are stacked on each other and positioned on a pallet 4 and wherein the lid 3 is positioned on top of the uppermost tray 2 in the stack 1. The stack 1 formed by the trays 2 and the lid 3 is secured to the pallet 4 by means of steps 6 of plastic or metallic material, which are applied around the lid 3 and the pallet 4 and thereafter tightened and joined together by means of any suitable type of strapping tool or strapping machine.

[0028] Products that are to be transported and/or stored are accommodated in the trays 2. The shape and size of the trays 2 may vary in dependence on the shape and size of the products to be accommodated in the trays. In the illustrated embodiment, each tray 2 is designed to accommodate four electric vehicle lithium-ion batteries (not shown), but the trays may of course also be designed to accommodate other types of products. The trays 2 may for instance have a length of 800-1200 mm, a width of 600-1000 mm and a height of 150-300 mm.

[0029] Each tray 2 is of plastic material and produced by thermoforming, preferably from a sheet of plastic material having a thickness of 8-12 mm. Each tray 2 comprises a product supporting base 10, which has an upwardly facing upper side 10a and an opposite downwardly facing underside 10b. Each tray 2 also comprises sidewalls 11a-11d integrally formed with the base 10 and extending upwardly from the base 10 along the circumference thereof. The sidewalls 11a-11d are mutually connected to each other to form a collar or frame around the upper side 10a of the base 10. Each tray 2 is upwardly open, wherein the sidewalls 11a-11d of the tray together define an upper opening 12 of the tray. The base 10 and the sidewalls 11a-11d of the tray 2 together delimit an interior cavity 13 of the tray for receiving one or more products, wherein the upper side 10a of the base is facing this interior cavity 13. The interior cavity 13 of the tray 2 is open in vertical direction upwards and is delimited in

vertical direction downwards by the base 10 of the tray and in lateral directions by the sidewalls 11a-11d of the tray. In the illustrated embodiment, the interior cavity 13 of the tray is divided into two separate compartments by means of a partition 14 at the centre of the interior cavity 13, wherein two electric vehicle lithium-ion batteries are intended to be accommodated in each compartment. The partition 14 is integrally formed with the base 10 of the tray and extends upwardly from the base 10.

[0030] The tray 2 fits onto each other such that two or more trays 2 may be stacked on each other to form a stack of trays. When a tray 2 is positioned on top of another tray, the base 10 of the upper tray is configured to cover the upper opening 12 of the lower tray. The trays 2 included in the packaging system are with advantage identically designed, but the packaging system could also comprise trays 2 of different designs as long as they are stackable on each other, i.e. as long as each tray 2 fits onto each one of the other trays with the base 10 of the tray covering the upper opening 12 of the other tray.

[0031] In the illustrated embodiment, the sidewalls of each tray 2 comprise two opposite and mutually parallel longer sidewalls 11a, 11b and two opposite and mutually parallel shorter sidewalls 11c, 11d, wherein the shorter sidewalls 11c, 11d extend perpendicularly to the longer sidewalls 11a, 11b. In this case, the corners 11e between each end of a longer sidewall 11a, 11b and the adjacent end of an adjacent shorter sidewall 11c, 11d may be bevelled, as illustrated in Figs 1-7, or straight.

[0032] In the illustrated embodiment, each tray 2 is provided with an upper rim 15 that extends around the periphery of the upper opening 12 of the tray along the upper edges of the sidewalls 11a-11d and a lower rim 16 that extends around the periphery of the base 10 of the tray along the lower edges of the sidewalls 11a-11d. The lower rim 16 on each tray 2 is configured to mate with the upper rim 15 on each one of the other trays, such that the upper rim 15 on a first tray and the lower rim 16 on a second tray located on top of the first tray together form a seal that prevents dust and water from entering the interior cavity 13 of the first tray. In the illustrated embodiment, the upper and lower rims 15, 16 are bevelled, but they could also have any other suitable shape.

[0033] In the illustrated embodiment, each tray 2 has an upwardly facing shoulder 17 that surround the upper rim 15 on the tray and a downwardly facing shoulder 18 that surround the lower rim 16 on the tray. When two trays 2 are stacked on each other, the downwardly facing shoulder 18 on the upper tray is configured to abut against the upwardly facing shoulder 17 on the lower tray.

[0034] The lid 3 is of plastic material and is preferably produced by thermoforming, for instance from a sheet of plastic material having a thickness of 8-12 mm. The lid 3 is configured to fit onto each one of the trays 2 such that it covers the upper opening 12 thereof and prevents dust and water from entering the interior cavity 13 of the tray. The lid 3 has an underside 3b that is configured to face a tray 2 when the lid is mounted onto the tray and

an opposite upper side 3a.

[0035] The packaging system further comprises several elongated support elements 5, preferably of plastic material. In the embodiment illustrated in Figs 1-8, the support elements 5 are tubular and cylindrical and open at both ends. One of the tubular support elements 5 included in the embodiment of Figs 1-8 is shown in closer detail in Figs 9a and 9b. In this case, each support element 5 has a polygonal cross-sectional shape, as illustrated in Fig 9b. However, such tubular and cylindrical support elements 5 could also have a circular cross-sectional shape, as illustrated in Figs 10a and 10b. As a further alternative, the support elements 5 could be formed as solid elements. The support elements 5 may have any suitable cross-sectional shape, such as for instance quadratic, as illustrated in Figs 11a and 12a, rectangular or triangular. The cross-sectional shape of each support element 5 is with advantage constant along the entire length of the support element, as illustrated in Figs 9a, 10a and 11a. In the variant illustrated in Fig 12a, there is a narrow waist between the two ends of the support element 5.

