(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 670 375 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.06.2020 Bulletin 2020/26

(51) Int Cl.:
B65D 19/40 *(2006.01)* ***B65D 19/38*** *(2006.01)*
B65D 19/32 *(2006.01)*

(21) Application number: **18382981.1**

(22) Date of filing: **21.12.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Viola Terès, Josep Ramón**
43850 Cambrils (ES)

(72) Inventor: **Viola Terès, Josep Ramón**
43850 Cambrils (ES)

(74) Representative: **Balder IP Law, S.L.**
Paseo de la Castellana 93
5a planta
28046 Madrid (ES)

(54) FOOT FOR A NESTABLE PALLET AND PALLET COMPRISING A PLURALITY OF FEET

(57) Foot (1) for pallet (P), a lower part (11) and an upper part (12) being defined in the foot (1), the lower part being formed by a lateral wall (L11) and a bottom wall (B11) and the lower part (11) having a cross section smaller than the upper part (12), so that when stacking one pallet (P) on top of another pallet (P), the feet (1) can be fitted thus reducing the height of the resulting stack, a geometric envelope being defined in the lower part (11), wherein the lateral wall (L11) comprises a movable part (13), the movable part (13) being displaceable between a hidden position in which it does not protrude from the geometric envelope, and an extension position in which it protrudes from the geometric envelope. The invention also relates to a pallet (P) comprising a pallet body (2) and a plurality of replaceable feet.

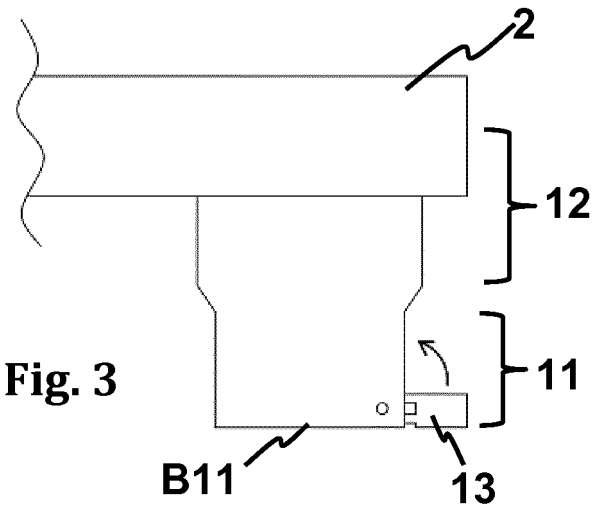


Fig. 3

EP 3 670 375 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a pallet foot and a pallet body and pallet foot assembly especially designed for automated logistic installations. Several developments are presented below that facilitate the automatic handling of the pallet. However, the feet and the pallet described here also have advantages for use with operator manipulation, especially because they are designed to prevent breakage, minimize impact damage and facilitate handling.

STATE OF THE ART

[0002] Known are in the art foots for pallet, where a lower part and an upper part are defined. The lower part is formed by a lateral wall and a bottom wall. The bottom wall has a surface that will withstand the weight of the pallet and its load. The lateral wall is a part that is exposed to impacts, mainly coming from the bars of the pallet trucks. The lower part has a cross section smaller than the upper part, so that when stacking one pallet on top of another pallet, the feet can be fitted thus reducing the height of the resulting stack.

[0003] A geometric envelope is defined in the lower part. This geometric envelope should be understood as that geometric shape in which the foot of the pallet is inscribed, that is to say that it does not take into account the details such as recesses, holes, etc. It is therefore a surface that contains the foot.

[0004] Known pallets are generally designed to withstand certain loads, resist impacts, facilitate their stacking, facilitate their handling, and, to a lesser extent, be managed by automatic installations.

[0005] It has been possible to verify that in this sense there are many aspects clearly improvable.

[0006] In the first place, the pallets are increasingly managed by automated logistical installations. A drawback of the known nestable pallets is that their borders at the level of the feet and the pallet body are different, which is an inconvenience when centering the pallets in the pallet conveyor belts. That is to say that the pallet will not be centered in the same way in a lane provided with a raised fence, so the pallet body will impact, that in a lane provided with an edge located at the level of the feet.

[0007] In the facilities there are many changes of direction, the aforementioned fences being those that stop the pallet so that it can follow a trajectory perpendicular to the previous one.

[0008] This is illustrated in FIGS. 1 and 2. When there is a distance d between the lower edge of the foot 1 and the edge of the pallet body 2, the position in which the pallet will remain after reaching the obstacle F will differ according to the height of the obstacle F.

[0009] This will cause that the geometry of the feet will determine the positioning of the pallets in the rails.. Consequently the pallet will move displaced a distance "d" towards the rail guides, this is an inconvenience for its automatic handling.

[0010] Other aspects of the invention are aimed at minimizing the damage caused to the feet, and also the body pallet.

[0011] The present invention is especially designed for pallets provided with replaceable feet.

[0012] Indeed, it has been found that the vast majority of pallets are disabled by the damage to the feet, as they are weaker elements and also subjected to many impacts, usually from the forks the pallet trucks and forklifts.

DESCRIPTION OF THE INVENTION

[0013] For overcoming the mentioned drawbacks the present invention proposes a foot for pallet, a lower part and an upper part being defined in the foot, the lower part being formed by a lateral wall and a bottom wall and the lower part having a cross section smaller than the upper part, so that when stacking one pallet on top of another pallet, the feet can be fitted thus reducing the height of the resulting stack, a geometric envelope being defined in the lower part, and wherein the lateral wall comprises a at least one movable part, the movable part being displaceable between a hidden position in which it does not protrude from the geometric envelope, and an extension position in which it protrudes from the geometric envelope.

[0014] In some embodiments, the foot comprises a housing for the movable part, the housing being an outwards oriented cavity.

[0015] In some embodiments, the movable part is articulated with an axis arranged in the lower section of the cavity.

[0016] However, although a rotational kinematics is preferred for the movable element, the skilled person will be able to conceive that the movable element is retractable according to other kinematics. For example, it can be conceived that it is hidden in translation, or by a combined movement of translation and rotation. It can also be conceived to be hidden vertically or horizontally, providing convenient shapes to allow the movement to be effective while minimizing the risk of blockage.

[0017] In some embodiments, movable part has a lower extension which, in the hidden position protrudes from the bottom wall, such that, when the foot rests on a bearing surface, the lower extension is pressed thus pushing the movable part towards the extension position.

[0018] In some embodiments, the hidden position the lower extension is displaced with respect to the vertical projection of the axis so that when the foot approaches the ground, the contact with the ground exerts a moment with respect to the axis that causes the rotation of the movable part towards the extension position.

[0019] In some embodiments, the lower part and the upper part have a constant section, the transition between the lower part and the upper part having a de-

creasing section, such that there is a smooth transition between the lower part and the upper part.

[0020] In some embodiments, the foot is oblong such that a length and a width are defined, the movable part being placed on a wall placed along the length direction. It is preferred that the movable part occupies practically all the lateral length of the feet.

[0021] In some embodiments, the lower part is provided with vertical stiffeners such that vertical through channels are formed in the lower part, the stiffeners being widened at their lower end.

[0022] In this way, the horizontal reflective surface is increased. This increases the detection efficiency of the detectors arranged underneath the foot and oriented upwards, which is a further aspect of the present invention that facilitates its handling in automatic installations. We emphasize that it is an innovative feature in itself.

[0023] The invention also relates to a pallet comprising a pallet body and a plurality of feet, the pallet body having a length greater than the width, the pallet comprising four feet placed at the corners and two feet placed near the smaller side of the pallet body, and wherein the corner feet are according to any of the inventive variants disclosed above, the movable part being placed at the outer side. Extra foot at the centreline of the long direction of the pallet can be also considered.

[0024] In some embodiments, the pallet body comprises a through hole for housing each foot, a surface of the holes and the upper part of the feet being provided with coupling means such that the feet are replaceable.

[0025] In some embodiments, the coupling means comprise a plurality of vertical channels arranged in the surface of the holes, and hooks arranged in the upper part of the feet.

[0026] In some embodiments, the coupling between the vertical channels and hooks the has a horizontal gap between 1 and 5 mm, preferably between 1 and 3 mm and more preferably between 1 and 2 mm.

[0027] The pallets are subjected to strongly variable temperatures (differences up to 30º), since they are handled between open and closed spaces, while being subjected to highly variable forces. Besides, the market is global, and therefore they have to withstand different weather conditions.

[0028] In some embodiments, the coupling between the vertical channels and hooks has a vertical gap between 1 and 5 mm, preferably between 1 and 3 mm and more preferably between 1 and 2 mm.

[0029] In some embodiments, the vertical gap on the external side of the foot is smaller than the vertical gap on the internal side, such that the foot can rotate about a longitudinal axis.

[0030] Therefore, when the pallet is brought in contact with the ground the lateral feet tend to rotate away from the vertical longitudinal medium plane of the pallet. Thus, the space between foot, on the frontal/ rear sides of the pallet increases about some mm greater, thus increasing the space for the bars of the pallet trucks, and thus reducing even more the possibilities of damaging the foot.

[0031] Finally, the present invention also relates to a pallet comprising a pallet body and a plurality of feet, wherein that the pallet body and/or the feet comprise bumpers on the edges.

[0032] Preferably the pallet bumpers are molded in the pallet body and/or the feet themselves.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] To complete the description and in order to provide a better understanding of the invention, a set of drawings is provided. Said drawings form an integral part of the description and illustrate embodiments of the invention, which should not be interpreted as restricting the scope of the invention, but just as an example of how the invention can be carried out. The drawings comprise the following figures:

Figure 1 shows schematically the corner of a pallet, where the foot is, highlighting the distance that leads to problems of alignment of the pallet in the transport belts.

Figure 2 shows a pallet arranged at the end of the path of a stretch of conveyor belt, where the retaining fence is located, point from which the pallet will change direction.

Figure 3 shows the basic principle of the invention in an embodiment in which the mobile part is rotatable, in the collected configuration. In this embodiment the foot is of the type that has two parts of constant section, with the upper section being larger to allow stacking.

Figure 4 is analogous to Figure 3, but here the moving part is hidden.

Figure 5a shows the function of the moving part, i.e. "widening" the foot for contact purposes on the edge of the conveyor belt.

Figure 5b shows another embodiment of the invention, in which another movable part is placed at the outer extreme of the foot.

Figures 6a to 6c show the effect of the lower projection of the foot, which automatically activates the deployment of the moving part when the pallet rests on the foot.

Figure 7 shows a stacking of feet in the case of pallets with tapered foot, to which the inventive concept of moving part is applicable.

Figure 8 shows a stacking of feet in the case of decreasing section in two sections of constant section.

Figure 9 shows the known arrangement of internal ribs in the lower part of the foot.

Figure 10 shows the effect of known arrangement of stiffening ribs in the reflection of a light detector.

Figures 11 and 12 are analogous to figures 9 and 10 respectively, but with ribs according to the present invention, that is to say with an inverted T-shape.

Figure 13 shows in plan a foot fitting opening of a pallet body, with the fitting channels of the fixing means between pallet body and pallet foot.

Figure 14 shows the snap hooks of the pallet foot.

Figure 15 shows one of the coupling channels, i.e. the part of the fixing means that is in the pallet body.

Figure 16 shows the resulting fitting, in a centered situation.

Figures 17a and 17b show in plan, i.e. according to the vertical direction, the coupling between channels and hooks. The transversal gap is shown.

Figures 18a and 18b show the fitting in two extreme arrangements, so that the gap can be appreciated. It is pointed out that the gap game that goes beyond the necessary gap for a correct fit, that is to say that it is greater than the necessary gap to absorbe thermal dilatations, and it is destined to reduce to the maximum frictions between foot, to facilitate its nesting and unnesting.

Figure 19 shows in perspective a lateral foot of the pallet, i.e. those provided with the mobile element, in a configuration of movable element occult.

Figure 20 shows in perspective a lateral foot of the pallet, that is to say of those provided with the movable element, in a deployed configuration of the movable element.

Figures 21a to 24b show front and side elevational views of the feet provided with movable element.

Figures 25a and 25b are a view from above and from the bottom respectively of a lateral foot.

Figures 25c and 25c are schematic drawings showing the effect of the asymmetry in the coupling hooks, that is allowing the foot to rotate so that its external lower corner tends to go towards the outside.

Figures 26a and 26b are perspective views of the movable element, in vertical position (occult configuration).

Figures 27a and 27b are perspective views of the central feet.

Figure 28a is a bottom view of a central foot.

Figure 28b is a front view, from the outer side of the foot, that is to say from the end oriented towards the outside of the pallet, and provided with the two vertical orientation edges.

Figure 28c is a top view of a central foot.

Figure 28d is a front view, from the inner side of the pallet, that is to say the end oriented towards the inside of the pallet.

Figure 29 is an exploded view of the pallet assembly.

Figure 30 is a view of a mounted pallet.

