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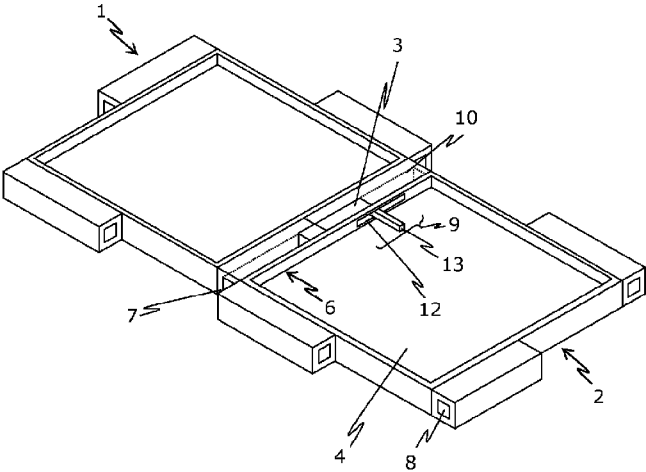


FIG. 1

(57) Abstract: Connection mechanism of afirst panel (1) and asecond panel (2) in a modular packaging, comprising a movable locking element (3), characterised in that the first panel (1) comprises a plate (4), at least one first edge band (5), attached to at least one edge of the plate (4), and the second panel (2) comprises the plate (4), at least one second edge band (6), attached to at least one edge of the plate (4), and the joining mechanism includes a first circumferentially closed profile (7), comprising a first through-hole (8), fixed on the surface of the first edge band (5), and that the locking mechanism (9) comprises a second circumferentially closed profile (10), fixed on the surface of the first edge band (5), and a second circumferentially closed profile (10), fixed on the second edge band (6), comprising a second through-hole (11), in which the movable locking element (3) is arranged, and wherein the connecting surface between the second edge band (6) and the second circumferentially closed profile (10) has a longitudinal slot (12) through through

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which a control arm (13) attached to the movable locking element (3) extends; and the first panel (1) is connected to the second panel (2) by a movable locking element (3) partially extended from the second through-hole (11) and partially inserted into the first through-hole (8) via a control arm (13) moved in the slot (12) and positioned in a fixed position, the the movable locking element (3) has a cross-section corresponding the shape of the cross-section of the first through-hole (8) or second through-hole (11) and fills it tightly.

PANEL CONNECTION MECHANISM AND METHOD OF CONNECTING PANELS IN MODULAR PACKAGING

The subject of the invention is a panel connection mechanism and a method of connecting panels in a modular packaging. In particular, the subject of the invention is a panel connection mechanism and a method of connecting panels by means of a panel connection mechanism in a reusable, foldable modular packaging.

In the prior art, modular packaging solutions are known. Patent document US5632392A discloses a collapsible container comprising a base, a first pair of opposing side walls hingedly mounted on one pair of opposing edges of the base, a second pair of opposing side walls hingedly mounted on one pair of opposing edges of the base and including flanges extending from both lateral end regions of the second pair of side walls towards the first pair of opposing side walls, and connecting means for providing toothed engagements between the flanges of the second pair of side walls and the corresponding lateral end regions of the first pair of side walls in an upright position. The collapsible container according to said document can be easily folded and exhibits good rigidity during use, however, it is a single size collapsible container without the option of modular panels from which different containers can be assembled.

Another patent document, EP0947434A2, relates to a container having a rectangular base and having side walls extending from the edges of the base. The base and side walls are formed by a plurality of rectangular wall panels joined together by respective pairs of cooperating sides, each cooperating side having one or more integral connecting formations thereon cooperating with one or more complementary connecting formations on the respective fitting side of an adjacent wall panel to form a channel extending along the fitting sides. A longitudinal locking member is engaged with the channel to secure the cooperating sides together. The solution according to said patent is, however, full of significant contradictions and deficiencies, and therefore does not fulfil its assumptions concerning panels which can be joined together in a modular and structurally stable manner, in contrast to the solution according to the invention. The lack of full modularity of the solution results from the use of the same spacing and size of the connecting formations on the wall panels. This allows only panels of the same size to be assembled, and connecting

panels of different sizes will be impossible due to the lack of space for inserting the longitudinal locking member into the resulting channel. The lack of structural stability is a result of the channel design and the lack of tight filling of the channel with the locking member. A semi-open, not circumferentially closed channel, subjected to stress, especially in linear connections, will tend to open and lose the channel geometry, which will destabilise the connection of panels and further loosen the channel filling with the locking member.

The foldable packaging known from the state of the art has many disadvantages. Commercially available are foldable packaging with fixed dimensions (similar to the solution from patent US5632392A), whose locking mechanisms and panel connections do not provide adequate stability. However, the market still needs modular packaging that will combine the universality and stability of connecting different panels with each other, from which structurally stable packagings of different sizes can be built.

The present disclosure aims to provide a mechanism and method for connecting panels in a modular packaging. It is therefore an object of the present disclosure to provide a solution that overcomes the problems of the prior art.

The subject of the invention is a panel connection mechanism for connecting a first panel and a second panel in a modular packaging, comprising a movable locking element, characterised in that

the first panel comprises a plate, at least one first edge band attached to at least one edge of the plate, and the second panel comprises a plate, at least one second edge band attached to at least one edge of the plate,

and the connecting mechanism comprises

a first circumferentially closed profile comprising a first through-hole attached to the surface of the first edge band,

and

a locking mechanism comprising a second circumferentially closed profile attached to a second edge band and comprising a second through-hole in

which a movable locking element is arranged, and wherein a longitudinal slot is arranged in the connecting surface of the second edge band and the second circumferentially closed profile through which a control arm attached to the movable locking element extends;

and the first panel is connected to the second panel by a movable locking element partially extended from the second through-hole and partially inserted into the first through-hole via a control arm moved in the slot and positioned in a fixed position,

and the movable locking element has a cross-section corresponding to the shape of the cross-section of the first through-hole or the second through-hole and tightly fills it.

It is advantageous when the first circumferentially closed profile has a length equal to or shorter than the movable locking element, and when the movable locking element, the first through-hole and the second through-hole have the shape of a rectangle in cross-section. Equally advantageously, the movable locking element, the first through-hole and the second through-hole have the shape of a circle in cross-section.

Advantageously, the movable locking element comprises an internal spring. At least one projection is provided on the second panel plate for locking the control arm when the movable locking element is extended from the second circumferentially closed profile. The first circumferentially closed profile and the locking mechanism may advantageously be provided on the surface of the first edge band or on the surface of the second edge band.

Preferably, more than one first circumferentially closed profile is provided on the surface of the first edge strip or the second edge strip. Equally preferably, more than one locking mechanism is provided on the surface of the first edge strip or the second edge strip.

Preferably, the movable locking element has a rounded end.

Preferably, two connected locking mechanisms are attached to the surface of the second edge band, the movable locking elements of which are configured to extend along the same axis but in opposite directions, and two first circumferentially closed profiles are attached to the surface of the first edge band, arranged in a manner adapted to the connected locking mechanisms. More preferably, each first circumferentially closed profile is placed on a different edge band.

The connected locking mechanisms are preferably arranged axially on the surface of the second edge band, and a spring is preferably arranged between the movable locking elements, and at least one rail is arranged on the surface of the second panel, directed perpendicularly to the nearest edge of the panel, on which a movable cover plate is mounted, comprising a first opening and a second opening, and projections are arranged on the control arms, which are movably arranged in the openings. More preferably, three parallel rails are arranged on the plate of the second panel, and the cover plate has the shape of an isosceles triangle with a truncated vertex facing the nearest edge of the second panel, and is arranged with guides on the rails in such a way that a rail is arranged under each vertex, and the first opening and the second opening of the cover plate are arranged along the arms of the triangle, obliquely to the nearest edge of the second panel. Preferably, a lock is attached to the cover plate, and at least one recess is arranged on the second rail, configured to lock the cover plate in a fixed position with a lock.

The subject of the invention is a method of connecting a first panel and a second panel by means of the said first panel and second panel connecting mechanism in a modular packaging comprising a movable locking member, such that:

the first panel comprises a plate, at least one first edge band attached to at least one edge of the plate, and the second panel comprises a plate, at least one second edge band attached to at least one edge of the plate,

and the connecting mechanism comprises

a first circumferentially closed profile having a first through-hole attached to the surface of the first edge band,

and

a locking mechanism comprising a second circumferentially closed profile attached to the second edge band, having a second through-hole in which a movable locking element is arranged, and wherein the connecting surface of the second edge band and the second circumferentially closed profile includes a longitudinal slot through which a control arm attached to the movable locking element extends;

and the first panel is connected to the second panel by a movable locking element partially extended from the second through-hole and partially inserted into the first through-hole by means of a control arm moved in the slot and placed in a fixed position,

and the movable locking element has a cross-section corresponding in shape to the cross-section of the first through-hole or the second through-hole and tightly fills it

characterised in that the first panel and the second panel are brought together edge to edge in such a way that the first circumferentially closed profile is aligned on the same axis with the locking mechanism, whereupon the first panel and the second panel are locked in a fixed position by moving the control arm in a slot that causes the movable locking element to slide out of the second through-hole in such a way that the movable locking element is partially inserted into the first through-hole and the remaining part thereof remains in the second through-hole, locking the first panel and the second panel in the fixed position.