[0036] Several first seats 21 adapted for connection to a respective one of the support elements 5 are provided on the upper side 10a of the base 10 of each tray 2.

[0037] Several second seats 22 adapted for connection to a respective one of the support elements 5 are also provided on the underside 3b of the lid 3 in such positions that each one of these second seats 22 is vertically aligned with one of the first seats 21 on the upper side 10a of the base of a tray 2 when the lid 3 is mounted on top of the tray 2 with the lid 3 covering the upper opening 12 of the tray.

[0038] Furthermore, several third seats 23 adapted for connection to a respective one of the support elements 5 are provided on the underside 10b of the base 10 of each tray 2 opposite to a respective one of the first seats 21 on the upper side 10a of the base 10. Thus, each third seat 23 on the underside 10b of a base of a tray 2 is located below and in vertical alignment with one of the first seats 21 on the upper side 10a of the base of the tray 2.

[0039] Each support element 5 has a first end 5a that is adapted to mate with the first seats 21 on the upper side 10a of the base of each tray 2, and an opposite second end 5b that is adapted to mate with the second seats 22 on the underside 3b of the lid 3 and with the third seats 23 on the underside 10b of the base of each tray 2.

[0040] The support elements 5 are vertically and detachably mountable to the first seats 21 of the trays 2 in order to extend in vertical direction through the interior cavity 13 of the trays with each individual support element 5 extending:

- between a first seat 21 on the upper side 10a of the base 10 of one tray 2 and a second seat 22 on the underside 3b of a lid 3 mounted on top of the tray in

- question, to thereby provide load bearing support between the lid 3 and the base 10 of the tray, or
- between a first seat 21 on the upper side 10a of the base 10 of a first tray 2 and a third seat 23 on the underside 10b of the base 10 of a second tray mounted on top of the first tray, to thereby provide load bearing support between the base 10 of the second tray and the base 10 of the first tray.

[0041] In the illustrated embodiment, there are ten first seats 21 on the upper side 10a of the base 10 of each tray 2, wherein a first group of five first seats 21 are arranged on the upper side of the base 10 along a first one 11a of the two longer sidewalls of the tray and a second group of five first seats 21 are arranged on the upper side of the base 10 in a second row along the other longer sidewall 11b of the tray. In this case, there are also ten second seats 22 arranged in corresponding rows on the underside 3b of the lid 3 and ten third seats 23 arranged in corresponding rows on the underside 10b of the base 10 of each tray 2. However, the first and third seats 21, 23 on each tray 2, and the second seats 22 on the lid 3, may of course also be of any other suitable number and/or arranged in any other suitable manner.

[0042] In the illustrated embodiment:

- each first seat 21 has the form of a pocket in the base 10 of the associated tray 2, wherein the first end 5a of the support elements 5 is adapted to fit, preferably with press fit, into this pocket; and
- each second and third seat 22, 23 comprises a protuberance 25, 26, wherein each support element 5 has a recess or cavity 5c at its second end 5b that mates with this protuberance 25, 26.

[0043] The first end 5a of each individual support element 5 has preferably the same design as the second end 5b of the support element, to thereby allow each support element 5 to be mounted with any of its two ends 5a, 5b facing the base 10 of the tray. In such case, both ends 5a, 5b of each support element 5 have to be adapted to mate with the first seats 21 on the upper side 10a of the base of each tray 2 and also with the second seats 22 on the underside 3b of the lid 3 and with the third seats 23 on the underside 10b of the base of each tray 2.

[0044] In the illustrated embodiment, the above-mentioned partition 14 has such a height that an upper part 14a of the partition 14 of a first tray 2 located immediately below a second tray in a stack 1 formed by two or more trays 2 is configured to be in contact with the underside 10b of the base 10 of the second tray to thereby allow the partition 14 of the first tray to provide support between the base 10 of the second tray and the base 10 of the first tray.

[0045] When a plurality of electric vehicle lithium-ion batteries are to be transported accommodated in a stack of trays 2 formed with a packaging system of the type described above, the following steps are performed:

- the electric vehicle lithium-ion batteries are accommodated in the interior cavity 13 of two or more trays 2;
- a plurality of support elements 5, preferably at least four support elements, are mounted to a respective first seat 21 on the upper side 10a of the base 10 of each tray 2;
- a stack 1 is formed on a pallet 4 with said trays 2 stacked on each other and with a lid 3 on the uppermost tray in the stack 1, wherein each one of the support elements 5 in each tray 2 in the stack 1 is aligned with one of the support elements 5 in each one of the other trays 2 in the stack 1 to thereby form several columns 7 of support elements 5, as illustrated in Fig 2, wherein each such column 7 extends between the upper side 10a of the base 10 of the tray at the bottom of the stack 1 and the underside 3b of the lid 3; and
- the stack 1 is secured to the pallet 4 by means of straps 6, which are applied around the lid 3 and the pallet 4 and then tightened and joined together by means of a strapping tool or strapping machine.

[0046] The invention is of course not in any way restricted to the embodiments described above. On the contrary, many possibilities to modifications thereof will be apparent to a person with ordinary skill in the art without departing from the basic idea of the invention such as defined in the appended claims.