Figures 31 and 32 are additional views in perspective from a higher point of view.

Figure 33 shows the interaction between a side foot of a pallet and a centering roller of a pallet conveyor.

Figure 34 shows the nesting of pallet feet in a stack, in the particular case of pallets with internal lateral recesses for a centering and guiding roller having a vertical axis.

Figure 35 is a perspective view of a pallet foot provided with a recess on the inner side, for the fitting of a centering and guiding roller having a vertical axis.

Figures 36, 37, 38 and 39 show, respectively, a plan seen from below, a left side view, a plan seen from above and a right side view of a pallet foot provided with a horizontal cross-section whose length changes at a predetermined height.

Figures 40 and 41 show, respectively, a perspective view and a side view of a pallet foot provided with a horizontal cross-section whose length changes at a predetermined height and provided with a recess on the inner side, for the fitting of a centering and guiding roller having a vertical axis.

Figure 42 is a perspective view of a pallet foot provided with a horizontal cross-section whose length changes at a predetermined height and provided with a movable part.

Figure 43, shows a side view of a pallet foot provided with a lateral wall L11 which does not comprise any movable part or any widening or extension which defines a cavity for fitting centering or guiding rollers.

Figures 44 to 52 are views of an embodiment of the side feet of the pallet, provided with a substantially vertical rear surface but forming an angle with the side of the pallet different from 90 °.

Figures 53 to 56 show the variable fitting depth provided by the oblique back wall or rear surface.

DESCRIPTION OF A WAY OF CARRYING OUT THE INVENTION

[0034] As shown in Fig. 3, the invention relates to a foot 1 for pallet P, a lower part 11 and an upper part 12 being defined in the foot 1.

[0035] The lower part is formed by a lateral wall L11 and a bottom wall B11. The lower part 11 has a cross section smaller than the upper part 12, so that when stacking one pallet P on top of another pallet P, the feet 1 can be fitted thus reducing the height of the resulting stack, as shown in FIGS. 7 or 8.

[0036] A geometric envelope is defined in the lower part 11, which defines the general shape of the foot.

[0037] As shown in FIGS. 3 and 4, the lateral wall L11 comprises a movable part 13, which is displaceable between a hidden position in which it does not protrude from the geometric envelope (See FIG. 4 or 19), and an extension position in which it protrudes from the geometric envelope (See FIG. 3 or 20).

[0038] When deployed, as shown in FIG. 5a, it allows setting the correct position of the pallet in the conveyor, thus avoiding the situation depicted in FIG. 2.

[0039] With respect to the movable parts 13, their shape has also been optimized. It is appreciated that its shape, as shown in figures 26a and 26b, is trapezoidal. In this way, impacts or blockages (which would be very damaging) are avoided with the intermittences of the lateral containment fences of the pallets in the pallet circuits (as they are usually not continuous).

[0040] In this sense, the section of the ends has also been optimized, which is rounded to allow the mobile element to rise in case of hitting an obstacle, such as a stone. It is noted that although more and more pallets run through automated systems, it will still be common for pallets to be "mistreated", such as dragged, or pushed on the floor of industrial warehouses, etc.

[0041] The foot comprises a housing 14 for the movable part 13, the housing being an outwards oriented cavity 14, as shown in FIG. 20.

[0042] The movable part 13 is articulated with an axis Γ arranged in the lower section of the cavity 14, as shown in FIGS. 20 and 26a.

[0043] As shown in FIGS. 22a, 22b, and 26a the movable part 13 has a lower extension 15 which, in the hidden position protrudes from the bottom wall B11, such that, when the foot rests on a bearing surface S, the lower extension 15 is pressed thus pushing the movable part 13 towards the extension position. In the hidden position the lower extension 15 is displaced with respect to the vertical projection of the axis Γ so that when the foot approaches the ground, the contact with the ground exerts a moment with respect to the axis Γ that causes the rotation R of the movable part 13 towards the extension position.

[0044] Figure 5b shows another embodiment of the invention, in which the movable part is placed at the outer end of the foot, without the need to be hidden. It is only necessary that the shape of the leg is stepped just above the movable part.

[0045] According to another embodiment, illustrated in Figure 5c, the movable part can be moved according to a translational movement. That is, instead of rotating, it moves in translation. In the illustrated embodiment the displacement is vertical, so that when the pallets P are stacked, the movable part 13 does not constitute an obstacle, but when the pallet P is unstacked, the moving part falls by its own weight.

[0046] It is also noted that there could be several moving parts on each foot, of smaller size, so that if one fails, there would be redundancy, thus guaranteeing the correct positioning of the pallets on the conveyor belts.

[0047] As shown in FIGS. 21a to 22b, the lower part 11 and the upper part 12 have a constant section, the transition 16 (16A, 16B) between the lower part 11 and the upper part 12 having a decreasing section, such that there is a smooth transition between the lower part 11 and the upper part 12.

[0048] The foot is oblong such that a length and a width are defined, the movable part 13 being placed on a wall placed along the length direction, and occupying more than 60% of the whole length, as shown in FIG. 20.

[0049] As shown in figures 9 to 12, the lower part 11 is provided with vertical stiffeners 17 such that vertical through channels CH are formed in the lower part 11, the stiffeners being widened at their lower end 17a such that the horizontal reflective surface is increased.

[0050] Herein also a pallet comprising a pallet body 2 and a plurality of feet 1, 1' is disclosed, as depicted in FIGS. 29 to 32.

[0051] The pallet body 2 has generally a length greater than the width, the pallet comprising four feet 1 placed at the corners and two feet 1' placed near the smaller side of the pallet body 2.

[0052] The corner feet 1 are according to any of the variants disclosed above, the movable part 13 being placed at the outer side.

[0053] The pallet body 2 comprises a through hole H for housing each foot 1, 1', a surface 2S of the holes H and the upper part of the feet 1, 1' being provided with coupling means such that the feet 1, 1' are replaceable. The holes have the direction perpendicular to the general plane of the pallet.

[0054] As shown in FIGS 14 to 18b, the coupling means comprise a plurality of vertical channels 21 arranged in the surface of the holes H, and hooks 22 arranged in the upper part of the feet 1, 1'.

[0055] The coupling between the vertical channels 21

and hooks the 22 has a horizontal gap between 1 and 2 mm.

[0056] The coupling between the vertical channels 21 and hooks the 22 has a vertical gap between 1 and 2 mm.

[0057] These gaps have proved to be essential to allow optimal stacking and destacking, i.e. without causing unnecessary blockages.

[0058] It is a solution to the technical problem of the high friction forces that exist between stacked pallets of the state of the art. Therefore, this selection of the coupling gaps constitutes an invention by itself.

[0059] Therefore, herein it is also disclosed a pallet P comprising a pallet body 2 and a plurality of feet 1, the pallet body 2 having a length greater than the width, the pallet comprising at least four feet 1 placed at the corners, wherein the pallet body 2 comprises a through hole H for housing each foot 1, a surface 2S of the holes H and the upper part of the feet 1 being provided with coupling means such that the feet 1 are replaceable, characterised in that the coupling means comprise a plurality of vertical channels 21 arranged in the surface of the holes H, and hooks 22 arranged in the upper part of the feet 1, the vertical channels 21 and hooks the 22 having a horizontal gap between 1 and 2 mm and a vertical gap between 1 and 2 mm.

[0060] As shown in FIG. 19, the vertical gap on the external side of the foot is smaller than the vertical gap on the internal side, such that the foot can rotate about a longitudinal axis LΓ. This axis is also represented in FIG. 25d. As shown in FIG. 19 this ability to rotate is possible thanks to the hooks 22b (internal) being longer than the outer ones 22a. It is emphasized that it is a very light rotation, of few degrees, only that allowed by the difference in length between the mentioned internal and external hooks. The effect is shown in Figures 25c and 25d. Upon reaching the ground, the lowest point of the foot will tend to move a few millimeters to the outside, and the foot will rotate. Therefore, those few millimeters will bring the outer side of foot L11 closer to the vertical plane that defines the body of the pallet. With this, the width of the moving part can be reduced slightly, although appreciably in relative terms.

[0061] However, it is also emphasized that this possibility of rotation allowed by the particular configuration of the coupling means is also an inventive solution in itself. Even in the absence of a movable part 13, this possibility of rotation allows, as has been stated, to bring the outer surface L11 towards the outside, which will reduce the distance d illustrated in figure 1 and which is the origin of problems of alignment of the pallets after being subjected to a change of direction.

[0062] Therefore, herein also is disclosed a pallet P comprising a pallet body 2 and a plurality of feet 1, the pallet comprising at least four feet 1 placed at the corners, wherein the pallet body 2 comprises a through hole H for housing each foot 1, a surface 2S of the holes H and the upper part of the feet 1 being provided with coupling means such that the feet 1 are replaceable, characterised in that the coupling means comprise a plurality of vertical channels 21 arranged in the surface of the holes H, and hooks 22 arranged in the upper part of the feet 1, wherein the coupling between the vertical channels 21 and hooks the 22 has a vertical gap, wherein the vertical gap on the external side of the foot is smaller than the vertical gap on the internal side, such that the foot can rotate about a longitudinal axis LΓ.

[0063] The invention also relates to a pallet P comprising a pallet body 2 and a plurality of feet 1, 1', characterised in that the pallet body 2 and/or the feet comprise bumpers on the edges.

[0064] The invention also relates to pallet components, either feet or pallet bodies, provided at the edges with at least one impact absorber (bumper) B1, B2, B3, B4, B5.

[0065] In the case of the body, the bumpers are arranged on the sides of the pallet, except for the fitting edges of the feet, so as not to weaken the coupling between the feet and the pallet body.

[0066] Precisely these are the areas where the impact of the pallet trucks is more likely to be impacted, as the inventors have been able to verify.

[0067] The bumpers are designed in different ways for the body of the pallet and for the feet.

[0068] In the case of the pallet body, the bumpers are materialized through grooves GR arranged in the vicinity of the lateral parts so that between the groove GR and the outside there is a narrow plastic wall PW. Vertical absorbers walls AB are arranged in the groove GR, which act as energy absorbers. In this way, in case of impact, damage is minimized strongly.

[0069] In addition, it is an element that does not increase the cost of the pallet, as it is a feature that is just molded.

[0070] In the case of the feet, these bumpers are embodied as perimeter protrusions B4 arranged at the longitudinal ends of the feet, in the upper part 11 of the feet, at the level of the connection with the pallet body.

[0071] As can be seen in figures 29 to 32, a continuity of bumpers is thus achieved along the entire perimeter of the pallet, at the height at which impacts usually occur.

[0072] In the same way, the bumpers consist of elongated projection, and provided with vertical holes, so that a deformable element is formed.

[0073] The height of the leg bumpers will be chosen from 1 to 2 cm in height and will more preferably be 1.5 cm.

[0074] As an alternative, it will be chosen that this height corresponds to that which allows the bumper to serve as a support between stacked pallets. Indeed, when stacking the pallets, the lower surface of the feet will rest on the upper edge of the ribs (17) of the feet of the lower pallet. In that situation, the bumpers will also receive pressure above their own pallet, and below the pallet on which their own pallet rests. This will contribute to further increase the support surface between pallets, decreasing the efforts, increasing their useful life.

[0075] It is emphasized that the bumpers, both of the

pallet body and of the feet, constitute inventions by themselves.

[0076] Therefore, herein it is also disclosed a foot 1 for pallet P, a lower part 11 and an upper part 12 being defined in the foot 1, the upper part comprising a coupling portion to a pallet body 2, bumpers B4, B5 being arranged below the coupling portion. Preferably the bumpers B4, B5 are molded with the foot itself and consist of a protruding edge, the protruding edge being provided with holes, such that an external wall and absorber walls are defined.

[0077] And also herein is disclosed a pallet body 2 comprising bumpers B1, B2 consisting in grooves or channels GR, such that an external wall PW is defined that separates the grooves or channels GR from the outside, absorber walls or stiffeners AB being arranged in the grooves or channels GR.

[0078] The thickness of the pallet wall PO, in the outer edge of the pallet foots 1, is between 15 and 20 mm, and is preferably 16 mm. This distance is an optimal compromise between the need to have a resistant area for the feet, and on the other hand the need to have the foot as close to the edge, and leave the maximum space between feet for the passage of the bars of the pallet trucks.

[0079] The length (understood as the dimension according to the longitudinal dimension) of the foot is also a compromise between:

- The need to have a sufficient support length for the foot to be able to rest between two consecutive rollers of a conveyor belt, and also increasing the bearing surface; and

- The need to have the maximum longitudinal distance between feet in order to have more space for the bars of the pallet trucks for its transversal introduction TI.

[0080] As can be seen in the figures, the feet arranged in the central plane have two parts, one arranged more external, close to the external front, and another disposed towards the interior.

[0081] The outermost part has a greater width than the inner part. The reason for this is that the dimensions of the external part, which is where the pallet truck operates, corresponds to the width of the central feet of standard wooden feet.