Advantageously, the first panel and the second panel are brought together edge to edge in such a way that the first circumferentially closed profiles are in one axis with the locking mechanisms, and the cover plate is moved away from the edge of the second panel, whereby the movable locking elements are inserted in the second circumferentially closed profiles, and then the cover plate is moved along at least one rail towards the nearest edge of the second panel, causing the projections in the openings to move and the control arms to spread apart, which causes the movable locking elements to slide out of the second through-holes and their parts to be inserted into the first through-holes, and their ends together with the control arms

remain in the second through-holes, locking the first panel and the second panel in a fixed position.

Preferably, the first panel and the second panel are connected in one plane.

Preferably, the first panel and the second panel are connected perpendicularly to each other.

Preferably, after the cover plate is moved to a position extending the movable locking elements from the second through-holes, such position of the cover plate is locked by means of a lock.

The edge band according to the invention is a flat and elongated strip made of a material identical to the material from which the panel is made and attached to the edge of the panel.

The subject of the invention will be presented in the embodiment examples in the drawing, in which:

Fig. 1 shows a schematic perspective view of a first panel (1) connected to a second panel (2) by means of a connecting mechanism.

Fig. 2 shows a schematic longitudinal section of a movable locking element (3) comprising a spring (14) and a rounded end (16).

Fig. 3a shows a schematic view of the first panel (1) or the second panel (2), on one edge band (5, 6) of which there is both a locking mechanism (9) and a first circumferentially closed profile (7) with a through-hole (8).

Fig. 3b shows a schematic view of the first panel (1) or the second panel (2), on one edge band (5, 6) of which there are two unconnected locking mechanisms (9), with visible projections (15) locking the control arms (13).

Fig. 4 shows the first (1) and second (2) panels with connected locking mechanisms (9) on the surface of the second edge band (6) and with first circumferentially closed profiles (7) fitted thereto on the surface of the first edge band (5) in a view before connection.

Fig. 5 shows a view of the connection mechanism, where two locking mechanisms (9) are connected, and the movable locking elements (3) pass through the longitudinal slots (12) of the second circumferentially closed profiles (10), and a spring (17) is located between them to facilitate the extension of the movable locking elements from the second circumferentially closed profiles.

Fig. 6A-C show a view of the connection mechanism on which the control arm (13) moves in the longitudinal slot (12).

Fig. 7A-B show the cover plate (19) in the open position with the movable locking elements (3) extended and in the closed position with the movable locking elements (3) inserted into the through-holes (8), and Fig. 7B further shows the method of attaching the lock (24) to the cover (19) and the recess (25) for the lock (24) in the fixed position.

Fig. 8 shows a schematic representation of the modular packaging after assembly, wherein the modular wall (26) is composed of four panels (1) and a tunnel (27) for a movable locking element (3) is provided at the edges of the packaging.

Fig. 9A shows a movable locking element of the first type (28) comprising a longitudinal slot (29) dividing the ends into a first part (30) and a second part (31), and an opening (32).

Fig. 9B shows a second type of locking element (33), the second end of which is provided with an elongated protruding element (34), and on opposite sides of the protruding element (34) there are projections (35).

Fig. 10 shows a schematic arrangement of the first type (28) and second type (33) locking elements in the edges of the base (36) and the edges of the walls (37) of the modular packaging.

Fig. 11 shows a schematic representation of the panel (1, 2) plate (4) in which a window (39) is located.

Fig. 12 shows a schematic representation of the panel (1, 2) plate (4) with a perforated or openwork structure.

The symbols in the figures in the drawing correspond to the following elements:

- 1 First panel
- 2 Second panel
- 3 Movable locking element
- 4 Panel plate
- 5 First edge band
- 6 Second edge band
- 7 First circumferentially closed profile
- 8 First through-hole
- 9 Locking mechanism
- 10 Second circumferentially closed profile
- 11 Second through-hole
- 12 Slot
- 13 Control arm
- 14 Inner spring
- 15 Control arm locking projection
- 16 Rounded end of movable locking element
- 17 Spring between locking elements
- 18 Rail
 - a. Rail 2
 - b. Rail 3

- 19 Cover plate
- 20 First hole
- 21 Second hole
- 22 Projection
- 23 Truncated vertex of isosceles triangle
- 24 Lock
- 25 Recess
- 26 Modular wall
- 27 Tunnel
- 28 Movable locking element of the first type
- 29 Slot
- 30 First part of a movable locking element
- 31 Second part of a movable locking element
- 32 Hole of a movable locking element
- 33 Locking element of the second type
- 34 Protruding element
- 35 Projections
- 36 Base edge
- 37 Side wall edge
- 38 Base corner
- 39 Window

In an embodiment of the invention, the mechanism for connecting a first panel **1** and a second panel **2** in a modular packaging comprises a movable locking member **3** and comprises a first panel **1** comprising a plate **4**, wherein a first edge band **5** is attached to the edge of the plate **4**, and a second panel **2** comprising a plate **4**, wherein a second edge band **6** is attached to the edge of the plate **4**. The connecting mechanism itself comprises a first circumferentially closed profile **7**, which in turn comprises a first through-hole **8** attached to the surface of the first edge band **5**, and a locking mechanism **9**, consisting of a second circumferentially closed profile **10** attached to the second edge band **6**, comprising a second through-hole **11** in which a movable locking element **3** is located, and wherein in the connecting surface of the second edge band **6** and the second circumferentially closed profile **10** there is a longitudinal slot **12** through which a control arm **13** attached to the movable locking element **3** passes. The said first panel **1** is connected to the second panel **2** by a movable locking element **3** partially extended from the second through-hole **11** and partially inserted into the first through-hole **8** by means of a control arm **13** moved in the slot **12** and placed in a fixed position. The movable locking element **3** has a cross-section corresponding in shape to the cross-section of the first through-hole **8** or the second through-hole **11** and tightly fills it. The first circumferentially closed profile **7** has a length equal to the length of the movable locking element **3**. The said movable locking element **3**, the first through-hole **8** and the second through-hole **11** have a rectangular shape in cross-section. In the embodiment, the movable locking element **3** comprises an internal spring **14**. On the plate **4** of the second panel **2** there is a locking projection **15** of the control arm **13** when the movable locking element **3** is extended from the second circumferentially closed profile **10**. In this embodiment, the first circumferentially closed profile **7** and the locking mechanism **9** are located on the surface of the first edge band **5** or on the surface of the second edge band **6**. On the surface of the first edge band **5** and the second edge band **6** there are two first circumferentially closed profiles **7** and two locking mechanisms **9**. The movable locking element **3** has a rounded end **16**.

On the surface of the second edge band **6** there are attached two connected locking mechanisms **9**, the movable locking elements **3** of which are configured to slide out along the same axis but in opposite directions, and on the surface of the first edge band **5** there are attached two first circumferentially closed profiles **7** arranged in a

manner adapted to the connected locking mechanisms **9**. Each first circumferentially closed profile **7** is placed on a different edge band **5**, **6**. The connected locking mechanisms **9** are placed axially on the surface of the second edge band **6**.

There is a spring **17** between the movable locking elements **3**. On the surface of the second panel **2** there is one rail **18** directed perpendicularly to the nearest edge of the panel, on which a movable cover plate **19** is mounted, comprising a first opening **20** and a second opening **21**, and on the control arms **13** there are projections **22**, which are movably arranged in the openings **20**, **21**. On the plate **4** of the second panel **2** there are three parallel rails **18**, **18a**, **18b**, and the cover plate **19** has the shape of an isosceles triangle with a truncated vertex **23** facing the nearest edge of the second panel **2** and is placed by guides on the rails in such a way that there is a rail **18**, **18a**, **18b** under each vertex, and the first opening **20** and the second opening **21** of the cover plate **19** are placed along the arms of the triangle, diagonally to the nearest edge of the second panel **2**. Furthermore, a lock **24** is attached to the cover plate **19** and at least one recess **25** is provided on the second rail **18b**, configured to lock the cover plate **19** in a fixed position with the lock **24**.

In another embodiment, the movable locking element **3**, the first through-hole **8** and the second through-hole **11** have a circular shape in cross-section.

An embodiment of the method according to the invention comprises connecting a first panel **1** and a second panel **2** by means of a mechanism according to the invention, wherein the first panel **1** and the second panel **2** are brought together edge to edge in such a way that the first circumferentially closed profile **7** is aligned with the locking mechanism **9**, whereupon the first panel **1** and the second panel **2** are locked in a fixed position by moving the control arm **13** in the slot **12**, which causes the movable locking element **3** to slide out of the second through-hole **11** in such a way that the movable locking element **3** is partially inserted into the first through-hole **8** and the remaining part thereof remains in the second through-hole **11**, locking the first panel **1** and the second panel **2** in a fixed position. The first panel **1** and the second panel **2** are brought together edge to edge in such a way that the first circumferentially closed profiles **7** are in one axis with the locking mechanisms **9**, and the cover plate **19** is moved away from the edge of the second panel **2**, as a result of which the movable locking elements **3** are inserted in the second

circumferentially closed profiles **10**, after which the cover plate **19** is moved along the rail **18** towards the nearest edge of the second panel **2**, causing the projections **22** to move in the holes **20**, **21** and the control arms **13** to spread apart, which in turn causes the movable locking elements **3** to slide out of the second through-holes **11** and their parts to be inserted into the first through-holes **8**, and their ends together with the control arms **13** remain in the second through-holes **11**, blocking the first panel **1** and the second panel **2** in a fixed position. The first panel **1** and the second panel **2** are connected perpendicularly to each other. After moving the cover plate **19** to the position extending the movable locking elements **3** from the second through-holes **11**, such position of the cover plate **19** is blocked by means of the lock **24**.