Claims

1. A packaging system for accommodating products, such as electric vehicle lithium-ion batteries, during transportation and storage, the packaging system comprising:

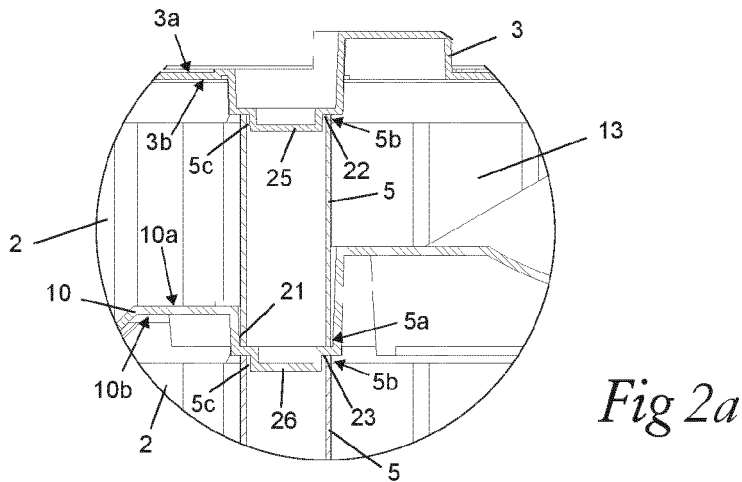
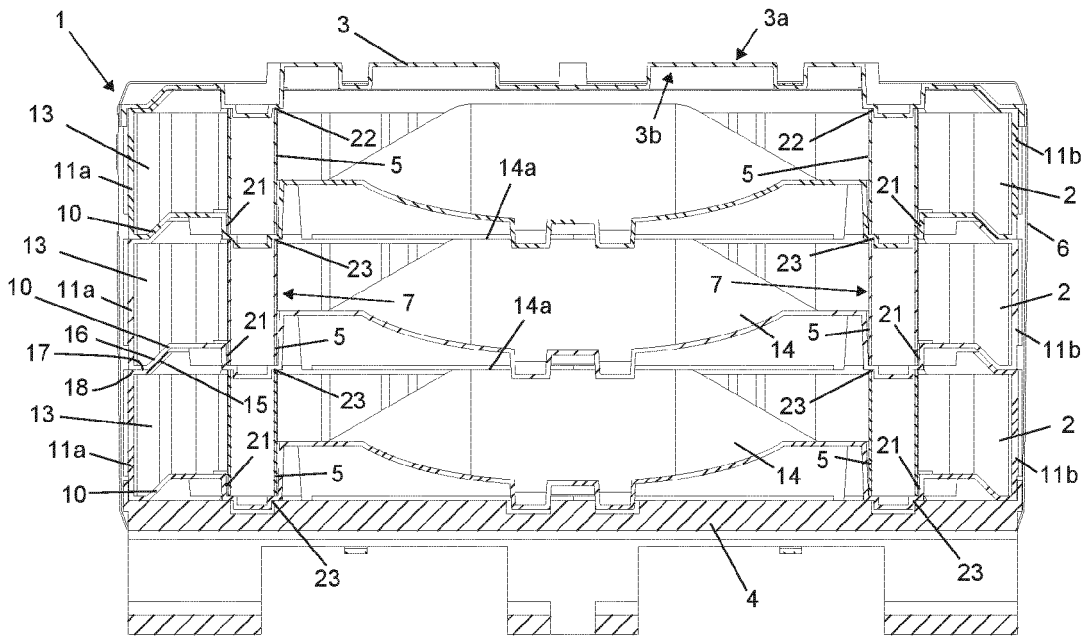
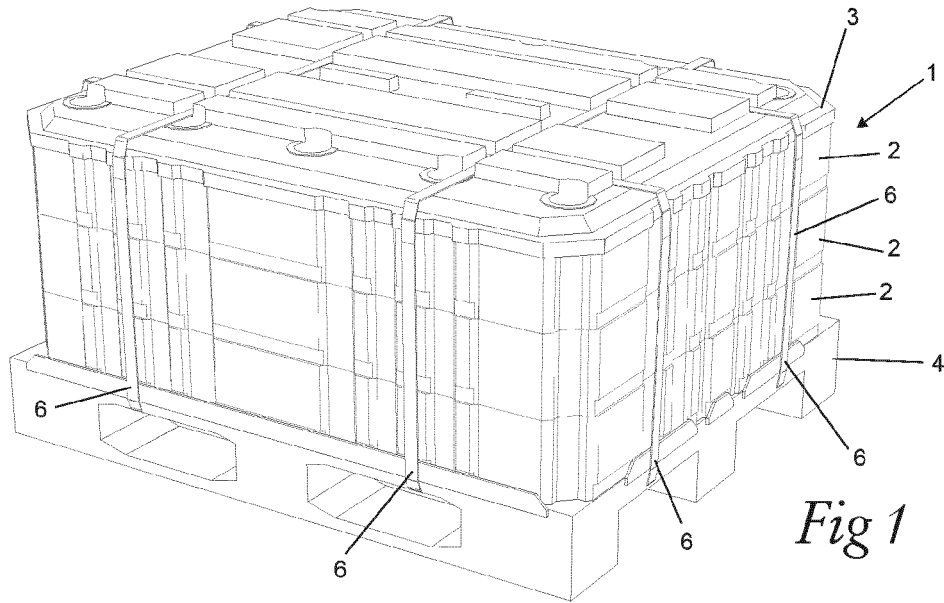
- at least one upwardly open thermoformed plastic tray (2) having a product supporting base (10) and sidewalls (11a-11d) integrally formed with the base (10) and extending upwardly from the base (10) along the circumference thereof, the sidewalls (11a-11d) defining an upper opening (12) of the tray, wherein the base (10) and the sidewalls (11a-11d) delimit an interior cavity (13) for receiving one or more products and wherein the base (10) has an upper side (10a) facing the interior cavity (13) of the tray and an opposite underside (10b); and
- a lid (3) of plastic material, which fits onto said at least one tray (2) so as to cover the upper opening (12) of the tray, the lid (3) having an underside (3b) configured to face the tray (2) when the lid is mounted onto the tray and an opposite upper side (3a),