[0082] Now, since it is not necessary for the internal part to be so wide, which also weakens the body, it has been decided to equip the foot with the mentioned section change.

[0083] It is further appreciated that in the upper corners of the feet in which two orientation protuberances 11', 12' are located, there are respective openings W, intended for fitting the protrusion of the foot of the pallet arranged stacked on top of the pallet stack.

[0084] The two orientation protuberances 11', 12' are aimed at providing means for correctly orienting the pallet when it is not correctly oriented, that is when the sides are not parallel to the movement direction. By providing two protuberances or two vertical edges in the central foot, one of them will contact a stop fence and then will tend to correctly orientate the pallet. Even if the effect is for a few degrees, it is important for reducing misalignments that could hind the correct handling of the pallets in an automatic facility.

[0085] Now, another novel feature, that can be considered by itself as a further invention, will be disclosed.

[0086] As can be seen in figure 33, some conveyors have vertical centering and guiding rollers GW.

[0087] The tread of these rollers roll on the inner lateral surface PR of the feet. In particular, they are adapted to rest on the inner vertical surface PR of wooden pallets. As can be seen, these centering rollers GW generally have a chamfered shape, so that their diameter is decreasing at the ends of the tread.

[0088] As already stated in various passages of the present description, the present invention relates to nestable pallets, in which the feet are of decreasing section.

[0089] The centering and guiding rollers are arranged in a certain way on the conveyors, so that the location of the tread plane PR on the foot is fixed and imposes a maximum width of the foot **wf**, in case the section is left constant or kept decreasing, as can be seen in figure 33.

[0090] The limitation of this maximum width **wf** can pose drawbacks when the pallet moves transversely and a distance between rollers of the conveyor that can be arranged with a larger separation than usual should be saved, which can happen in transitions between conveyor units . Therefore, any increase of the width **wf** that can be provided to the foot will be advantageous, always respecting that it is guaranteed that the surface PR can be at the correct distance.

[0091] Therefore, as shown in Fig. 33, by taking advantage of the chamfered shape of the roller, an enlargement EX is provided on the inner side of the foot, so that the width of the foot is increased to **wf '**.

[0092] Obviously, this widening is limited by the internal distance of the upper section of the foot, to continue guaranteeing that the pallets are nestable, as illustrated in figure 34.

[0093] A practical embodiment of this feature, which can be considered as an inventive solution by itself, is illustrated in Figure 35. Here it can be seen that the EX widening results in the presence of a cavity GWR wherein the GW rolls, which is also illustrated in figure 33.

[0094] Another feature, which can be considered a separate invention, is described below.

[0095] This feature relates to a foot for pallet, the foot comprising an upper part couplable to a pallet body and a lower part wherein the horizontal cross-section of the foot changes at a predetermined height to a horizontal cross-section whose length is smaller than the length of the bottom wall of the foot. In this way, the bottom wall of the foot is long enough to be supported by at least two

rollers of a roller conveyor disposed underneath the foot and, at the same time, when the feet are coupled to a pallet, a standard pallet carrier fork fits between the feet being able to lift the pallet.

[0096] As already stated in various passages of the present description, the present invention relates to nestable pallets, in which the feet are of decreasing section.

[0097] When a pallet is moved on a roller conveyor disposed underneath the feet of the pallet, the feet should be long enough to be supported by at least two consecutive rollers at any time. Otherwise, the pallet would fall between the two consecutive rollers. However, if the feet are two long, the fork of a pallet carrier would collide with the feet when introducing the fork between the feet of the pallet or, once introduced, when the fork lifts the pallet.

[0098] In one aspect of the present feature, the feet comprise a lower part which comprises a bottom wall B11 which is longer than the distance between two consecutive rollers of a roller conveyor. Specifically, given a roller conveyor with an inter-roller distance below 250 cm, the length of the lower surface can be between 250 and 300 cm.

[0099] In another aspect of the present feature, a foot of a pallet 2 comprises a horizontal cross-section section whose length at a continuous height range is smaller than the length of the bottom wall of the lower part of the feet. The horizontal cross-section of the feet can change gradually (e.g. as shown by the change of horizontal cross-section 24 and the wedge-shaped section 23). Specifically, the difference between the length of the horizontal cross-section in the continuous height range and the length of the bottom wall of the lower part of the feet can be between 30 and 40 cm. In addition, the predetermined height at which the horizontal cross-section of the foot changes can be between 15 and 150 cm. However, these specific values can change according to the configuration of the fork of the pallet carrier (e.g. width, thickness, height of each fork bar). Specifically, the predetermined height can be a standard thickness of wood bars of the lower surface of standard pallets (the wood bars over which a fork of a carrier is introduced in order to lift the pallet).

[0100] The features of the previous embodiment are shown in FIGS. 36 to 39. This embodiment comprises a change of a horizontal cross-section 24 of the feet 1, defining a wedge-shaped section 23 disposed on rear part of feet 1, flushing with the bottom wall B11 of feet 1. The horizontal cross-section of the wedge-shaped section 23 decreases as the height of the wedge-shaped section 23 increases, until reaching a particular length of the horizontal cross-section.

[0101] The previous embodiment can comprise a plurality of hooks on the external 22a and internal side 22b of the foot, arranged in the upper part of the feet 1 for coupling with a plurality of vertical channels 21 arranged in the surface of the holes H. This coupling comprises a vertical gap. The vertical gap on the external side 22a of the foot can be smaller than the vertical gap 22b on the internal side, such that the foot can rotate about a longitudinal axis determined by the plurality of hooks of the external side LΓ. The coupling between the vertical channels 21 and hooks the 22 has a horizontal gap between 1 and 2 mm.

[0102] The previous embodiment can comprise detectors arranged underneath the foot and oriented upwards, which is a further aspect of the present invention that facilitates its handling in automatic installations.

[0103] As shown in FIGS. 36 to 39, the previous embodiment can comprise vertical stiffeners 17 in the lower part 11 such that vertical stiffeners through channels CH are formed in the lower part 11, the stiffeners being widened at their lower end 17a such that, if the detectors are used, the horizontal reflective surface is increased.

[0104] In the embodiment shown in FIGS. 36 to 39, the previous embodiment further comprises impact absorbers (bumpers) B6 on the upper part of the peripheric edges of foot 1. More specifically, the bumpers B6 can be disposed in front of the cross-section change (24), so that the pallet carrier fork will not crash with the bumpers B6 when introducing the fork between the feet 1 of the pallet 2 or, once introduced, when lifting the pallet 2. More specifically, bumpers can be disposed between the change of cross-section (24) and the centre of the length of the foot 1. More specifically, bumpers can be disposed at a height lower than the height of hooks 22. Otherwise, the bumpers B6 could be an obstacle to the coupling between the foot 1 and a pallet 2. The height of the leg bumpers B6 will be chosen from 1 to 2 cm in height and will more preferably be 1.5 cm. As an alternative, it will be chosen that this height corresponds to that which allows the bumper to serve as a support between stacked pallets. Indeed, when stacking the pallets, the lower surface of the feet will rest on the upper edge of the ribs (17) of the feet of the lower pallet. In that situation, the bumpers will also receive pressure above their own pallet, and below the pallet on which their own pallet rests. This will contribute to further increase the support surface between pallets, decreasing the efforts, increasing their useful life.

[0105] The foot 1 shown in FIGS. 40 and 41 comprises a change of a horizontal cross-section 24 of the foot 1, defining a wedge-shaped section 23 disposed on rear part of feet 1, flushing with the bottom wall B11 of foot 1. The horizontal cross-section of the wedge-shaped section 23 decreases as the height of the wedge-shaped section 23 increases, until reaching a particular length of the horizontal cross-section.

[0106] The previous embodiment can comprise a plurality of hooks 22 arranged in the upper part of the foot 1 for coupling with a plurality of vertical channels 21 arranged in the surface of the holes H. The coupling between the vertical channels 21 and hooks the 22 has a horizontal gap between 1 and 2 mm.

[0107] The previous embodiment can comprise detectors arranged underneath the foot and oriented upwards,

which is a further aspect of the present invention that facilitates its handling in automatic installations.

[0108] As shown in FIGS. 40 and 41, the previous embodiment can comprise vertical stiffeners 17 in the lower part 11 such that vertical stiffeners through channels CH are formed in the lower part 11, the stiffeners being widened at their lower end 17a such that, if the detectors are used, the horizontal reflective surface is increased.

[0109] As shown in FIGS. 40 and 41, the previous embodiment further comprises impact absorbers (bumpers) B7 on the upper part of the peripheric edges of the foot 1. More specifically, the bumpers B7 can be disposed in front of the change of cross-section (24), so the pallet carrier fork will not crash with the bumpers B7 when introducing the fork between the feet 1 of the pallet 2 or, once introduced, when lifting the pallet. More specifically, bumpers can be disposed on the upper part of the front side of feet 1, being disposed at a height lower than the height of hooks 22. Otherwise, the bumpers B6 could be an obstacle to the coupling between the foot 1 and a pallet 2. The height of the leg bumpers will be chosen from 1 to 2 cm in height and will more preferably be 1.5 cm. As an alternative, it will be chosen that this height corresponds to that which allows the bumper to serve as a support between stacked pallets. Indeed, when stacking the pallets, the lower surface of the feet will rest on the upper edge of the ribs (17) of the feet of the lower pallet. In that situation, the bumpers will also receive pressure above their own pallet, and below the pallet on which their own pallet rests. This will contribute to further increase the support surface between pallets, decreasing the efforts, increasing their useful life.

[0110] As shown in FIGS. 40 and 41, the previous embodiment can comprise an EX widening which results in the presence of a cavity GWR wherein centering rollers GW can roll. According to the chamfered shape of the roller, the enlargement EX is provided on the inner side of the foot, so that the width of the foot is increased in order to increase the surface in contact with the centering rollers GW. Obviously, this widening is limited by the internal distance of the upper section of the foot, to continue guaranteeing that the pallets are nestable, as illustrated in figure 34.

[0111] As shown in figures 40 and 41, the previous embodiment can further comprise recesses 26 and 27

[0112] The foot 1 shown in FIG. 42 comprises a change of a horizontal cross-section of the foot 1, defining a wedge-shaped section 23 disposed on rear part of feet 1, flushing with the bottom wall B11 of foot 1. The horizontal cross-section of the wedge-shaped section 23 decreases as the height of the wedge-shaped section 23 increases, until reaching a particular length of the horizontal cross-section.

[0113] The previous embodiment can comprise a plurality of hooks on the external 22a and internal side 22b of the foot, arranged in the upper part of the feet 1 for coupling with a plurality of vertical channels 21 arranged in the surface of the holes H. This coupling comprises a vertical gap. The vertical gap on the external side 22a of the foot can be smaller than the vertical gap 22b on the internal side, such that the foot can rotate about a longitudinal axis determined by the plurality of hooks of the external side LΓ.

[0114] As shown in FIG. 42, the previous embodiment further comprises impact absorbers (bumpers) B7 on the upper part of the peripheric edges of foot 1. More specifically, the bumpers B7 can be disposed in front of the change of cross-section (24), so the pallet carrier fork will not crash with the bumpers B7 when introducing the fork between the feet of the pallet 2 or, once introduced, when lifting the pallet. More specifically, bumpers can be disposed on the upper part of the front side of feet 1, being disposed at a height lower than the height of hooks 22a, 22b. Otherwise, the bumpers B6 could be an obstacle to the coupling between the foot 1 and a pallet 2. The height of the leg bumpers will be chosen from 1 to 2 cm in height and will more preferably be 1.5 cm. As an alternative, it will be chosen that this height corresponds to that which allows the bumper to serve as a support between stacked pallets. Indeed, when stacking the pallets, the lower surface of the feet will rest on the upper edge of the ribs (17) of the feet of the lower pallet. In that situation, the bumpers will also receive pressure above their own pallet, and below the pallet on which their own pallet rests. This will contribute to further increase the support surface between pallets, decreasing the efforts, increasing their useful life.

[0115] The lateral wall of the previous embodiment comprises a movable part 13, which is displaceable between a hidden position in which it does not protrude from the geometric envelope (See FIG. 4), and an extension position in which it protrudes from the geometric envelope (See FIG. 3).

[0116] When deployed, as shown in FIG. 5a, it allows setting the correct position of the pallet in the conveyor, thus avoiding the situation depicted in FIG. 2.

[0117] As shown in FIG. 42, the shape of the movable part 13 has been optimized. It is appreciated that its shape, is trapezoidal. In this way, impacts or blockages (which would be very damaging) are avoided with the intermittences of the lateral containment fences of the pallets in the pallet circuits (as they are usually not continuous).

[0118] The movable part 13 is articulated with an axis Γ arranged in the lower section of the cavity 14, as shown in FIG. 42.