In an embodiment of the invention, the modular packaging comprises modular walls **26**, wherein each modular wall **26** consists of four first panels **1**, and adjacent panels **1** are mutually connected along the edges, such that the first panel **1** comprises a plate **4** and a first edge band **5** attached to the edge of the plate **4**, on which a first circumferentially closed profile **7** with a first through-hole **8** is placed, and adjacent panels **1** are mutually connected by a movable locking element **3** placed in a tunnel **27** formed at the edge by the first through-hole **8** of the first panel **1** and the first through-hole **8** of the second, adjacent first panel **1**, and the movable locking element **3** is longer than the length of the tunnel **27** through which it passes and has a cross-section corresponding to the cross-section of the tunnel **27** and tightly fills it. Each of the circumferentially closed profile **7**, the movable locking element **3**, the first through-hole **8** and the tunnel **27** have a rectangular cross-section. In addition, the first type of movable locking element **28** comprises in both ends a longitudinal slot **29** running along the axis of the first type of movable locking element **28**, which divides the ends into a first part **30** and a second part **31**, which parts are parallel to each other, and in each end part there is an opening **32**. In turn, the movable locking element of the second type **33** comprises at one end a longitudinal slot **29** running along the axis of the movable locking element of the second type **33**, which divides the end into a first part **30** and a second part **31**, which parts are also parallel to each other, and in each part of the end there is an opening **32**. At the other end of the movable locking element of the second type **33** there is a longitudinal, protruding element **34** matching the shape of the slot **29**, and on the opposite sides of the

protruding element **34** there are projections **35** arranged in one axis, perpendicular to the axis of the movable locking element of the second type **33**.

In another embodiment of the packaging according to the invention, each of the circumferentially closed profile **7**, the movable locking element **3**, the first through opening **8** and the tunnel **27** have a circular shape in cross-section. In yet another embodiment of the packaging according to the invention, the movable locking element **3** has a cross-shaped shape in cross-section and fills the tunnel **27** in such a way that the ends of the arms of the cross are located in the corners of the tunnel **27**.

In an example of the implementation of the method of folding the packaging according to the invention, one modular wall **26** is the base and comprises a first panel **1**, a first circumferentially closed profile **7** is located on each edge of the base **36**, and a side wall is applied to each edge of the base **36**, consisting of a modular wall **26** comprising a first panel **1** and having a first circumferentially closed profile **7** on each edge of the side wall **37**, wherein a side wall with a matching arrangement of first circumferentially closed profiles **7** is applied to the edge of the base **36** in such a way that a tunnel **27** is formed on each edge of the base **36**, and movable locking elements of the second type **33** are successively placed in the tunnels **27** of the edge of the base **36**, which are connected in the corners of the base **38** in such a way that the protruding element **34** of one movable locking element of the second type **33** enters the slot **29** of the second movable locking element of the second type **33** and is locked in a fixed position by means of the projections **35** entering the holes **32**, and the penultimate movable locking element in the base is of the first type **28** and has the length of the tunnel **27** through which it passes, increased by a length suitable for connecting with one slot **29** at the corner **38** with the protruding element **34** of the movable locking element of the second type **33** previously placed in the adjacent channel, and the last movable locking element is of the second type **33** and its protruding element **34** enters the slot **29** of another movable locking element of the second type **33**, and the end comprising the slot **29** blocks the penultimate movable locking element from sliding out, then movable locking elements of the first type **28** are placed in the tunnels **27** formed in the edges of the side walls, and then a second base with a matching arrangement of the first circumferentially closed

profiles **7** is applied, in which movable locking elements of the first type **28** and of the second type **33** are placed in a manner analogous to the method described for the first base.

In an embodiment of the invention, the panel **1, 2** for constructing the modular packaging according to the invention is made of regranulate polypropylene (PP) and has a perforated structure. In another embodiment, the panel **1, 2** is made of plastic and has an openwork structure.

The modular measure (md) of the modular packaging according to the invention is a panel **1, 2** of which all sides have the same length. In an embodiment, the panel **1, 2** has a height of 220 mm and a width of 220 mm, while the adjacent panels **1, 2** are connected along the edges **36, 37** of the length of 220 mm, and on the edge of the first panel there is a circumferentially closed profile **7** of the length of 110 mm, placed axially in the middle of the edge, and on the edge of the second modular panel there are two circumferentially closed profiles **7** of the length of 54 mm each, placed at the ends of the edges. The packaging made of such panels will be a cube with internal dimensions of 220 mm x 220 mm x 220 mm (length x width x height).

There may also be panels of other dimensions, the gradation of which is done by a dimensional step of $\frac{1}{4}$ md:

- height 165.5 mm ($\frac{3}{4}$ md), width 220 mm (1 md),
- height 109.5 mm ($\frac{1}{2}$ md), width 220 mm (1md),
- height 55 mm ($\frac{1}{4}$ md), width 220 mm (1 md),
- height 165.5 mm ($\frac{3}{4}$ md), width 165.5 mm ($\frac{3}{4}$ md),
- height 109.5 mm ($\frac{1}{2}$ md), width 109.5 mm ($\frac{1}{2}$ md),
- height 55 mm ($\frac{1}{4}$ md), width 55 mm ($\frac{1}{4}$ md),

In the embodiment of the panel 165.5 mm high and 220 mm wide, adjacent panels **1, 2** are joined along an edge **37** of length 165.5 mm such that a on the edge of the first panel there is a 110 mm long circumferentially closed profile **7** located at one end of the edge, and a 54 mm long circumferentially closed profile **7** is located at the edge

of the second modular panel located at the end of the other edge, and along the edge **36** of length 220 mm the panels **1**, **2** are joined such that on the edge of the first panel **1** there is a 110 mm long circumferentially closed profile **7** located axially in the middle of the edge, and a two 54 mm long circumferentially closed profiles **7** are located at the edge of the second modular panel **2**, located at the ends of the edges. The packaging formed from panels according to this embodiment will be a cuboid.

Different side dimensions, graduated by $\frac{1}{4}$ md dimensional steps, enable the construction of packagings that create solids with different internal dimensions, for example:

Cube (length x width x height):

$1\text{md} \times 1\text{md} \times 1\text{md}$ or $\frac{3}{4}\text{md} \times \frac{3}{4}\text{md} \times \frac{3}{4}\text{md}$ or $\frac{1}{2}\text{md} \times \frac{1}{2}\text{md} \times \frac{1}{2}\text{md}$ or $2\text{md} \times 2\text{md} \times 2\text{md}$ or $2\frac{1}{2}\text{md} \times 2\frac{1}{2}\text{md} \times 2\frac{1}{2}\text{md}$ etc.

Cuboid (length x width x height):

$1\text{md} \times 1\text{md} \times \frac{1}{4}\text{md}$ or $1\text{md} \times 1\text{md} \times \frac{3}{4}\text{md}$ or $1\text{md} \times 1\text{md} \times 2\text{md}$ or $1\frac{1}{2}\text{md} \times 1\frac{1}{2}\text{md} \times 2\text{md}$ etc.

In addition, there may also be panels of other dimensions, the gradation of which is made by a dimensional step of, but not limited to, preferably $\frac{1}{5}$ md, $\frac{1}{6}$ md, $\frac{1}{7}$ md.

In other embodiments, the packagings are in the shape of the letter "L", "T" or "U".

The invention presents advantages over known and commercially available packagings, in line with the assumptions of the circular economy. The advantage of the solution is the ability to create many dimensions of panels, which are then combined to create packaging with shapes tailored to the individual needs of the user. The modularity of the solution, as well as the possibility of using many panels in one packaging, allows for easy and quick change of the dimensions of the packaging, in accordance with the given dimensions of the packaging to be transported and its easy return, because the packaging will take up very little space after unfolding. In addition, this feature allows for the replacement and repair of a single element, without the need to replace the entire packaging with a new one,

which not only saves time but is also beneficial for the environment. The use of recycled materials additionally reduces the carbon footprint, and the possibility of its multiple use and adaptation to specific needs reduces the consumption of disposable packaging (e.g. cardboard) and the need to produce new plastic packaging.

CLAIMS:

1. A panel connection mechanism for connecting a first panel (1) and a second panel (2) in a modular packaging, comprising a movable locking element (3), characterised in that

the first panel (1) comprises a plate (4), at least one first edge band (5) attached to at least one edge of the plate (4), and the second panel (2) comprises a plate (4), at least one second edge band (6) attached to at least one edge of the plate (4),

and the connecting mechanism comprises

a first circumferentially closed profile (7) comprising a first through-hole (8) attached to the surface of the first edge band (5),

and

a locking mechanism (9) comprising a second circumferentially closed profile (10) attached to a second edge band (6) and comprising a second through-hole (11) in which a movable locking element (3) is arranged, and wherein a longitudinal slot (12) is arranged in the connecting surface of the second edge band (6) and the second circumferentially closed profile (10) through which a control arm (13) attached to the movable locking element (3) extends;

and the first panel (1) is connected to the second panel (2) by a movable locking element (3) partially extended from the second through-hole (11) and partially inserted into the first through-hole (8) via a control arm (13) moved in the slot (12) and positioned in a fixed position,

and the movable locking element (3) has a cross-section corresponding to the shape of the cross-section of the first through-hole (8) or the second through-hole (11) and tightly fills it.