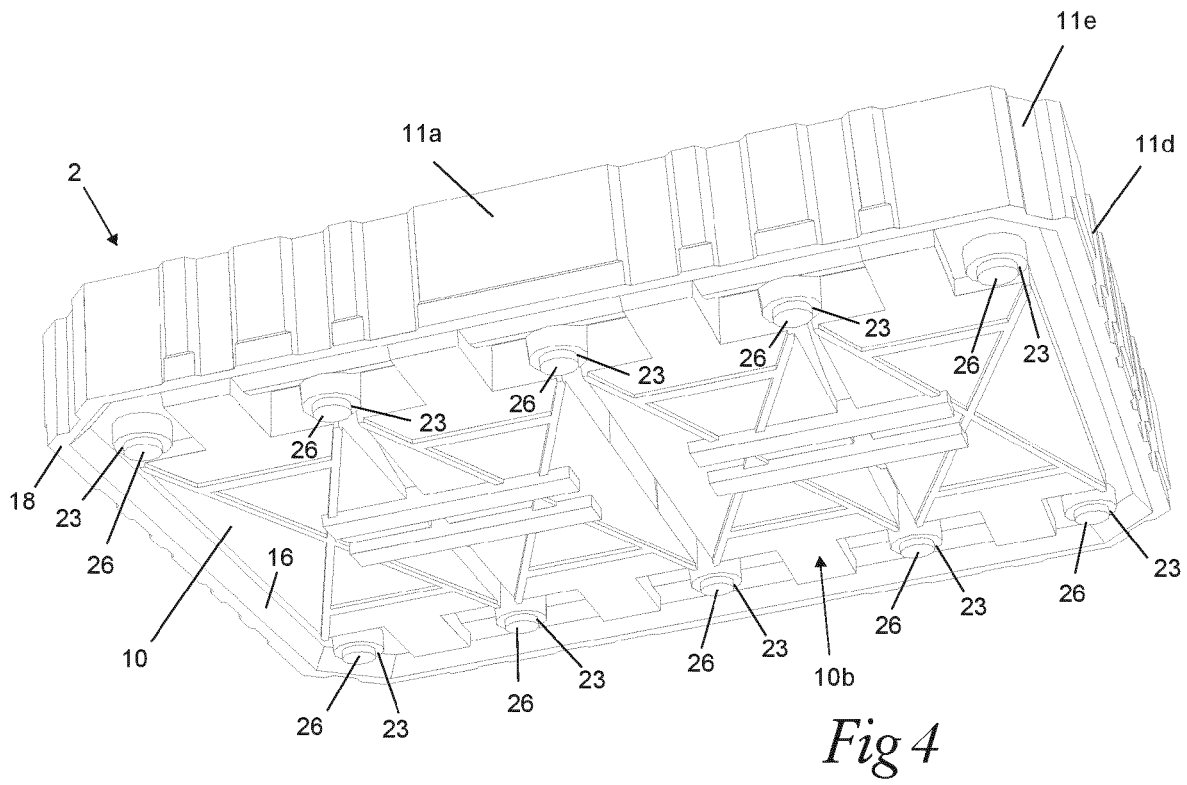
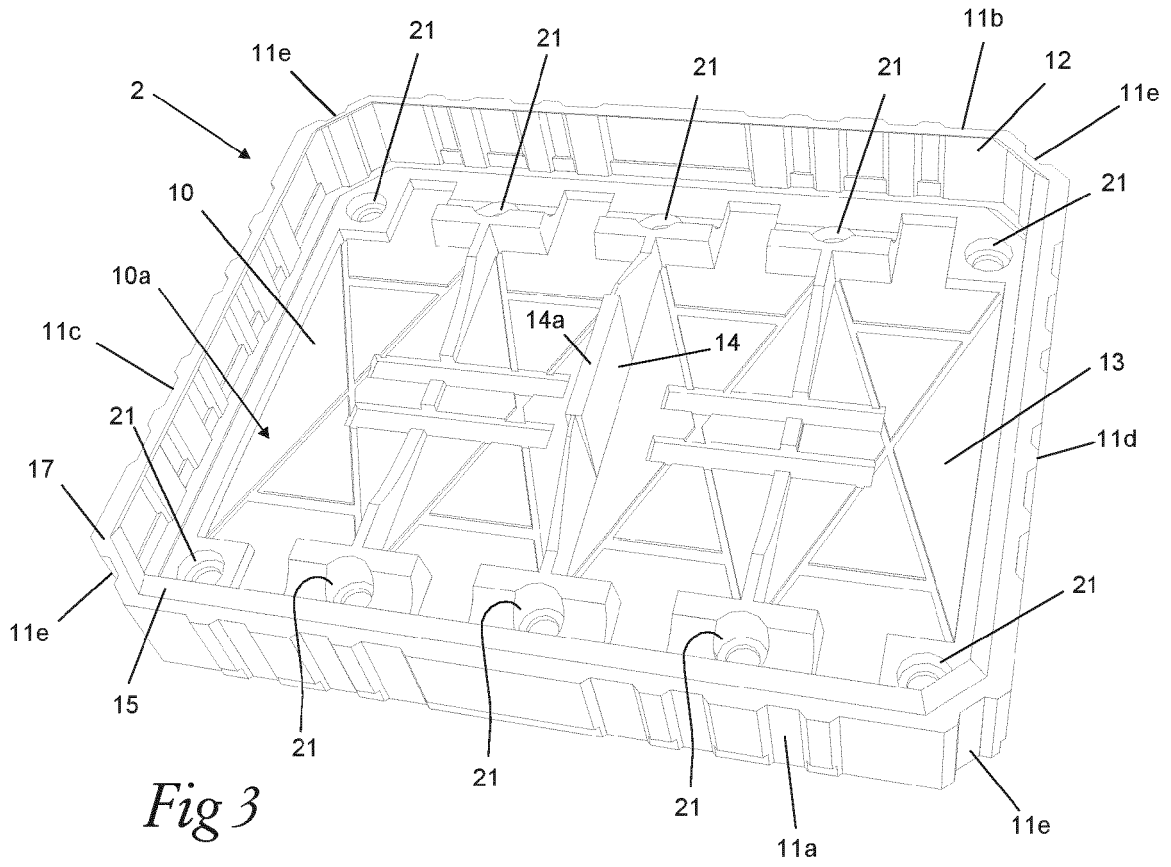
characterized in:

- **that** the packaging system further comprises several elongated support elements (5), preferably of plastic material;
 - **that** several first seats (21) adapted for connection to a respective one of said support elements (5) are provided on the upper side (10a) of the base (10) of said at least one tray (2), wherein the support elements (5) are vertically and detachably mountable to a respective one of these first seats (21) in order to extend through the interior cavity (13) of the tray between the base (10) of the tray and the lid (3), when the lid is mounted onto the tray (2), to thereby provide load bearing support between the lid (3) and the base (10) of the tray;
 - **that** several second seats (22) are provided on the underside (3b) of the lid (3) in such positions that each one of these second seats (22) is vertically aligned with one of the first seats (21) on the upper side (10a) of the base (10) of said at least one tray (2) when the lid (3) is mounted onto the tray (2); and
 - **that** each support element (5) has a first end (5a) adapted to mate with the first seats (21) on the upper side (10a) of the base (10) of said at least one tray (2) and an opposite second end (5b) adapted to mate with the second seats (22) on the underside (3b) of the lid (3).
2. A packaging system according to claim 1, **characterized in that** each first seat (21) on the upper side (10a) of the base (10) of said at least one tray (2) has the form of a pocket in the base (10), wherein the first end (5a) of the support elements (5) is adapted to fit into this pocket, preferably with press fit.
 3. A packaging system according to claim 1 or 2, **characterized in that** each second seat (22) on the underside (3b) of the lid (3) comprises a protuberance (25), wherein each support element (5) has a recess or cavity (5c) at its second end (5b) that mates with this protuberance (25).
 4. A packaging system according to any of claims 1-3, **characterized in:**
 - **that** several third seats (23) are provided on the underside (10b) of the base (10) of said at least one tray (2) opposite to a respective one of the first seats (21) on the upper side (10a) of the base (10), wherein the second end (5b) of the support elements (5) is adapted to mate with these third seats (23); and
 - **that** the packaging system comprises several such trays (2), wherein each tray (2) fits onto each one of the other trays (2) with the base (10) of the tray covering the upper opening (12) of the other tray such that the trays (2) are stackable on each other for the formation of a stack (1) consisting of two or more trays (2), a lid (3) on the uppermost tray (2) in the stack and support elements (5) vertically extending through the interior cavity (13) of each tray (2) in the stack between a respective first seat (21) and a respective second seat (22) or third seat (23).
 5. A packaging system according to claim 4, **characterized in that** each third seat (23) on the underside (10b) of the base (10) of each tray comprises a protuberance (26), wherein each support element (5) has a recess or cavity (5c) at its second end (5b) that mates with this protuberance (26).
 6. A packaging system according to claim 4 or 5, **characterized in that** the interior cavity (13) of each tray (2) is divided into separate compartments by means of at least one partition (14), which is integrally formed with the base (10) of the tray and extends upwardly from the base (10), wherein an upper part (14a) of the partition (14) of a tray (2) located immediately below another tray in a stack (1) is configured to be in contact with the underside (10b) of the base (10) of the other tray to thereby allow the partition (14) to provide support between the bases (10) of the trays.
 7. A packaging system according to any of claims 1-6, **characterized in that** the first end (5a) of each support element (5) is adapted to fit with press fit to each first seat (21) on the upper side (10a) of the base (10) of each tray.
 8. A packaging system according to any of claims 1-7, **characterized in that** the sidewalls of each tray (2) comprise two opposite longer sidewalls (11a, 11b) and two opposite shorter sidewalls (11c, 11d).
 9. A packaging system according to claim 7, **characterized in that** each tray (2) comprises a first group of first seats (21) arranged on the upper side (10a) of the base (10) of the tray in a first row along a first one (11a) of the two longer sidewalls and a second group of first seats (21) arranged on the upper side (10a) of the base (10) of the tray in a second row along the other longer sidewall (11b).
 10. A packaging system according to any of claims 1-9, **characterized in that** the support elements (5) are tubular and open at both ends (5a, 5b).
 11. A packaging system according to any of claims 1-10, **characterized in that** the support elements (5) are cylindrical.
 12. A packaging system according to any of claims 1-11, **characterized in that** each tray (2) is provided with

at least four, preferably at least six, and more preferably at least eight first seats (21) on the upper side (10a) of the base (10) of the tray.