[0119] The movable part 13 can comprise a lower extension 15 which, in the hidden position protrudes from the bottom wall B11, such that, when the foot rests on a bearing surface S, the lower extension 15 is pressed thus pushing the movable part 13 towards the extension position. In the hidden position the lower extension 15 is displaced with respect to the vertical projection of the axis Γ so that when the foot approaches the ground, the contact with the ground exerts a moment with respect to the axis Γ that causes the rotation of the movable part

13 towards the extension position.

[0120] According to another embodiment, illustrated in Figure 5c, the movable part can be moved according to a translational movement. That is, instead of rotating, it moves in translation. In the illustrated embodiment the displacement is vertical, so that when the pallets P are stacked, the movable part 13 does not constitute an obstacle, but when the pallet P is unstacked, the moving part falls by its own weight.

[0121] The foot is oblong such that a length and a width are defined, the movable part 13 being placed on a wall placed along the length direction, and can occupy more than 60% of the whole length, as shown in FIG. 42.

[0122] The width of the wedge (distance from a lateral side to the opposite lateral side) should be short enough to allow the nesting of the feet of different pallets on top of each other. In addition, the dimension of the lateral side in the extension direction 28 of the movable part 13 is such that it does not extend, in the extension direction dimension, beyond the movable part 13 when the movable part 13 is in the extension position.

[0123] The foot 1 shown in FIG. 43 comprises a change of a horizontal cross-section of the foot 1, defining a wedge-shaped section 23 disposed on rear part of feet 1, flushing with the bottom wall B11 of foot 1. The horizontal cross-section of the wedge-shaped section 23 decreases as the height of the wedge-shaped section 23 increases, until reaching a particular length of the horizontal cross-section.

[0124] The previous embodiment can comprise a plurality of hooks 22 arranged in the upper part of the feet 1 for coupling with a plurality of vertical channels 21 arranged in the surface of the holes H. The coupling between the vertical channels 21 and hooks the 22 has a horizontal gap between 1 and 2 mm.

[0125] In addition, FIG. 43 illustrates an embodiment in which a lateral wall L11 of foot 1 does not comprise any movable part 13 or any EX widening or extension which defines a cavity GWR.

[0126] In any of the previous embodiments which comprise the wedge-shaped section 23, the bottom wall of the wedged-shaped section 23 may be a curved wall in which the exterior end 29 of the curved wall is at a higher position than the section 30 of the curved wall that is in contact with the bottom wall B11 of the feet 1. In this way, the support by at least two rolllers disposed underneath the foot 1 is improved, being further ensured and the feet is lighter.

[0127] In a particular embodiment, the pallet 2 comprises central and lateral feet 1. The central feet are those which are disposed between two feet of the pallet 2. The lateral feet are those which are closest to the periphery of the pallet 2. In this embodiment, the lateral feet (e.g. element 1 in FIG. 41) have a bottom wall B11 with a length which can be smaller than the length of the bottom wall B11 of the central feet (e.g. element 1 in FIG. 43). In particular, the length of the bottom wall B11 of the lateral foot and of the bottom wall B11 of the central foot 1 can be 260.5 cm and 273.5 cm respectively.

[0128] Another problem identified by the inventors is related to the depth of fitting of the pallet handling forks, in particular when they must enter on the long sides, which is usual in automatic installations, to unstack or disengage them from each other.

[0129] As the rear surface of the legs is flat and 90 ° to the side of the pallet, the fork can enter completely if it is behind the foot. But if the fork LF tries to enter before that surface, it simply bumps on the foot and cannot enter. In short, it is an all-or-nothing situation.

[0130] To solve this drawback, a foot as shown in figures 44 to 52 is proposed. On this foot the rear surface RS is arranged obliquely with respect to the side of the pallet, for example forming between 60 ° and 70 °. Said in other words, this plane RS is not perpendicular to the medium plane of the foot (vertical plane having the longitudinal direction of the foot/pallet), but forms an angle between 60 ° and 70 °).

[0131] What is achieved with this is that the support surface of the foot is maintained, but a variable depth of entry of the forks LF is achieved, as illustrated in figures 53 to 56.

[0132] Therefore, if for some reason the forks LF are very displaced towards the back or front of the pallet (remember that they enter from the side) then they will not meet immediately with the foot, but before doing so they will have a penetration course (24.7 - 46.7 -67.74 - 101.7 mm as an example as shown in figures 53 to 56) that will allow a sufficient support surface to lift the pallet.

[0133] And all this without reducing the support surface, which is essential to distribute the weight and ensure that the foot can withstand high weights without deforming and maintain its useful life.

[0134] And in a manner similar to the other features described in this specification, it also contributes to the adaptation of the pallet to an automated logistics facility.

[0135] In this text, the term "comprises" and its derivations (such as "comprising", etc.) should not be understood in an excluding sense, that is, these terms should not be interpreted as excluding the possibility that what is described and defined may include further elements.

[0136] The invention is obviously not limited to the specific embodiments described herein, but also encompasses any variations that may be considered by any person skilled in the art within the general scope of the invention as defined in the claims.

Claims

1. Foot (1) for pallet (P), a lower part (11) and an upper part (12) being defined in the foot (1), the lower part being formed by a lateral wall (L11) and a bottom wall (B11) and the lower part (11) having a cross section smaller than the upper part (12), so that when stacking one pallet (P) on top of another pallet (P), the feet (1) can be fitted thus reducing the height of

the resulting stack, a geometric envelope being defined in the lower part (11), **characterized in that** the lateral wall (L11) comprises a movable part (13), the movable part (13) being displaceable between a hidden position in which it does not protrude from the geometric envelope, and an extension position in which it protrudes from the geometric envelope.

2. Foot (1) according to claim 1, which comprises a housing (14) for the movable part (13), the housing being an outwards oriented cavity (14).

3. Foot (1) according to claim 2, wherein the movable part (13) is articulated with an axis (Γ) arranged in the lower section of the cavity (14).

4. Foot (1) according to any of the previous claims, wherein the movable part (13) has at least one lower extension (15) which, in the hidden position protrudes from the bottom wall (B11), such that, when the foot rests on a bearing surface (S), the lower extension (15) is pressed thus pushing the movable part (13) towards the extension position.

5. Foot (1) according to claim 3 and claim 4, wherein in the hidden position the lower extension (15) is displaced with respect to the vertical projection of the axis (Γ) so that when the foot approaches the ground, the contact with the ground exerts a moment with respect to the axis (Γ) that causes the rotation (R) of the movable part (13) towards the extension position.

6. Foot (1) according to any of the previous claims, wherein the lower part (11) and the upper part (12) have a constant section, the transition (16) between the lower part (11) and the upper part (12) having a non-uniform decreasing section, such that there is a smooth transition between the lower part (11) and the upper part (12).

7. Foot (1) according to any of the previous claims wherein the foot is oblong such that a length and a width are defined, the movable part (13) being placed on a wall placed along the length direction.

8. Foot (1) according to any of the previous claims, wherein the lower part (11) is provided with vertical stiffeners (17) such that vertical through channels (CH) are formed in the lower part (11), the stiffeners being widened at their lower end (17a).

9. Pallet (P) comprising a pallet body (2) and a plurality of feet (1, 1'), the pallet body (2) having a length greater than the width, the pallet comprising four feet (1) placed at the corners and two feet (1') placed near the smaller side of the pallet body (2), **characterised in that** the corner feet (1) are according to any of claims 1 to 8, the movable part (13) being placed at the outer side.

10. Pallet (P) according to claim 9, wherein the pallet body (2) comprises a through hole (H) for housing each foot (1, 1'), a surface (2S) of the holes (H) and the upper part of the feet (1, 1') being provided with coupling means such that the feet (1, 1') are replaceable.

11. Pallet according to claim 10, wherein the coupling means comprise a plurality of vertical channels (21) arranged in the surface of the holes (H), and hooks (22) arranged in the upper part of the feet (1, 1').

12. Pallet according to claim 11, wherein the coupling between the vertical channels (21) and hooks the (22) has a horizontal gap between 1 and 5 mm, preferably between 1 and 3 mm, and more preferably 1 and 2 mm.

13. Pallet according to any of claims 10 to 12, wherein the coupling between the vertical channels (21) and hooks the (22) has a vertical gap between 1 and 5 mm, preferably between 1 and 3 mm, and more preferably 1 and 2 mm.

14. Pallet comprising a , wherein the vertical gap on the external side of the foot is smaller than the vertical gap on the internal side, such that the foot can rotate about a longitudinal axis (LΓ).

15. Pallet (P) comprising a pallet body (2) and a plurality of feet (1, 1'), **characterised in that** the pallet body (2) and/or the feet comprise bumpers on the edges.