2. The mechanism according to claim 1, characterised in that the first circumferentially closed profile (7) has a length equal to or shorter than the movable locking element (3).
3. The mechanism according to any one of claims 1 or 2, characterised in that the movable locking element (3), the first through-hole (8) and the second through-hole (11) have a rectangular shape in cross-section.
4. The mechanism according to any one of claims 1 or 2, characterised in that the movable locking element (3), the first through-hole (8) and the second through-hole (11) have a circular shape in cross-section.
5. The mechanism according to any one of claims 1 to 4, characterised in that the movable locking element (3) comprises an internal spring (14).
6. The mechanism according to any one of claims 1 to 5, characterised in that at least one locking projection (15) of the control arm (13) is provided on the plate (4) of the second panel (2) when the movable locking element (3) is extended from the second circumferentially closed profile (10).
7. The mechanism according to any one of claims 1 to 6, characterised in that the first circumferentially closed profile (7) and the locking mechanism (9) can be located on the surface of the first edge band (5) or on the surface of the second edge band (6).
8. The mechanism according to any one of claims 1 to 7, characterised in that more than one first circumferentially closed profile (7) is provided on the surface of the first edge band (5) or the second edge band (6).
9. The mechanism according to any one of claims 1 to 8, characterised in that more than one locking mechanism (9) is provided on the surface of the first edge band (5) or the second edge band (6).
10. The mechanism according to any one of claims 1 to 9, characterised in that the movable locking element (3) has a rounded end (16).

11. The mechanism according to any one of claims 1 to 10, characterised in that two connected locking mechanisms (9) are attached to the surface of the second edge band (6), the movable locking elements (3) of which are configured to slide along the same axis but in opposite directions, and two first circumferentially closed profiles (7) are attached to the surface of the first edge band (5), arranged in a manner adapted to the connected locking mechanisms (9).

12. The mechanism according to claim 11, characterised in that each first circumferentially closed profile (7) is placed on a different edge band (5, 6).

13. The mechanism according to claim 11 or 12, characterised in that the connected locking mechanisms (9) are arranged axially on the surface of the second edge band (6).

14. The mechanism according to claim 11, 12 or 13, characterised in that a spring (17) is provided between the movable locking elements (3).

15. The mechanism according to any one of claims 11 to 14, characterised in that on the surface of the second panel (2) there is at least one rail (18) directed perpendicularly to the nearest edge of the panel, on which a movable cover plate (19) is mounted, comprising a first opening (20) and a second opening (21), and on the control arms (13) there are projections (22) which are movably arranged in the openings (20, 21).

16. The mechanism according to claim 15, characterised in that the plate (4) of the second panel (2) has three parallel rails (18, 18a, 18b), and the cover plate (19) has the shape of an isosceles triangle with a truncated vertex (23) facing the nearest edge of the second panel (2) and is placed with guides on the rails in such a way that there is a rail (18, 18a, 18b) under each vertex, and the first opening (20) and the second opening (21) of the cover plate (19) are placed along the arms of the triangle, diagonally to the nearest edge of the second panel (2).

17. The mechanism according to claim 15 or 16, characterised in that a lock (24) is connected to the cover plate (19) and at least one recess (25) is provided on the second rail (18a) and is configured to lock the cover plate (19) in a fixed position with the lock (24).

18. A method of connecting a first panel (1) and a second panel (2) by means of a mechanism as described in any one of claims 1 to 10, characterised in that the first panel (1) and the second panel (2) are brought together edge to edge in such a way that the first circumferentially closed profile (7) is aligned with the locking mechanism (9), whereupon the first panel (1) and the second panel (2) are locked in a fixed position by moving the control arm (13) in the slot (12) which causes the movable locking element (3) to slide out of the second through-hole (11) in such a way that the movable locking element (3) is partially inserted into the first through-hole (8) and the remaining part thereof remains in the second through-hole (11), locking the first panel (1) and the second panel (2) in a fixed position.

19. The method of connecting a first panel (1) and a second panel (2) by means of a mechanism as described in any one of claims 11 to 18, characterised in that the first panel (1) and the second panel (2) are brought together edge to edge in such a way that circumferentially closed profiles (7) are in line with the locking mechanisms (9), and the cover plate (19) is moved away from the edge of the second panel (2), whereby the movable locking elements (3) are inserted in the second circumferentially closed profiles (10), and then the cover plate (19) is moved along at least one rail (18) towards the nearest edge of the second panel (2), causing the projections (22) to move in the holes (20, 21) and the control arms (13) to move apart, which causes the movable locking elements (3) to slide out of the second through-holes (11) and their parts to be inserted into the first through-holes (8), and their ends together with the control arms (13) remain in the second through-holes (11) and the ends of the control arms (13) remain in the second through-holes (11), locking the first panel (1) and the second panel (2) in a fixed position.

20. The method according to claim 18 or 19, characterised in that the first panel (1) and the second panel (2) are connected in one plane.

21. The method according to claim 18 or 19, characterised in that the first panel (1) and the second panel (2) are connected perpendicularly to each other.

22. The method according to any one of claims 18 to 21, characterised in that after the cover plate (19) has been moved to the position extending the movable

locking elements (3) from the second through-holes (11), such position of the cover plate (19) is locked by means of a lock (24).