13. A packaging system according to any of claims 1-12, **characterized in that** each tray (2) is thermoformed from a sheet of plastic material having a thickness of 8-12 mm. 5
14. A packaging system according to any of claims 1-13, **characterized in that** the lid (3) is thermoformed from a sheet of plastic material, preferably from a sheet of plastic material having a thickness of 8-12 mm. 10
15. A method for packing products using a packaging system according to any of claims 1-14, wherein the method comprises the steps of: 15
- accommodating the products in the interior cavity (13) of two or more trays (2), wherein a plurality of support elements (5), preferably at least four support elements (5), are mounted to a respective first seat (21) on the upper side (10a) of the base (10) of each tray; 20
 - forming a stack (1) on a pallet (4) with said two or more trays (2) stacked on each other and with a lid (3) on the uppermost tray in the stack (1), wherein each one of the plurality of support elements (5) in each tray (2) is aligned with one of the plurality of support elements (5) in each one of the other trays (2) to thereby form several columns (7) of support elements (5), each column (7) extending between the upper side (10a) of the base (10) of the tray at the bottom of the stack (1) and the underside (3b) of the lid (3); and 25
 - applying straps (6) around the lid (3) and the pallet (4) to thereby secure the stack (1) to the pallet. 30
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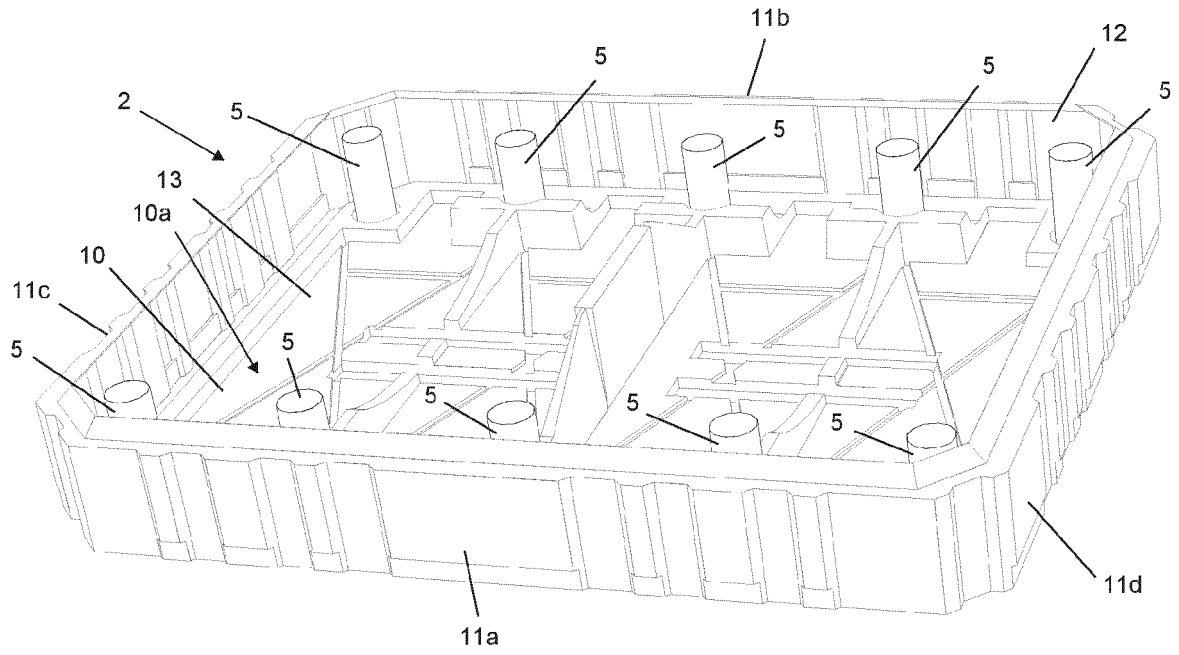