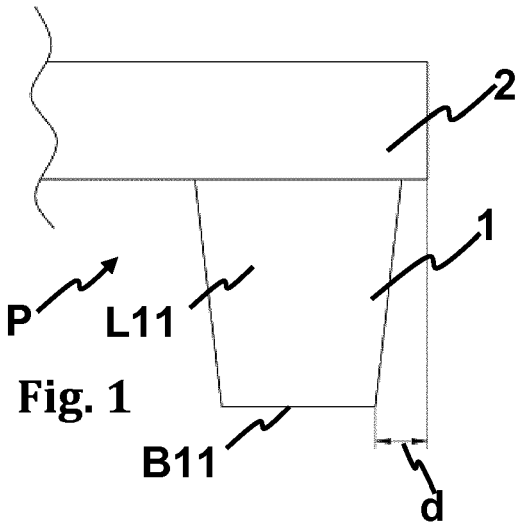


Fig. 1

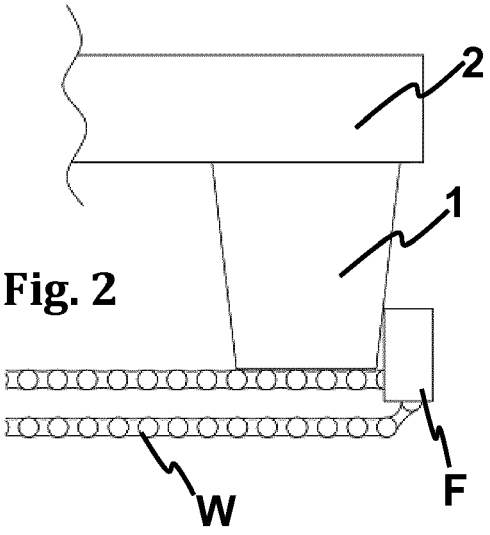


Fig. 2

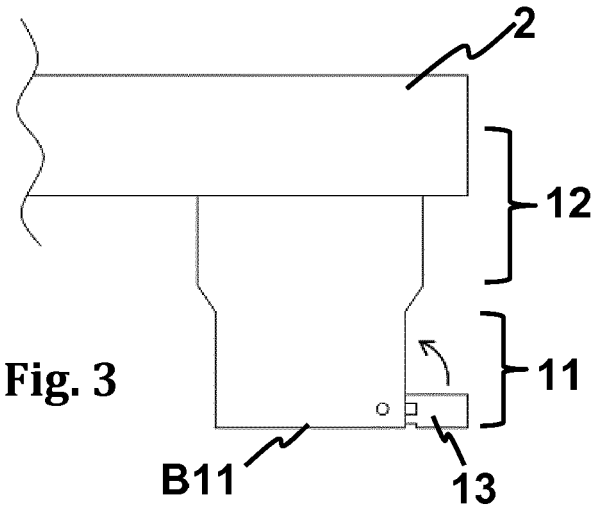


Fig. 3

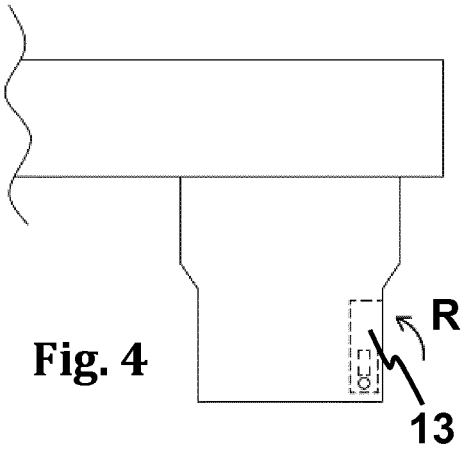


Fig. 4

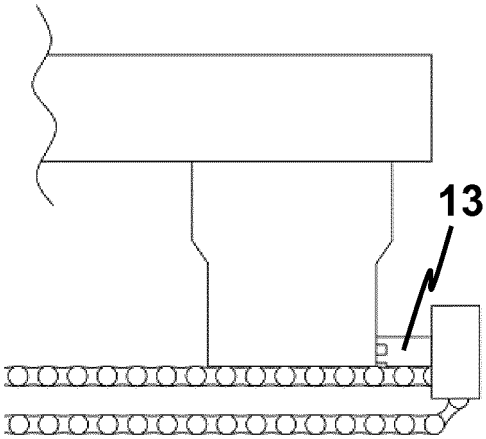


Fig. 5a

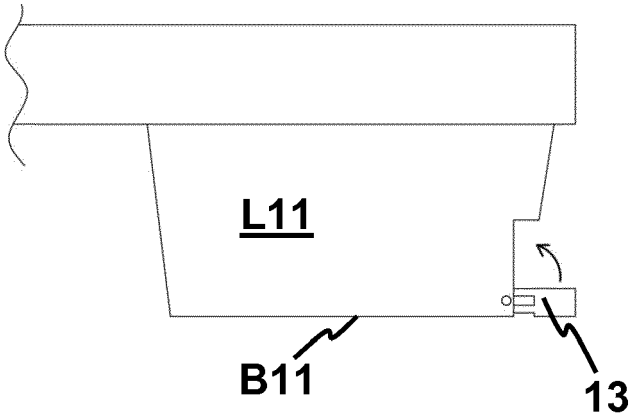


Fig. 5b

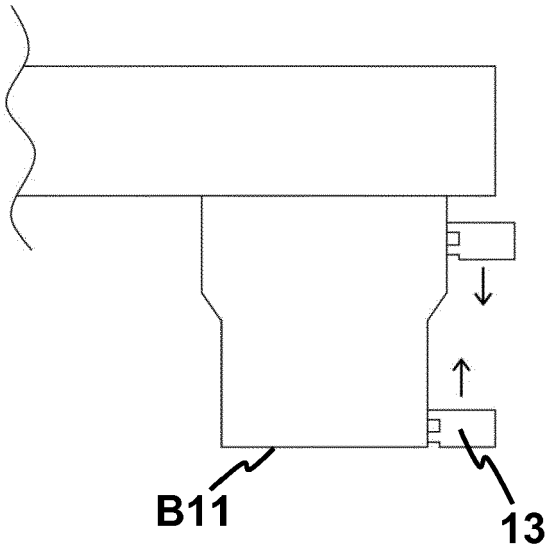


Fig. 5c

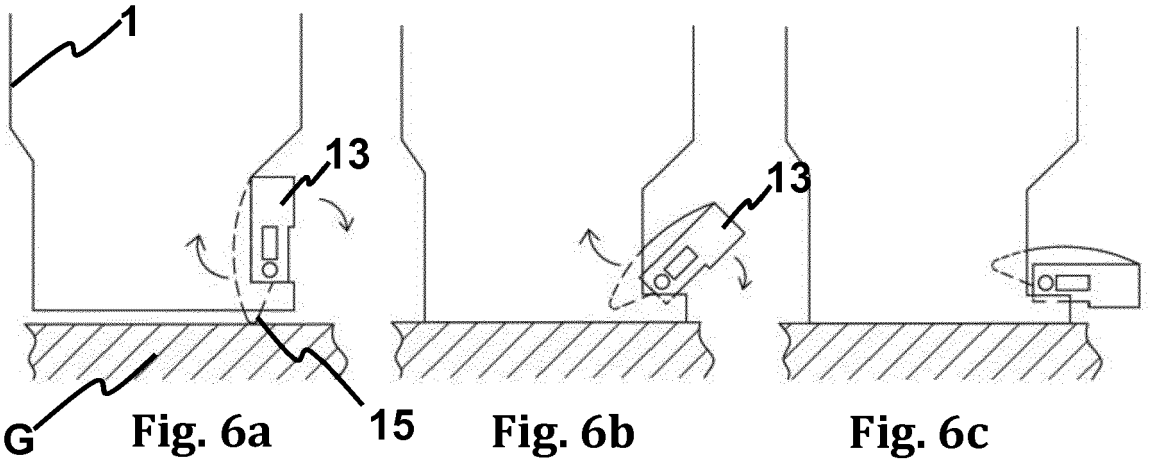


Fig. 6a Fig. 6b Fig. 6c

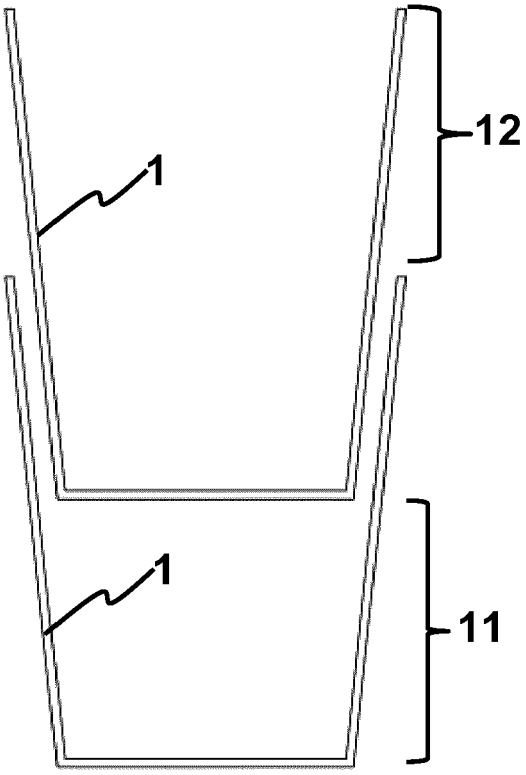


Fig. 7

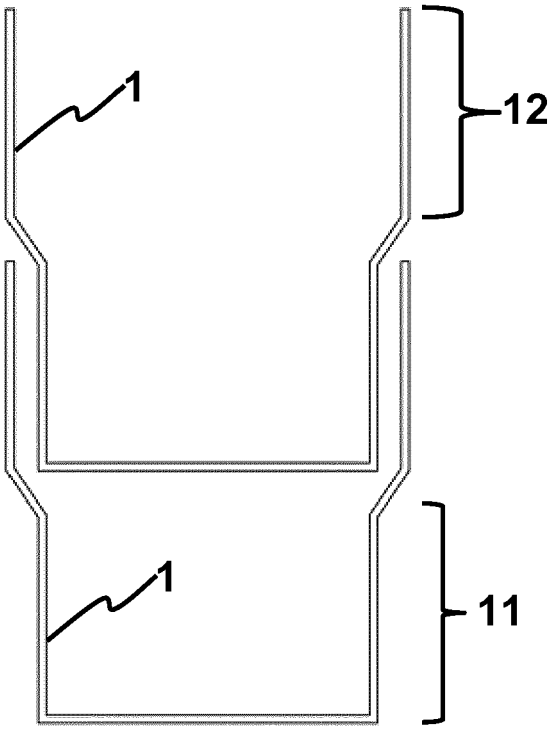


Fig. 8

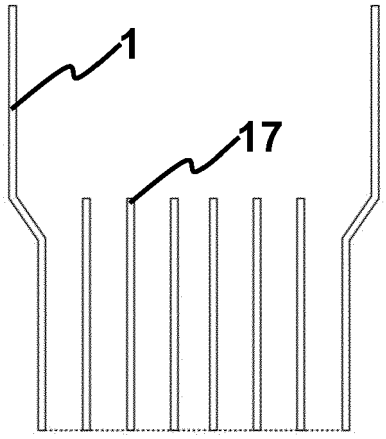


Fig. 9

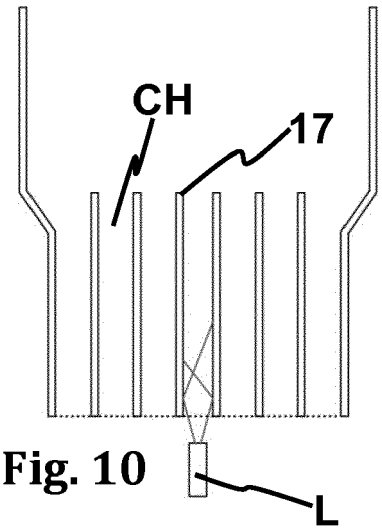


Fig. 10

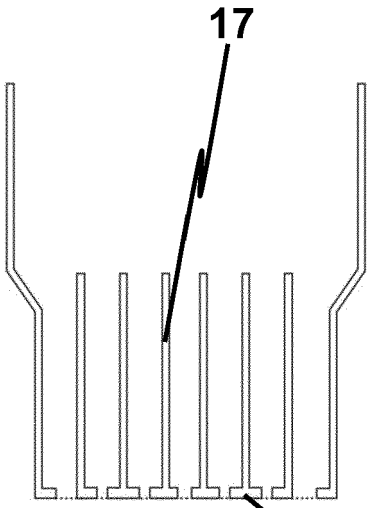


Fig. 11

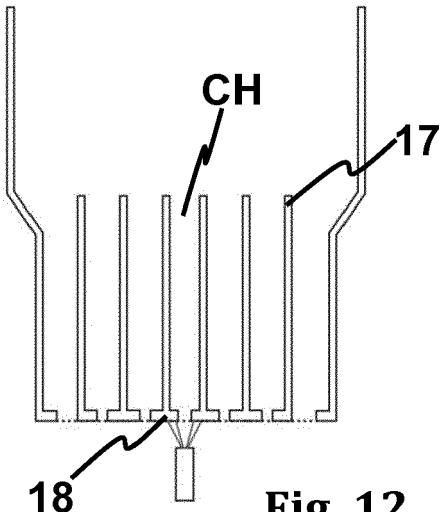
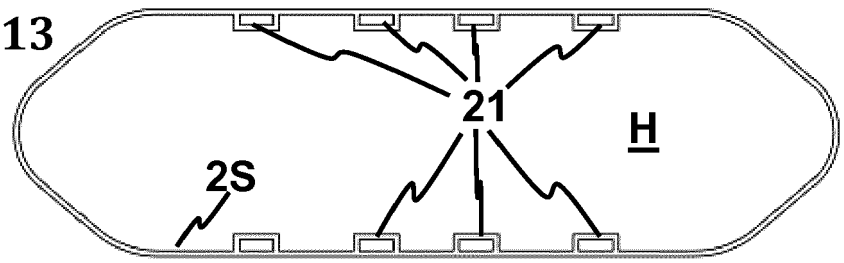