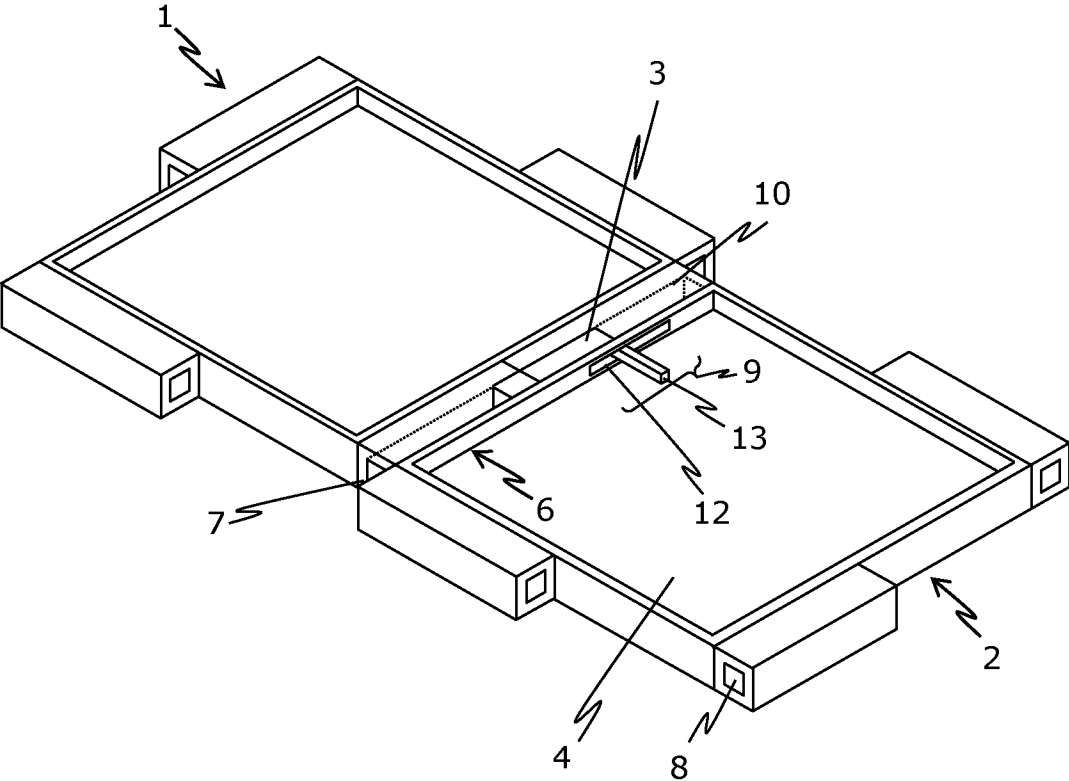


FIG. 1

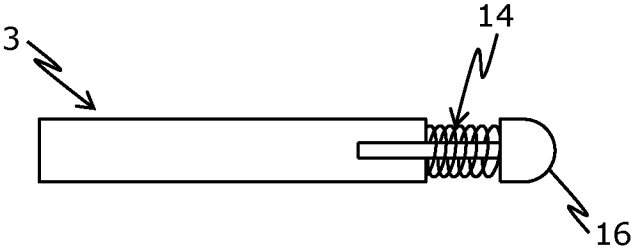


FIG. 2

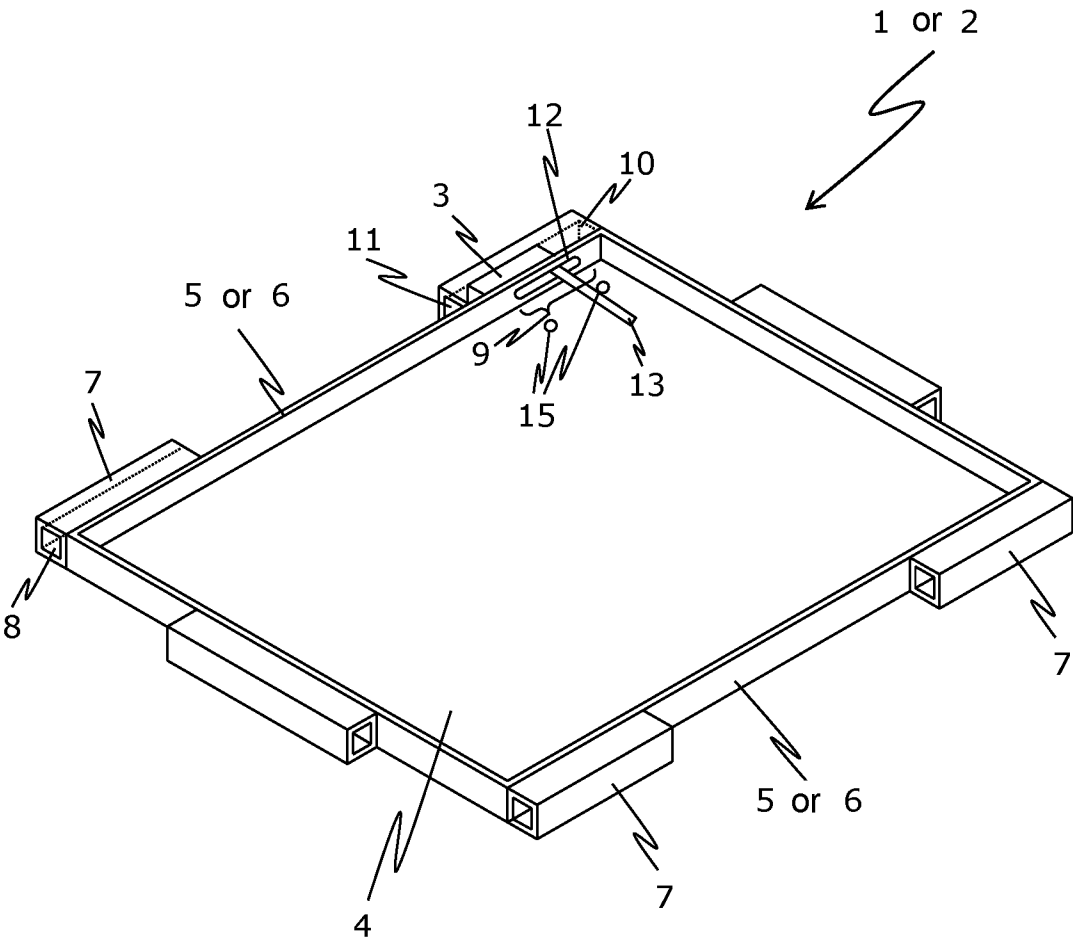


FIG. 3a

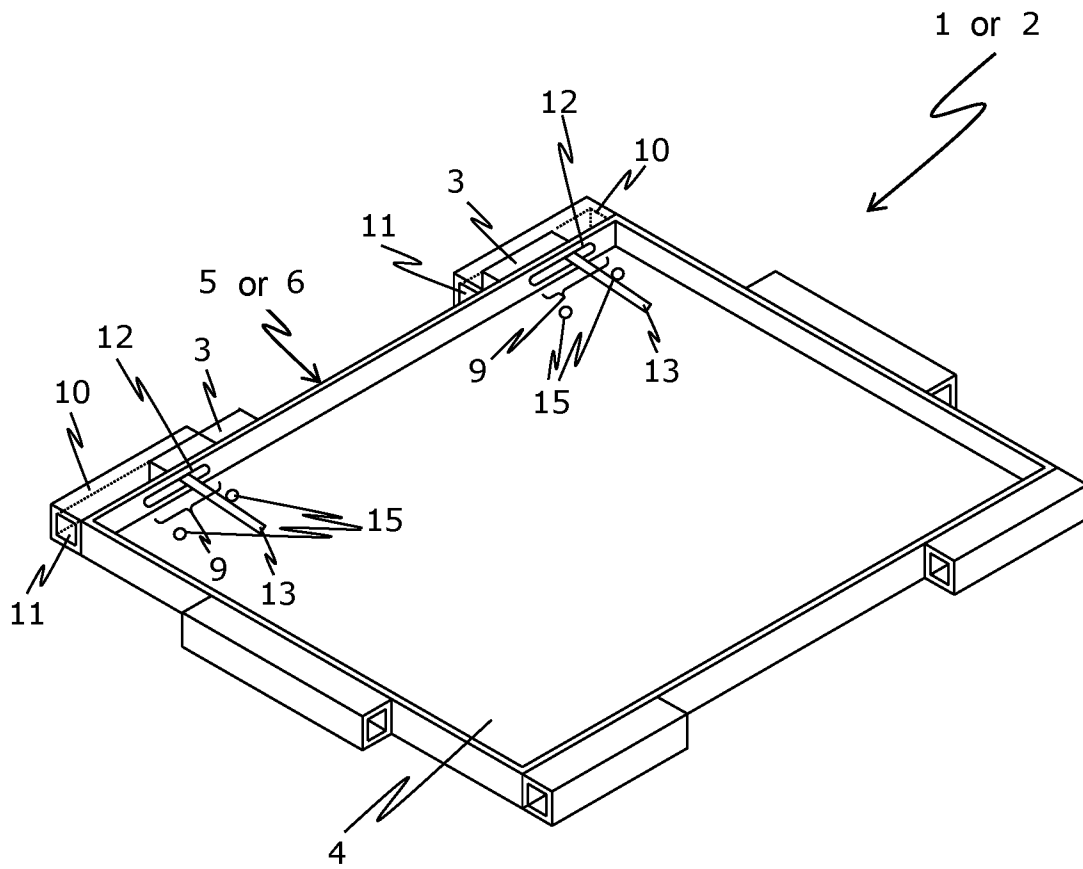


FIG. 3b

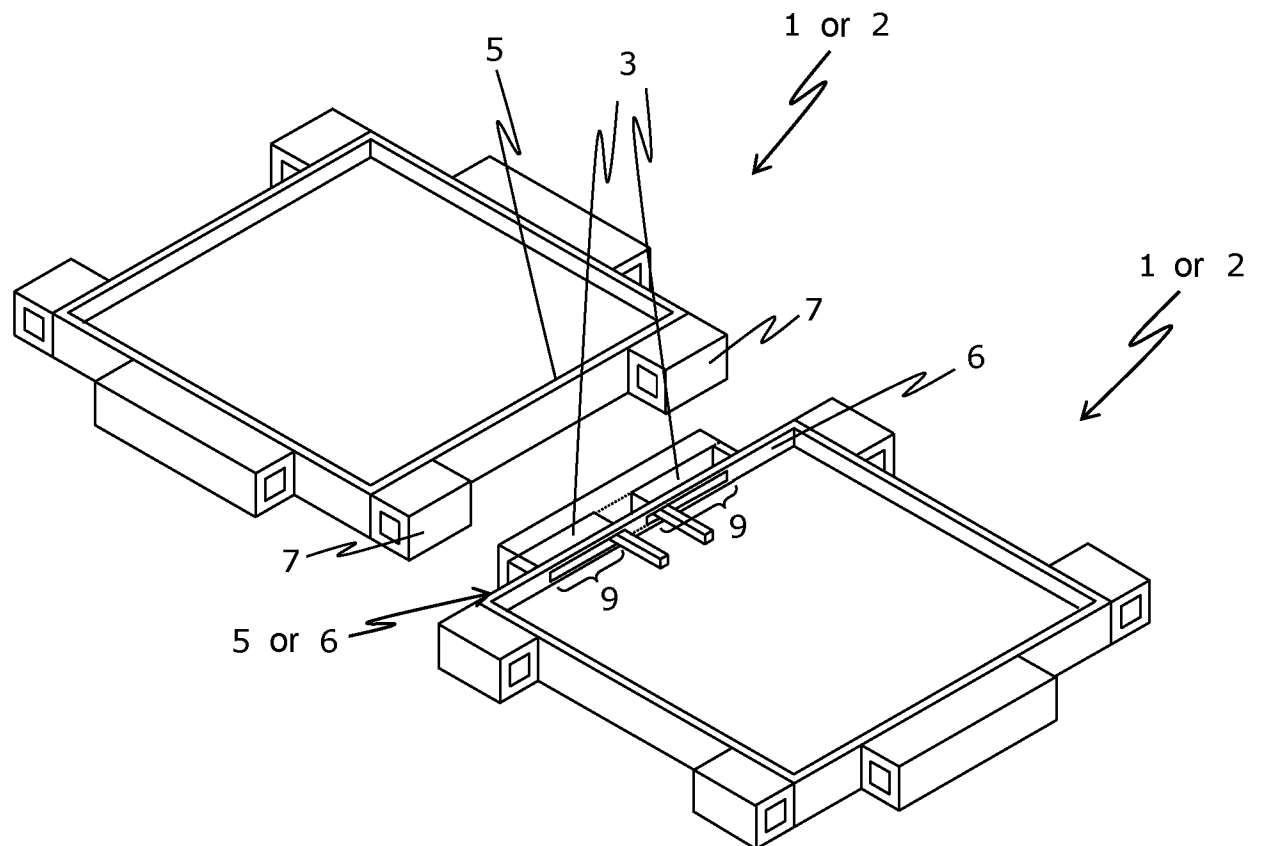


FIG. 4

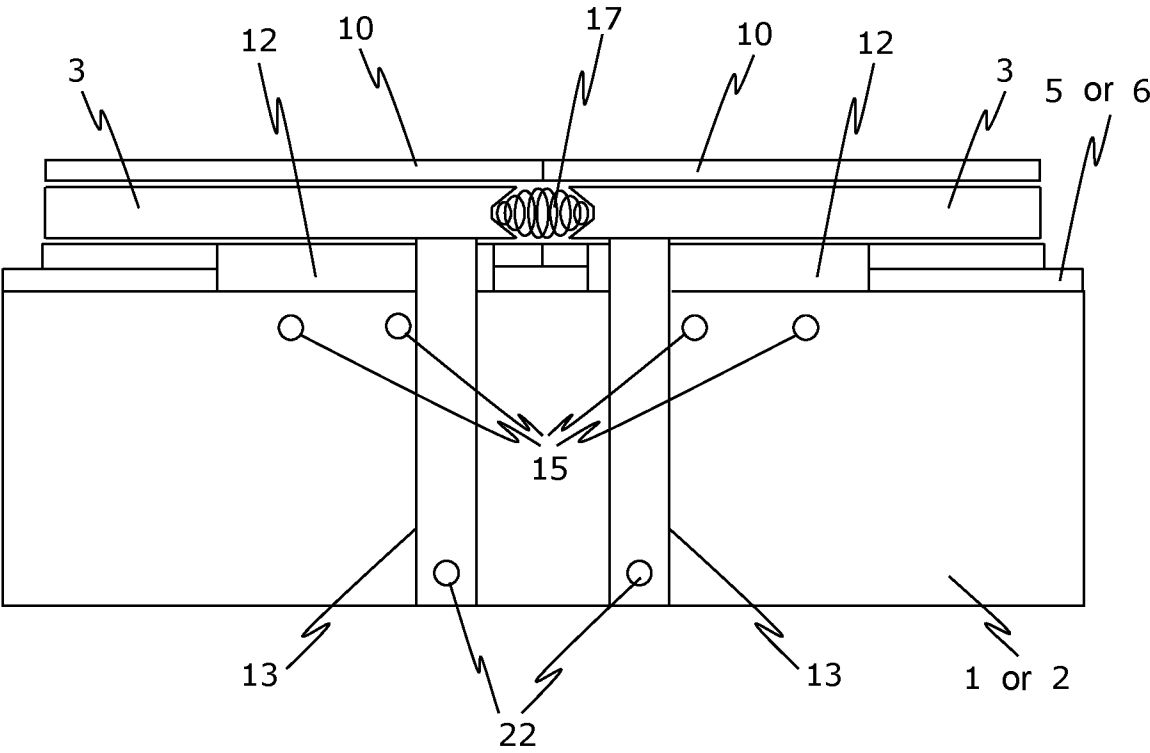


FIG. 5

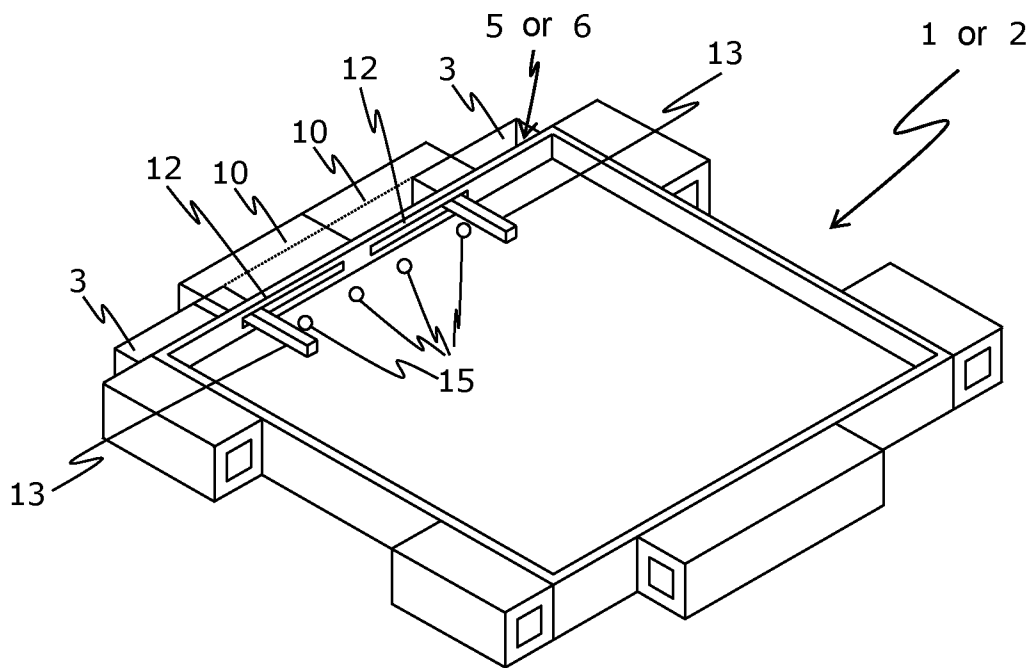


FIG. 6A

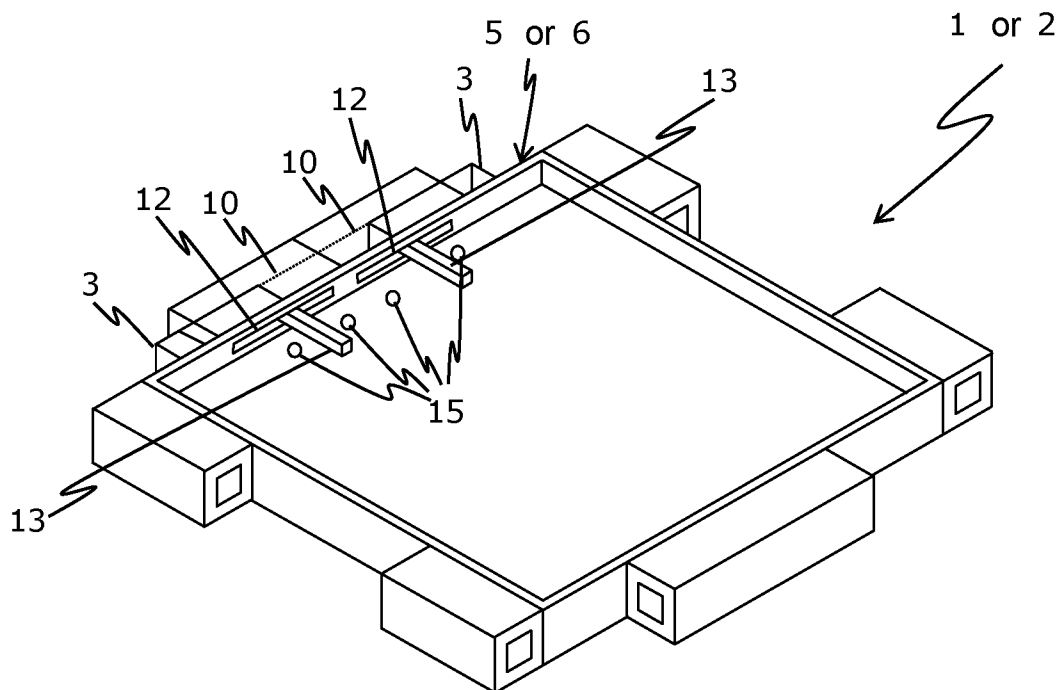


FIG. 6B