Fig 5

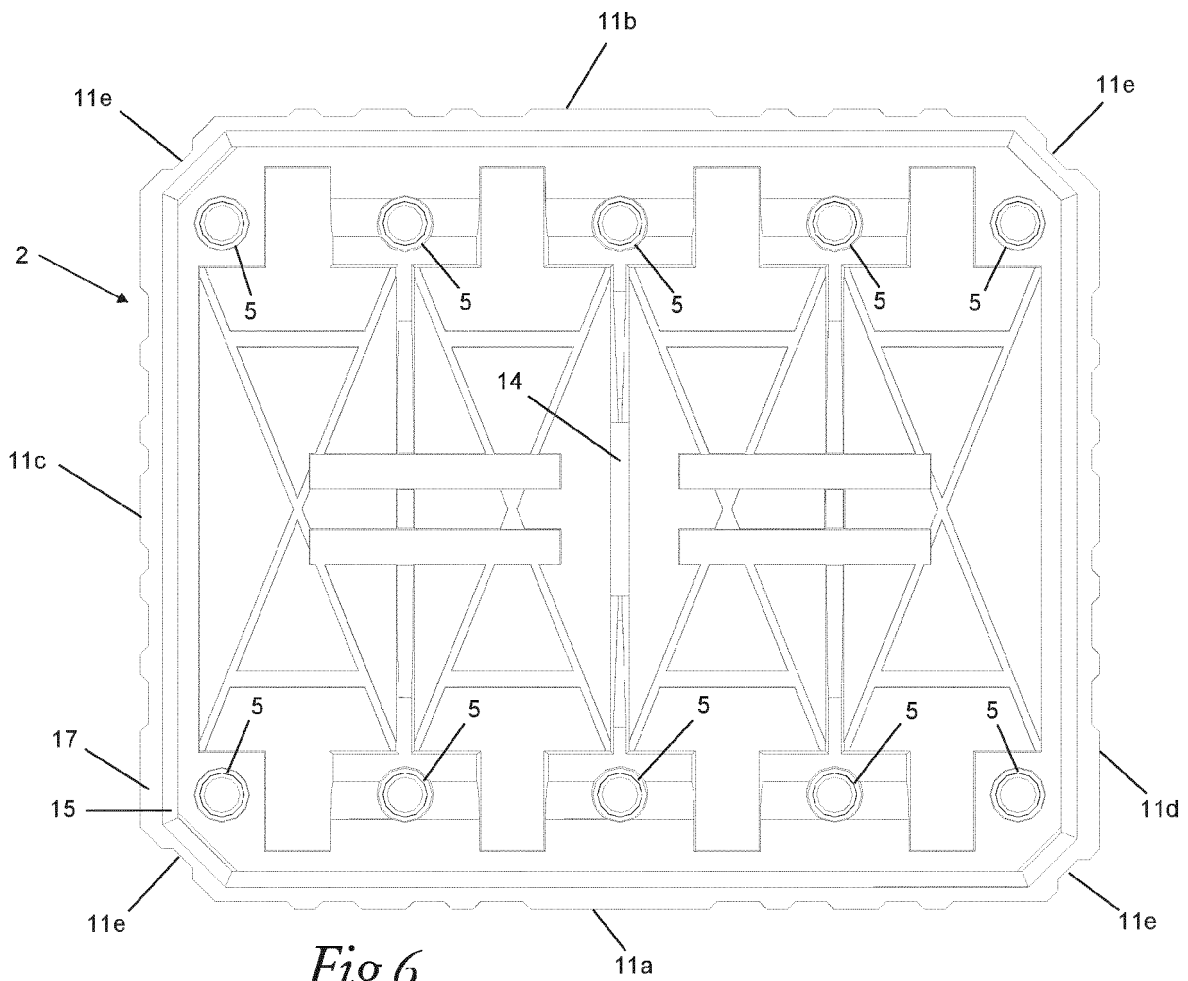


Fig 6

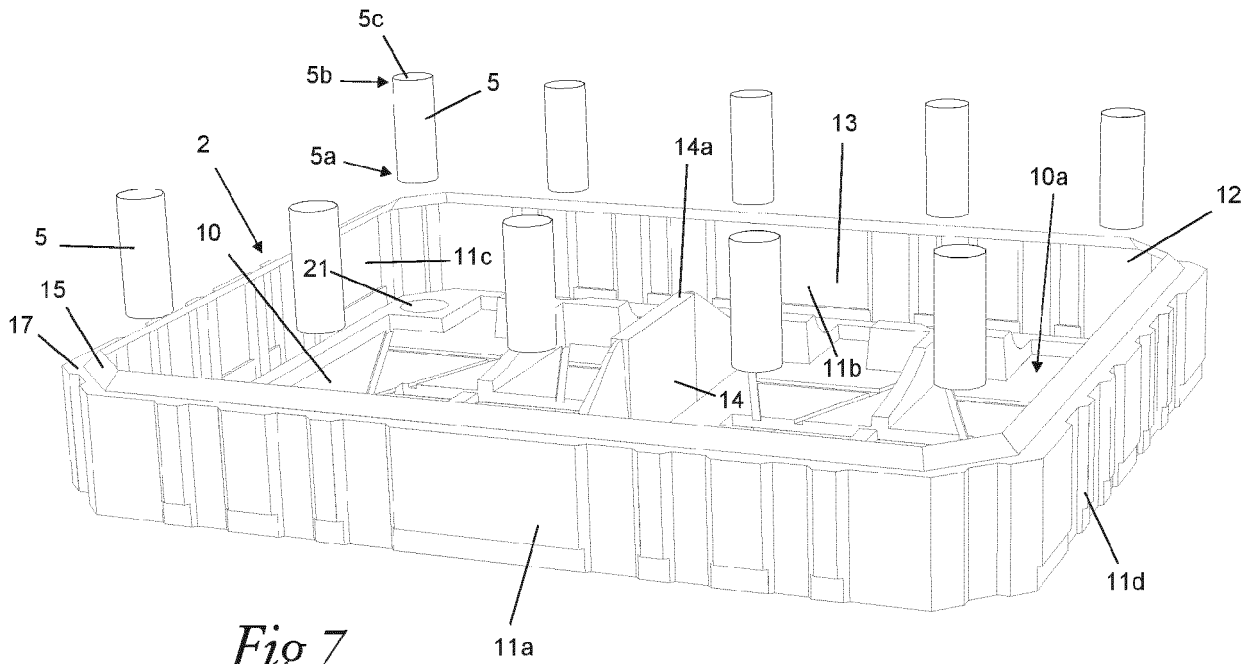


Fig 7

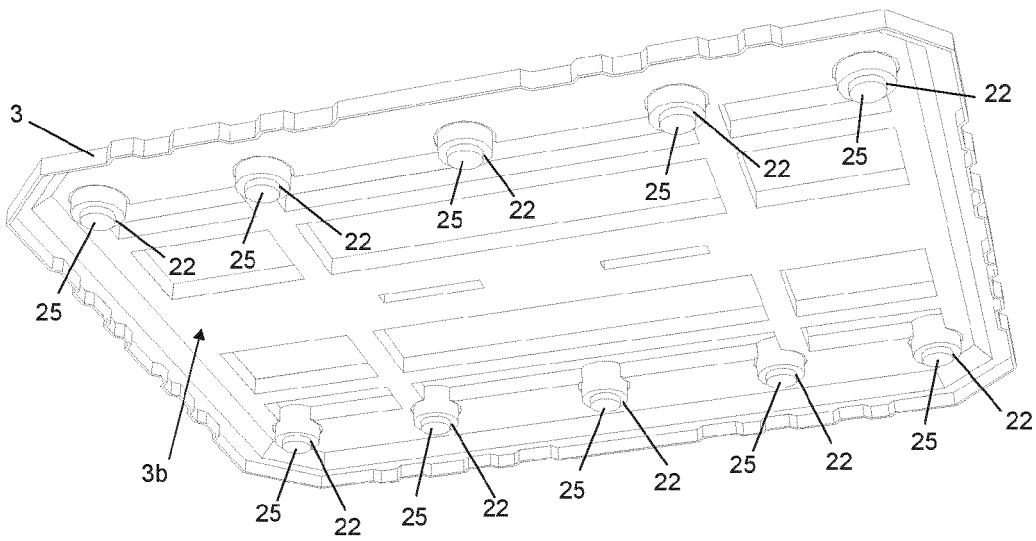


Fig 8

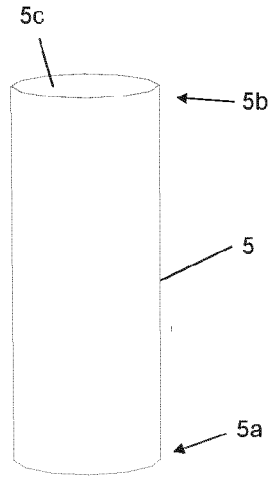


Fig 9a

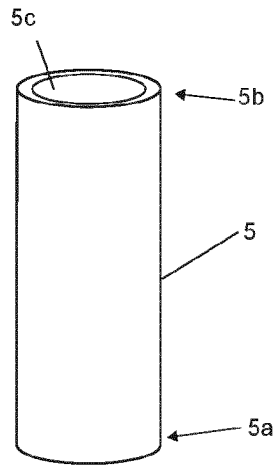


Fig 10a

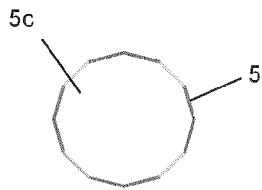


Fig 9b

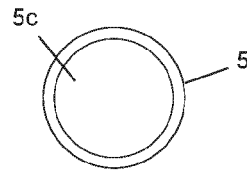


Fig 10b

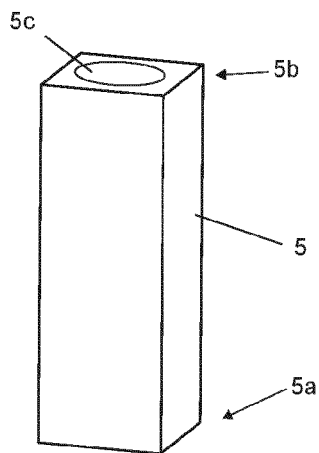


Fig 11a

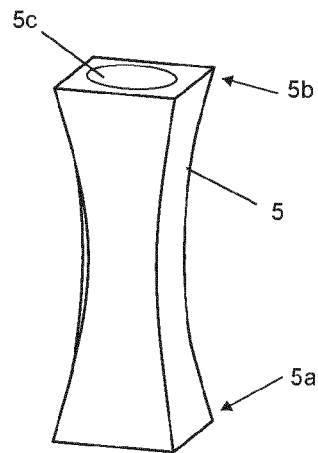


Fig 12a

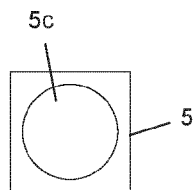


Fig 11b

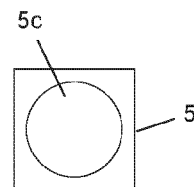


Fig 12b



EUROPEAN SEARCH REPORT

Application Number

EP 22 18 1180

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DOCUMENTS CONSIDERED TO BE RELEVANT

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2021/107694 A1 (WINDSOR SHAWN J [US] ET AL) 15 April 2021 (2021-04-15) * paragraph [0007] - paragraph [0075] * * figures 4-13 *	1-15	INV. B65D21/032 B65D21/036 B65D71/00
A	KR 1998 0053561 A (SAMSUNG CORNING CO LTD) 25 September 1998 (1998-09-25) * figures 1-5 *	1-15	ADD. B65D85/86 B65D85/88
A	WO 2020/165662 A1 (UPALE PRAVIN [IN]; MATHEW SHYNU [IN]) 20 August 2020 (2020-08-20) * page 7 - page 13; figures 1-10 *	1-15	
A	EP 2 824 035 A1 (FEURER FEBRA GMBH [DE]) 14 January 2015 (2015-01-14) * paragraph [0011] - paragraph [0015] * * figures 1-3 *	1-15	

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B65D

The present search report has been drawn up for all claims

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Place of search Munich	Date of completion of the search 2 December 2022	Examiner Fitterer, Johann
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CATEGORY OF CITED DOCUMENTS

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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02-12-2022

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