Fig. 12

Fig. 13



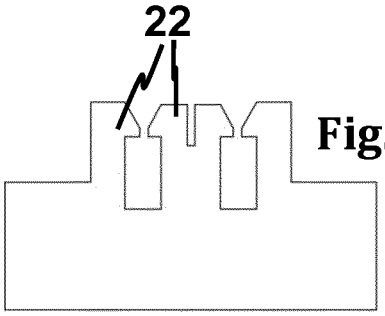


Fig. 14

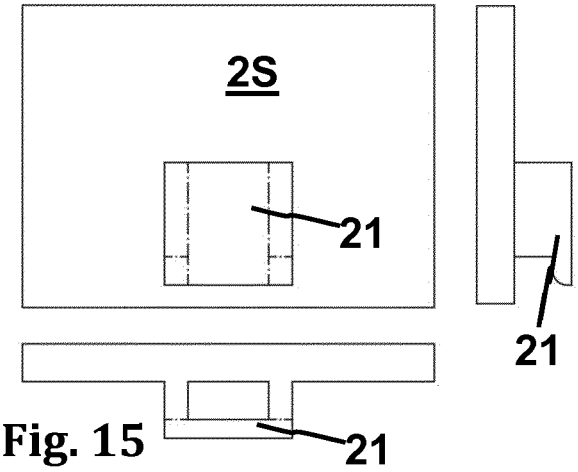


Fig. 15

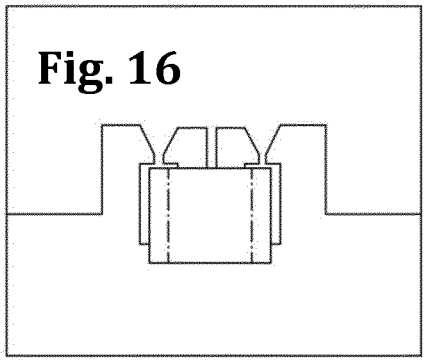


Fig. 16

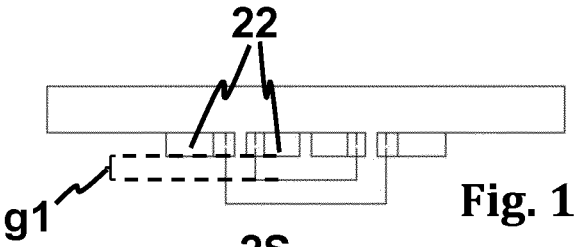


Fig. 17a

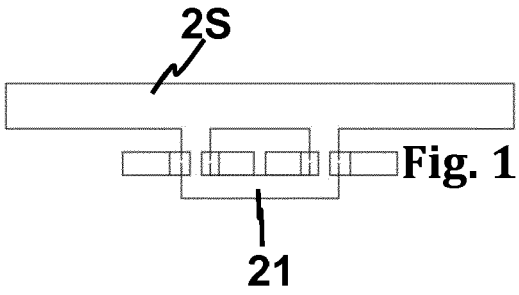


Fig. 17b

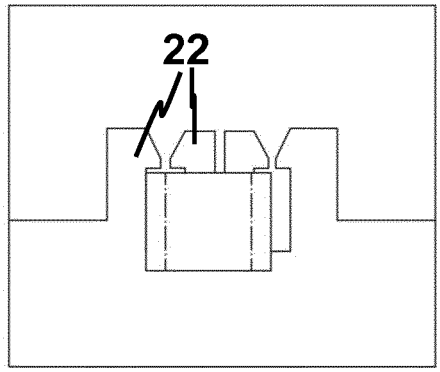


Fig. 18a

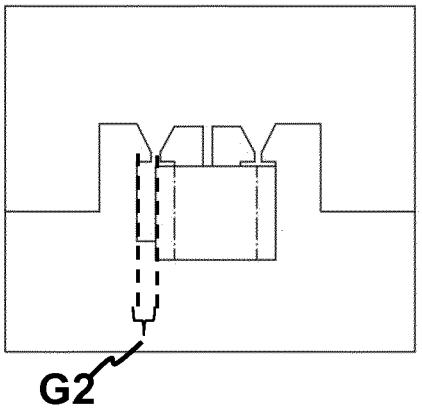


Fig. 18b

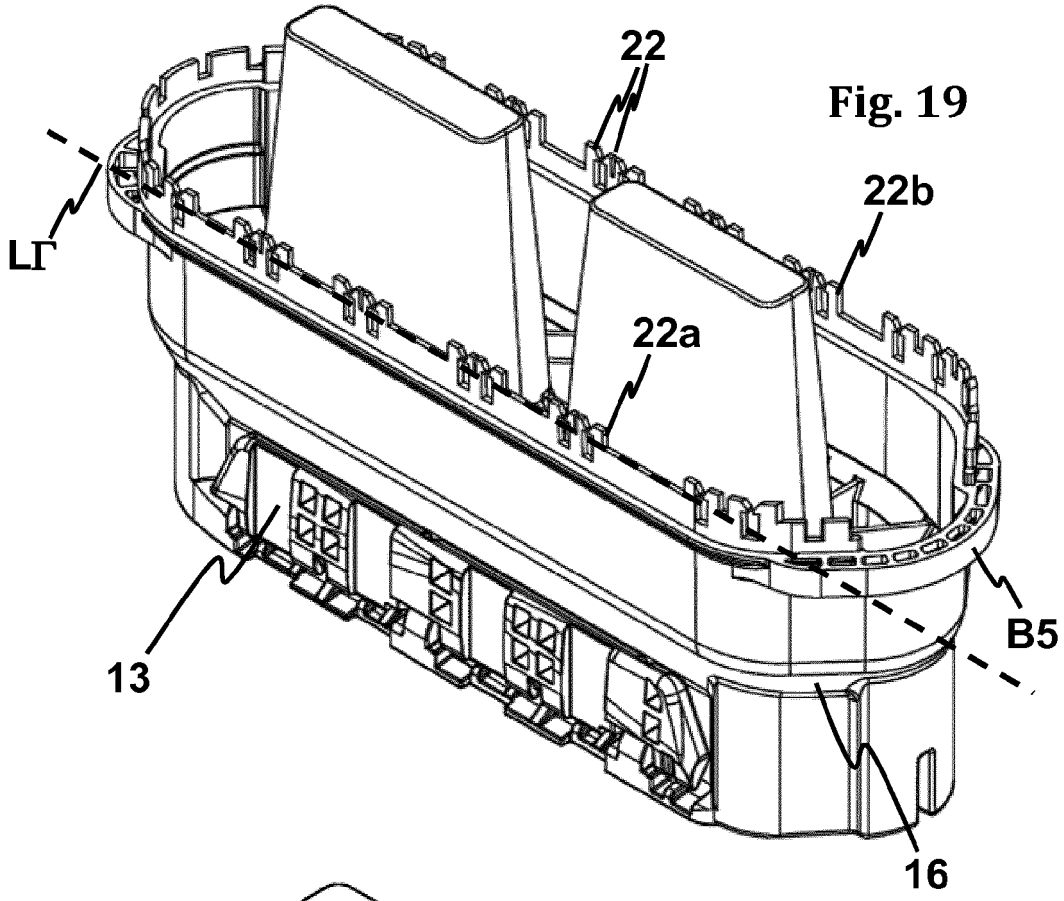


Fig. 19

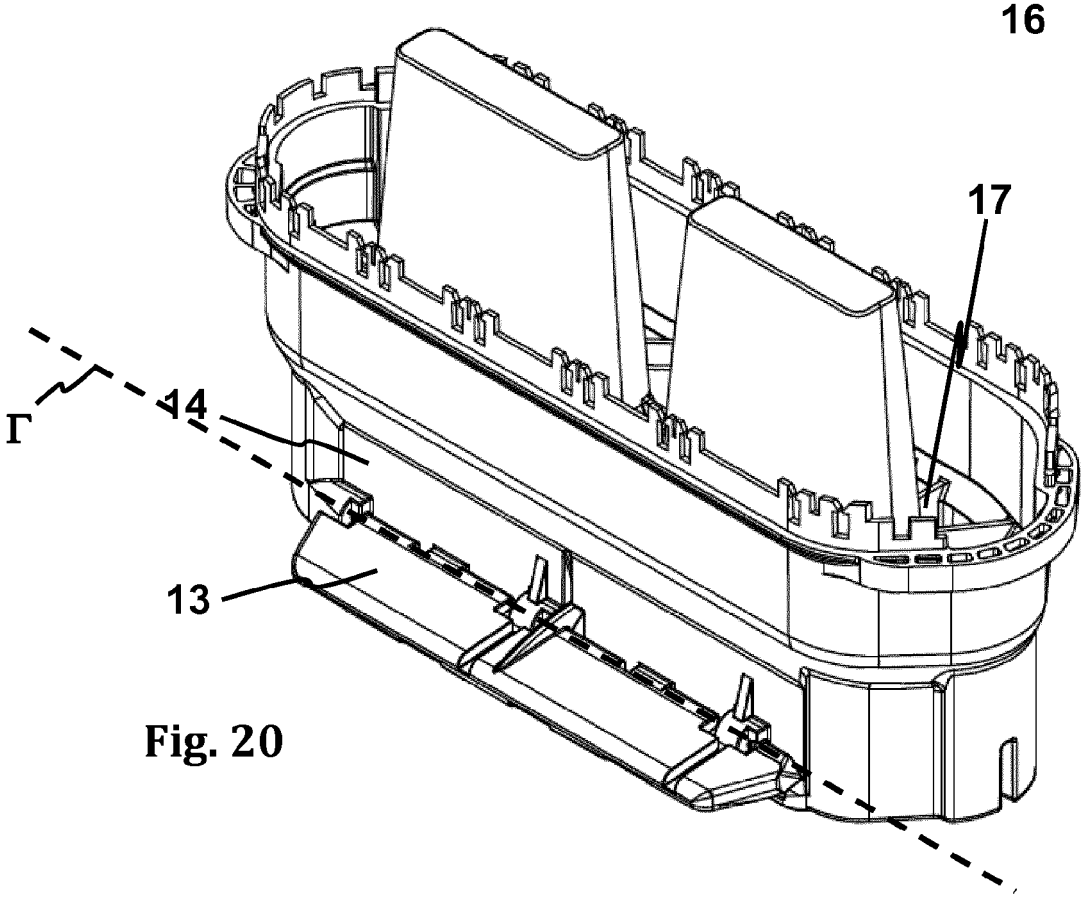


Fig. 20

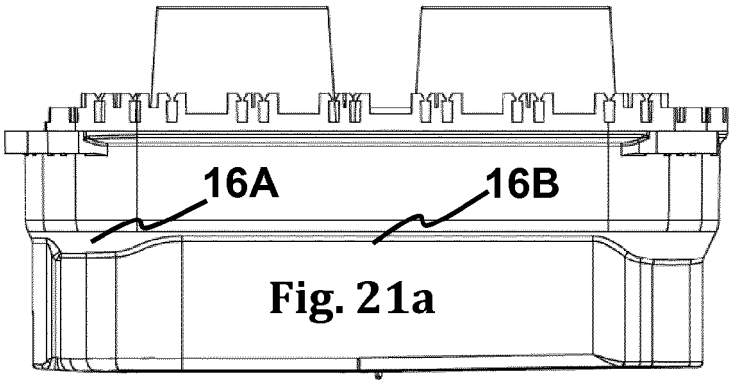


Fig. 21a

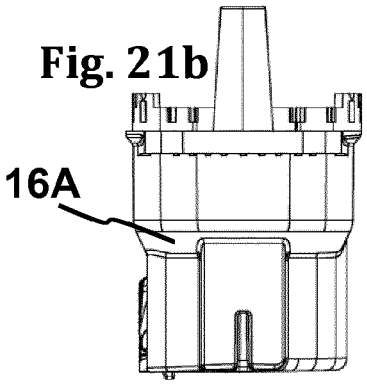


Fig. 21b

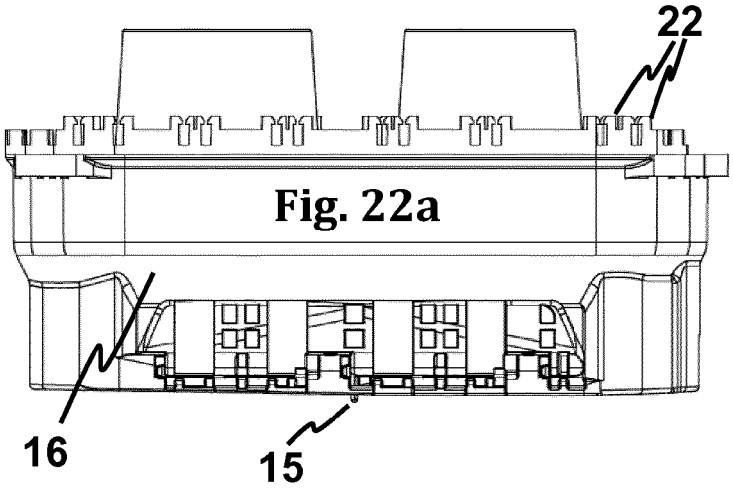


Fig. 22a

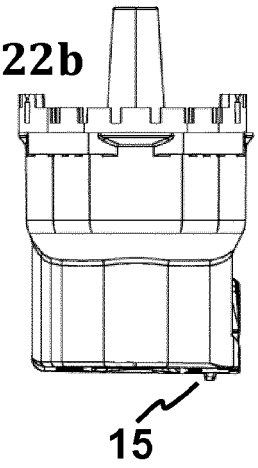


Fig. 22b

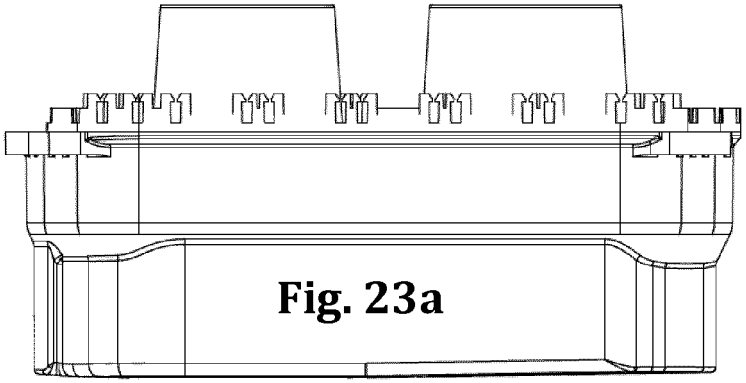


Fig. 23a

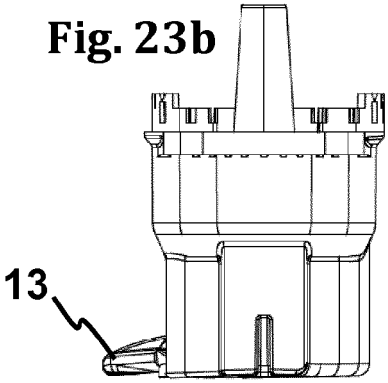


Fig. 23b

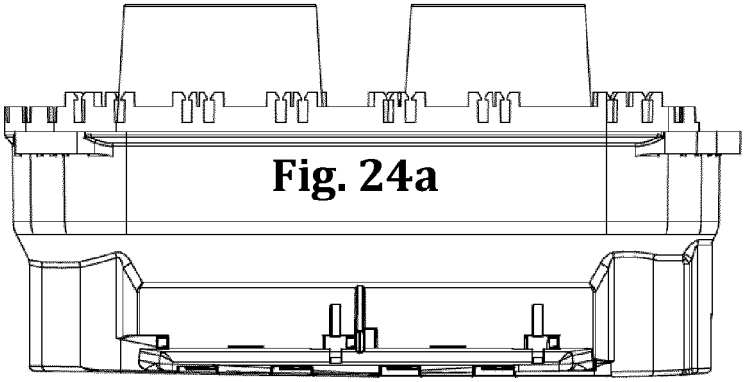


Fig. 24a

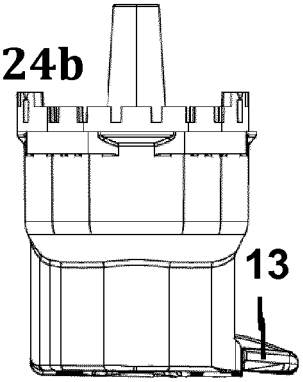
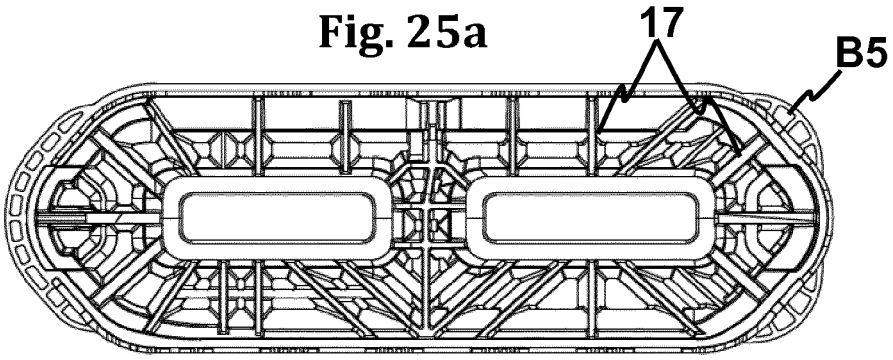