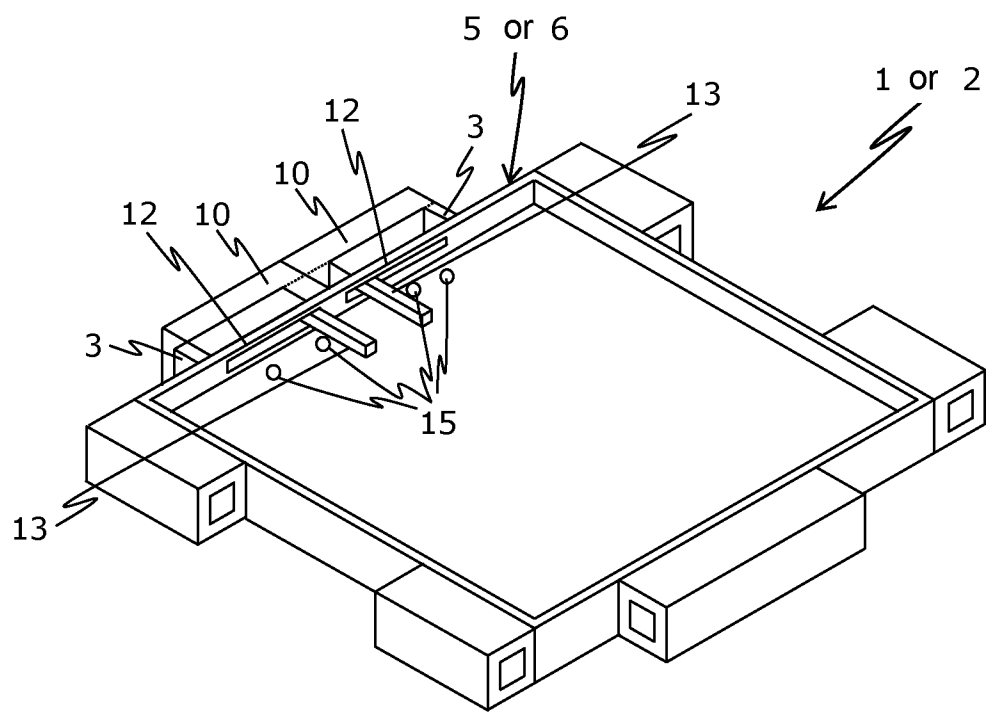


FIG. 6C

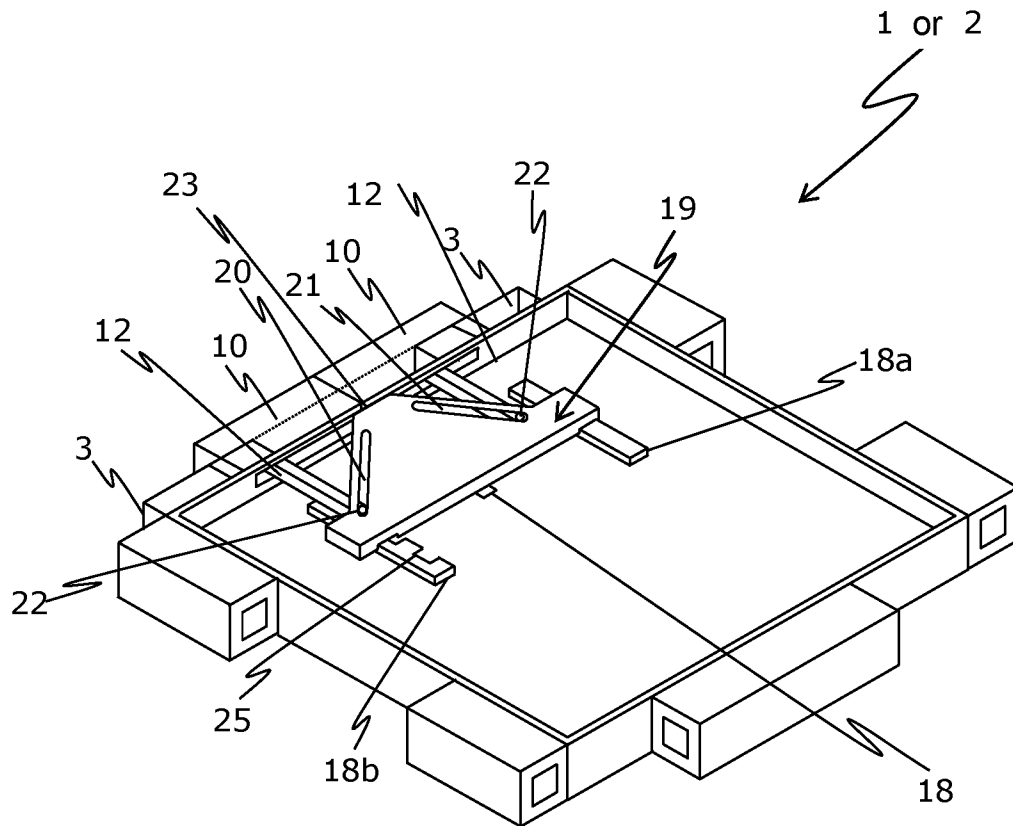


FIG. 7a

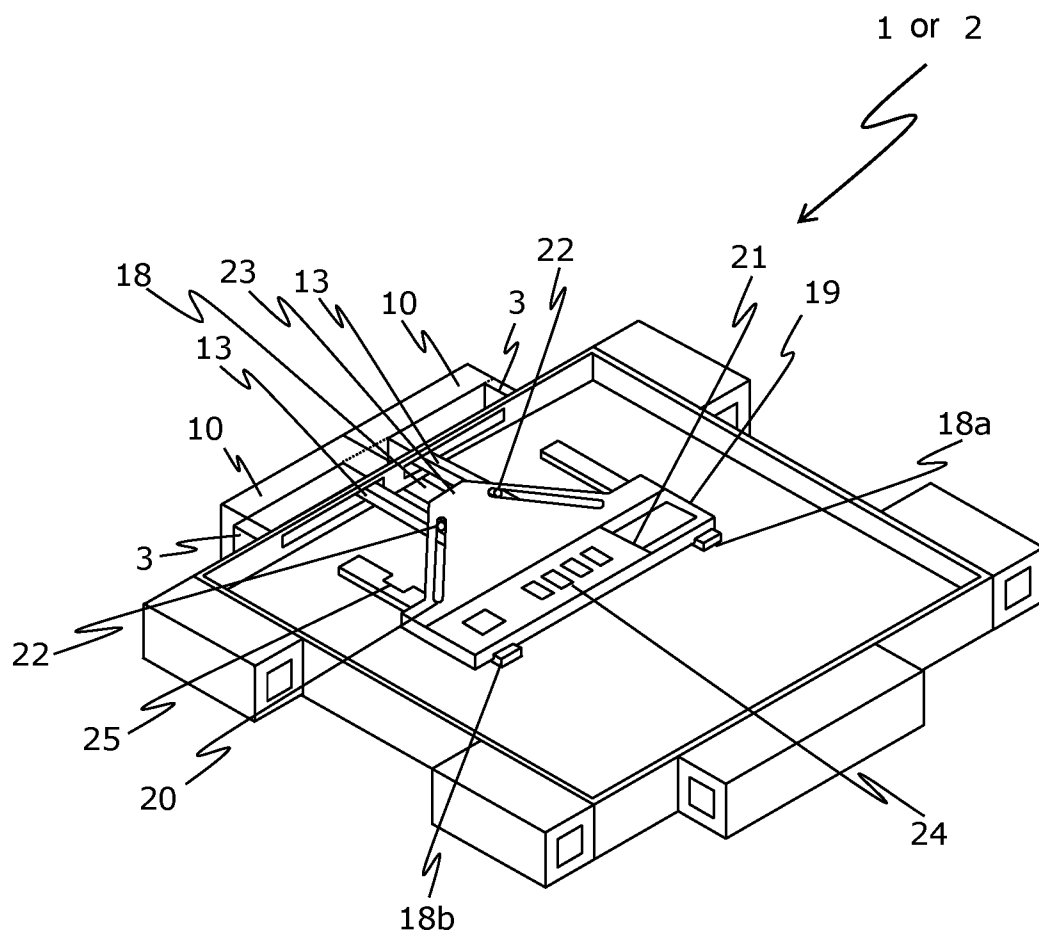


FIG. 7b

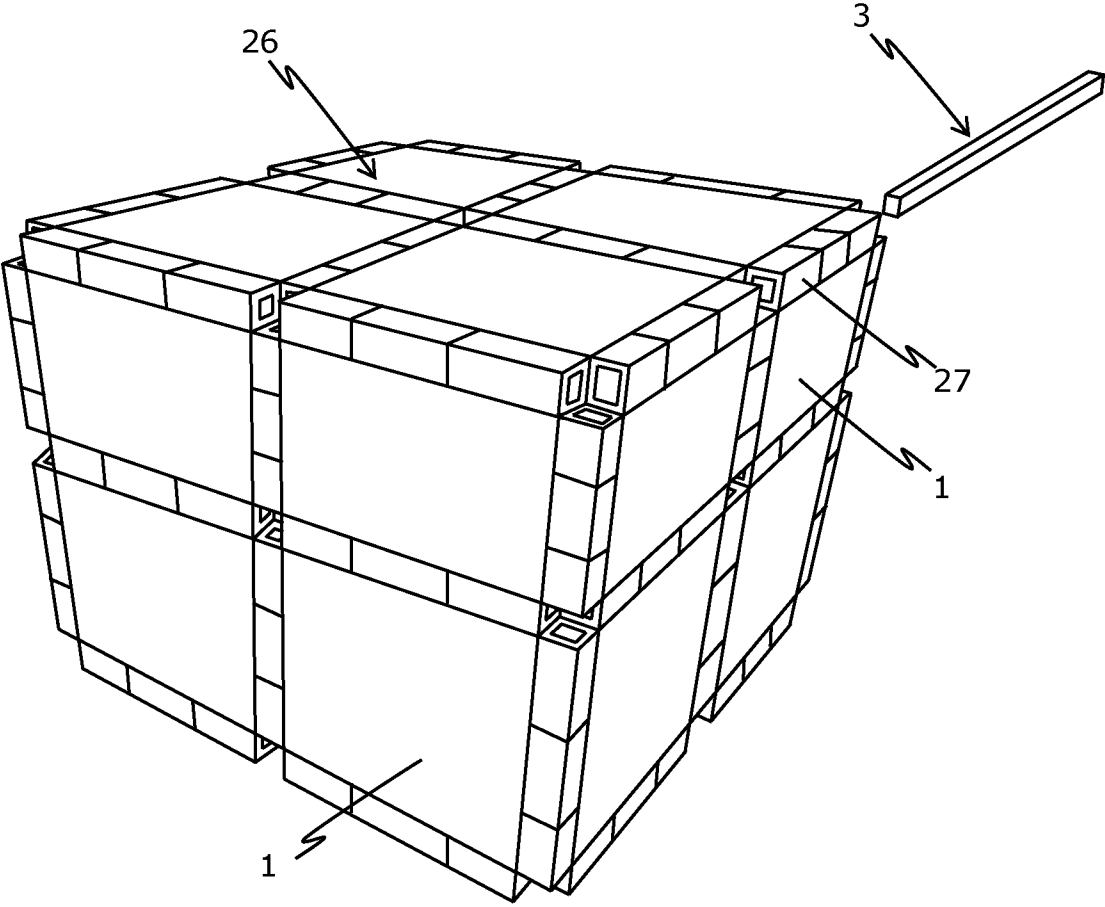


FIG. 8

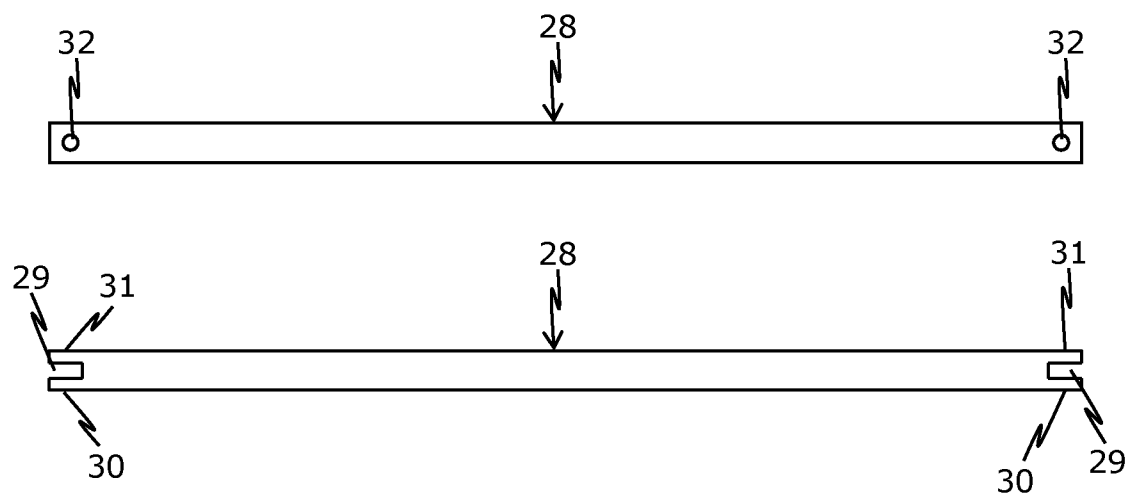


FIG. 9A

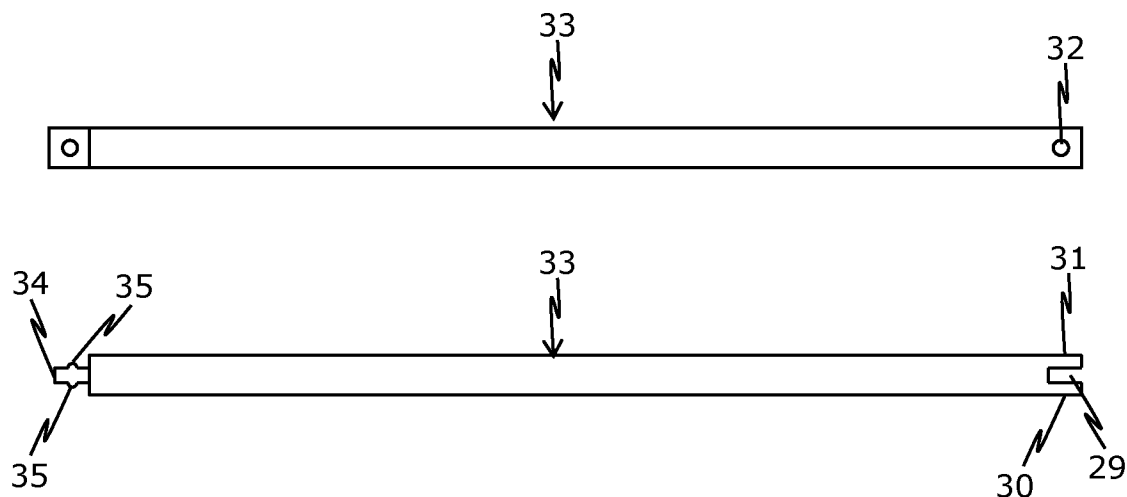


FIG. 9B

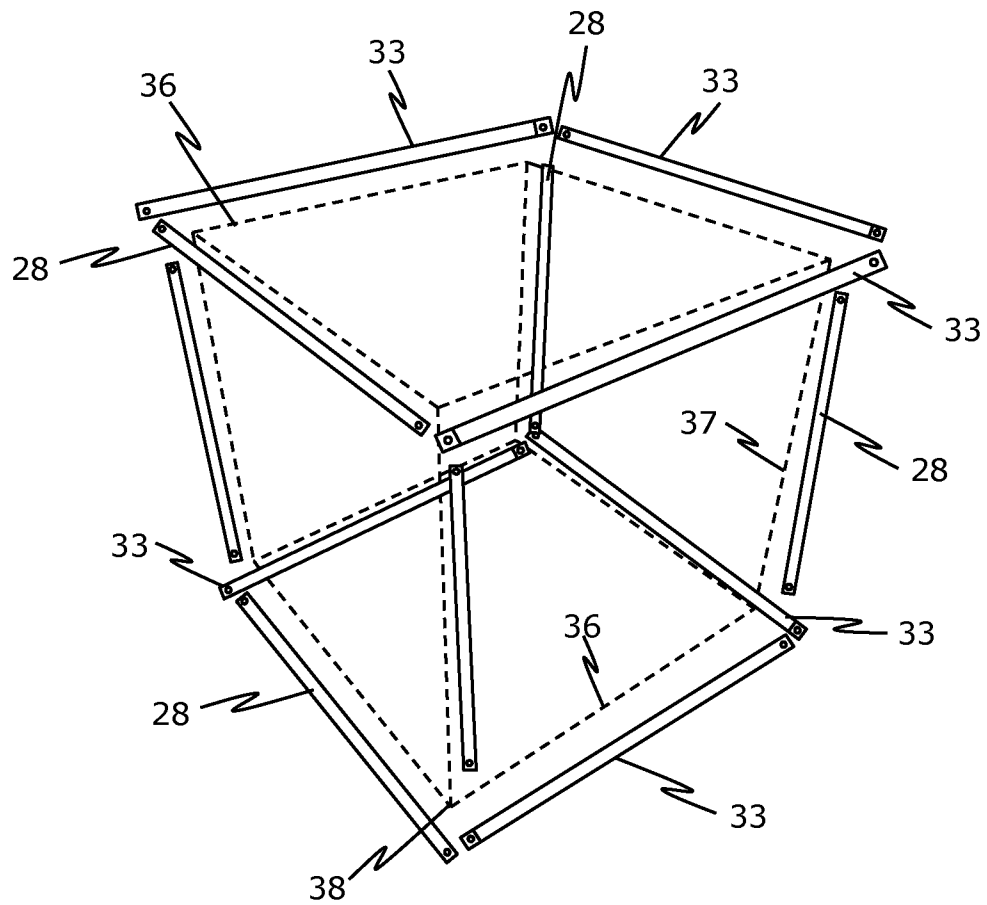


FIG. 10

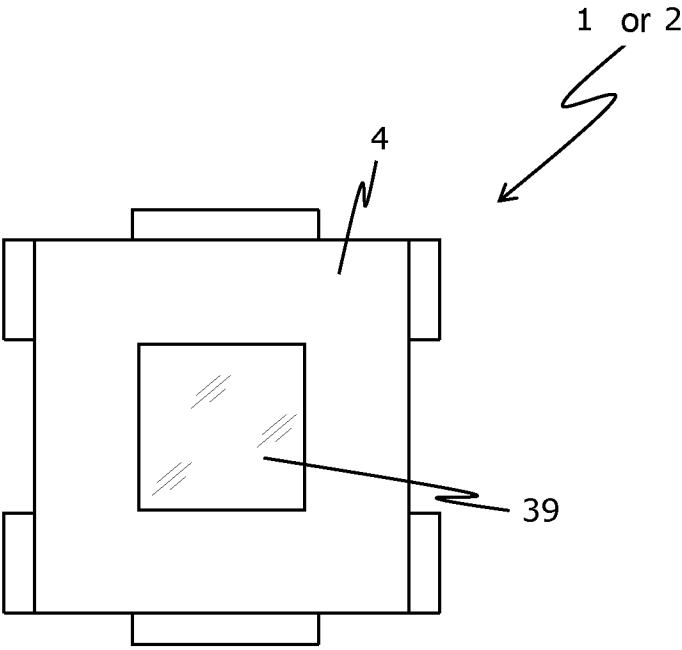


FIG. 11

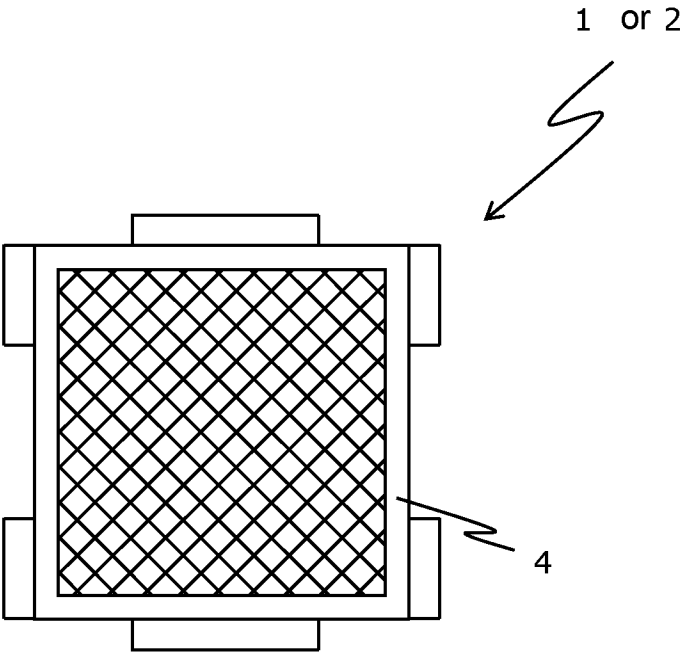


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/055167

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D6/24 B65D21/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2021/188480 A1 (PRUVOST JULIEN [FR]) 24 June 2021 (2021-06-24) paragraphs [0081] - [0126]; figures 1-8 -----	1 - 22
A	US 7 478 734 B2 (VARGAS EDGAR H [CR]) 20 January 2009 (2009-01-20) abstract; figures 1-5 -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 September 2024

Date of mailing of the international search report

20/09/2024

Name and mailing address of the ISA/

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Authorized officer

Leijten, René

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2024/055167

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