Fig. 24b

Fig. 25a



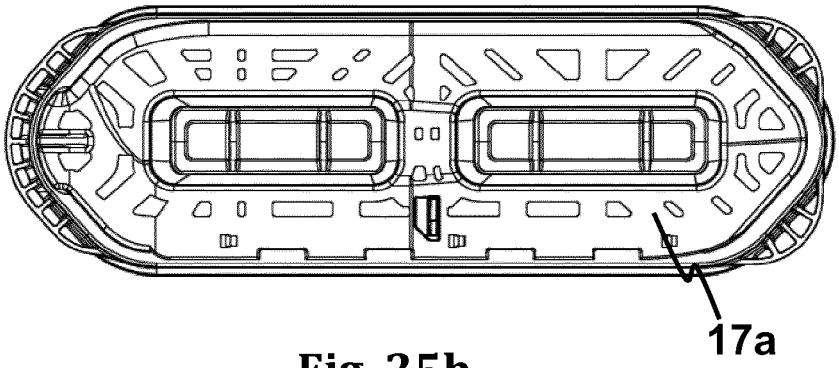


Fig. 25b

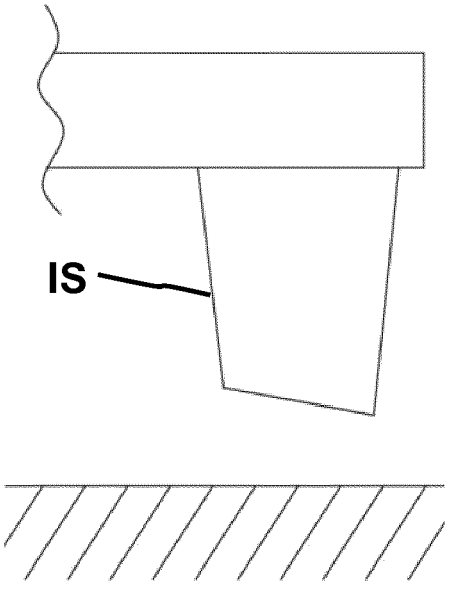


Fig. 25c

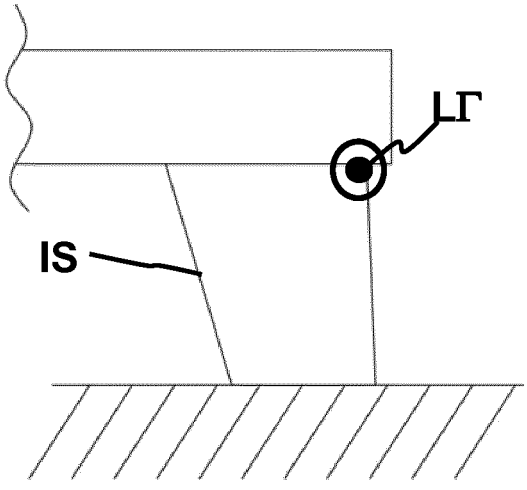


Fig. 25d

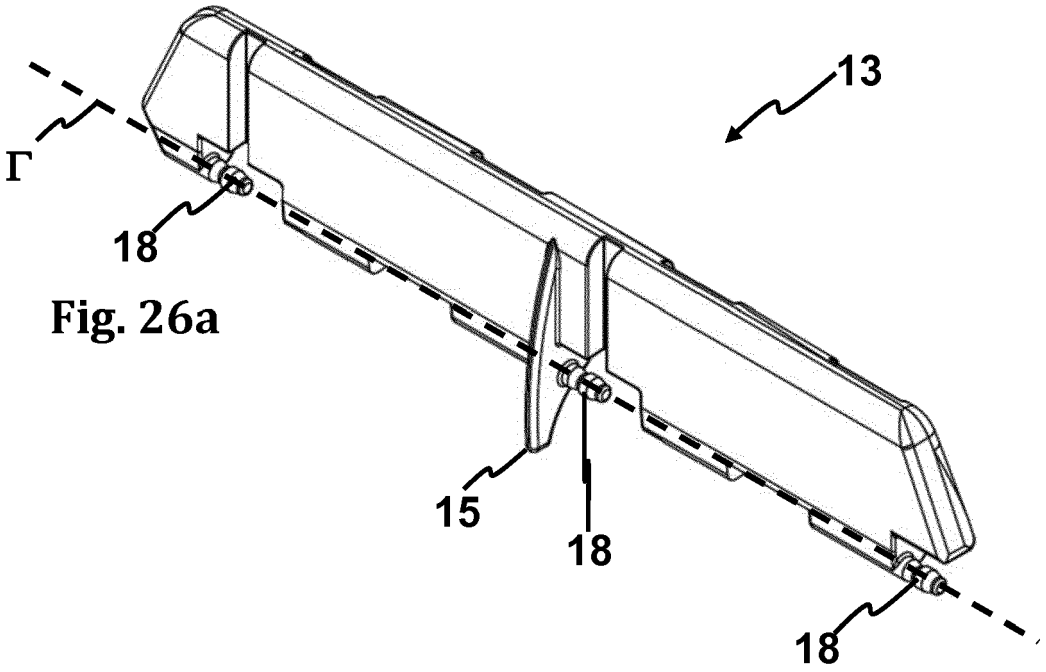


Fig. 26a

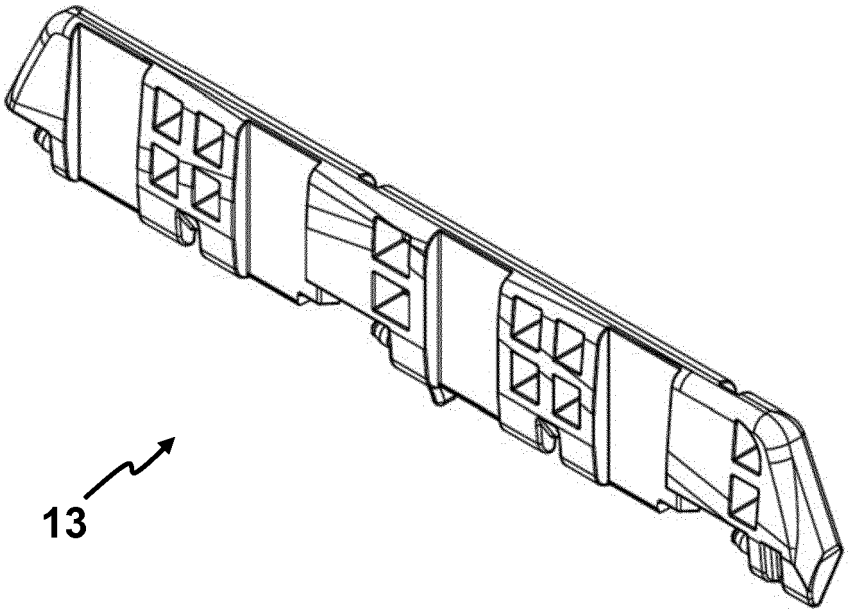


Fig. 26b

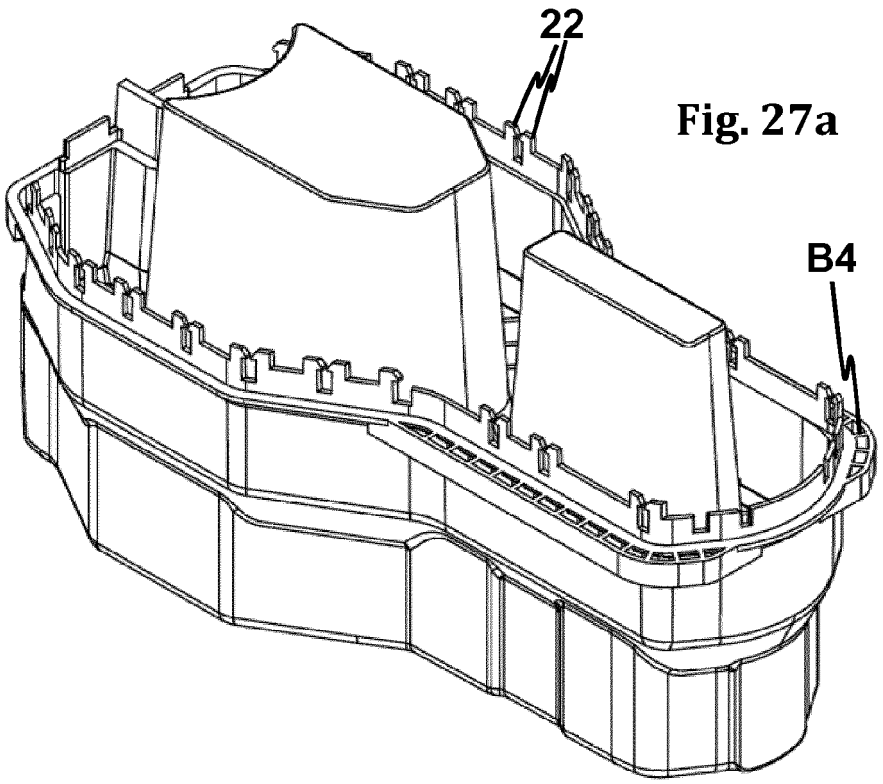


Fig. 27a

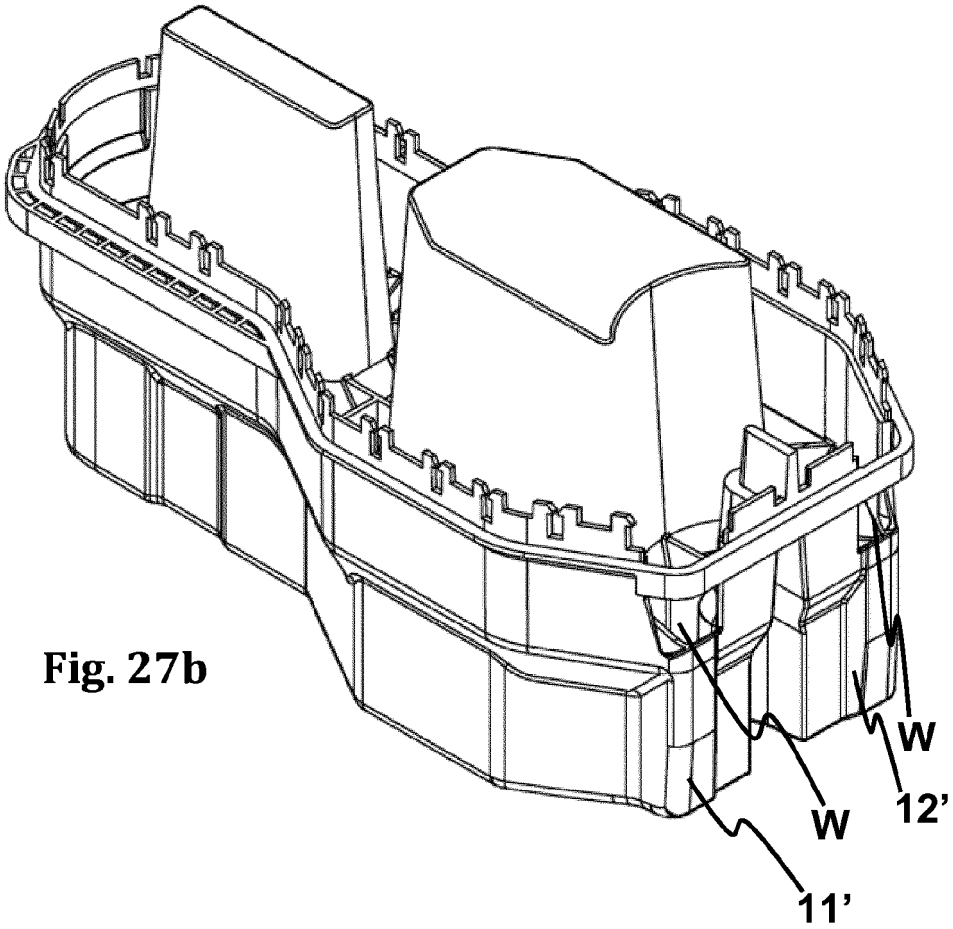


Fig. 27b

Fig. 28a

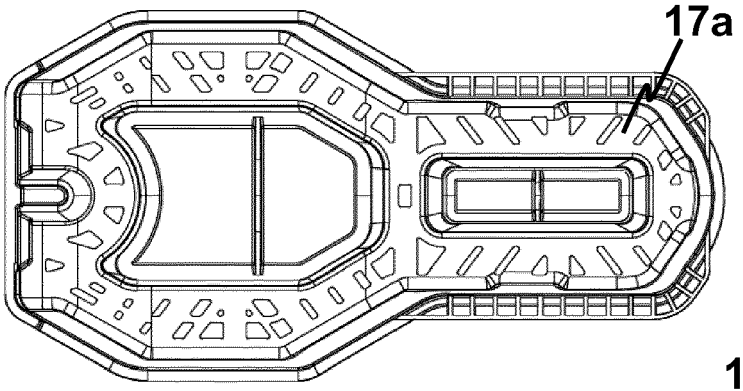
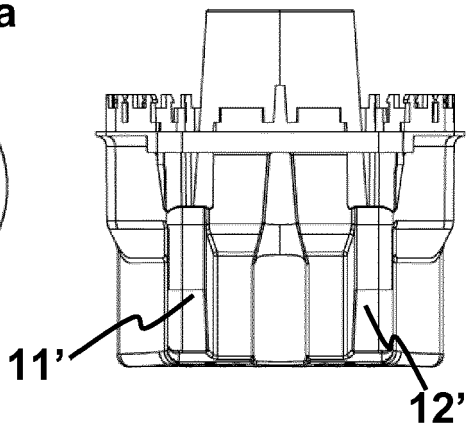


Fig. 28b



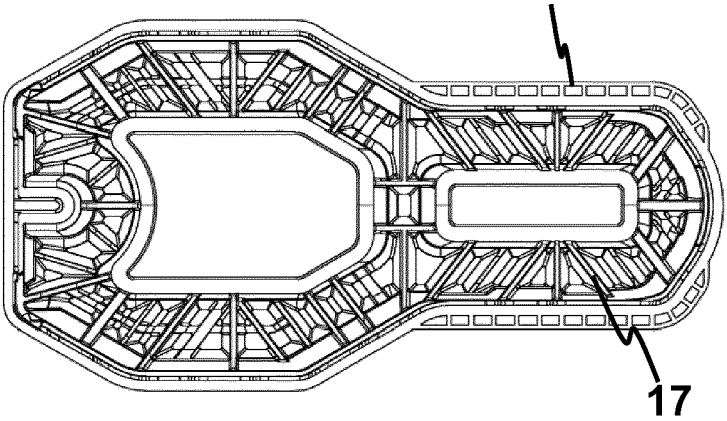


Fig. 28c

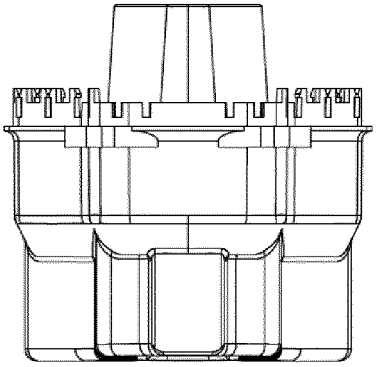


Fig. 28d

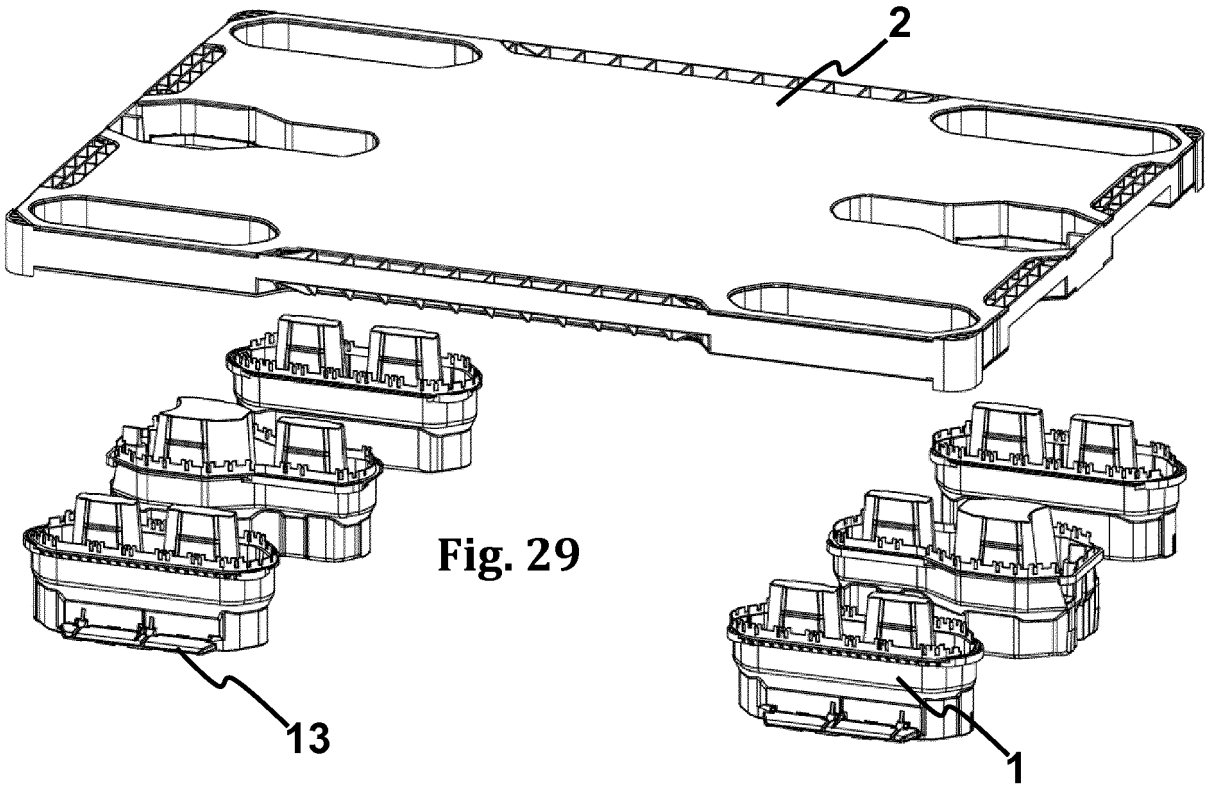


Fig. 29

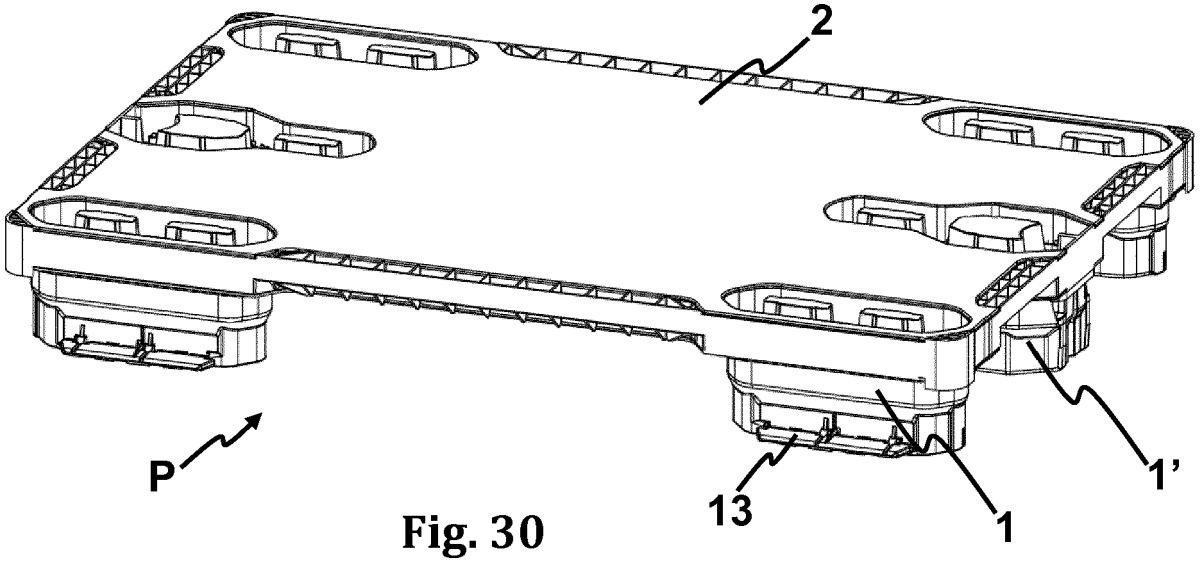


Fig. 30

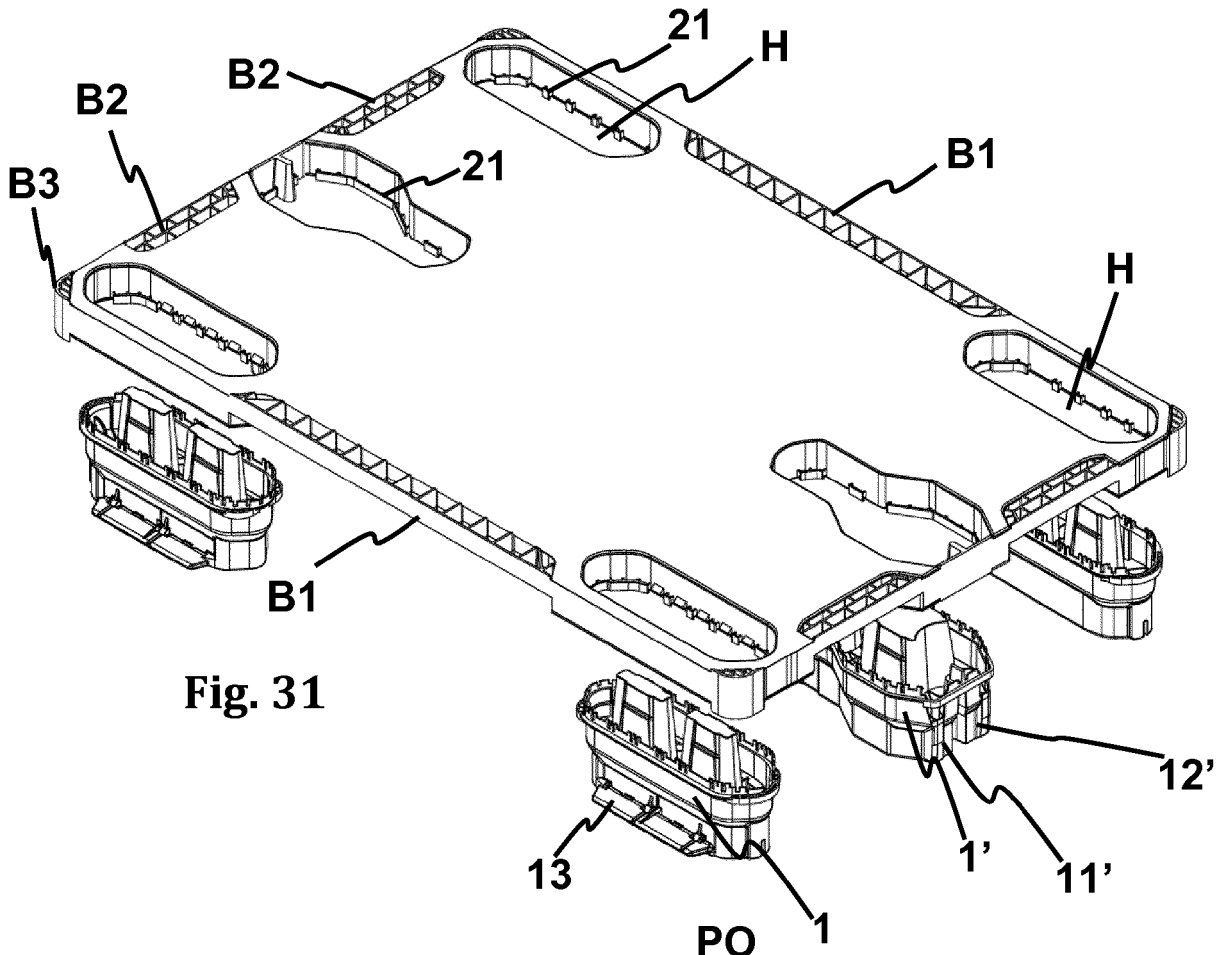


Fig. 31

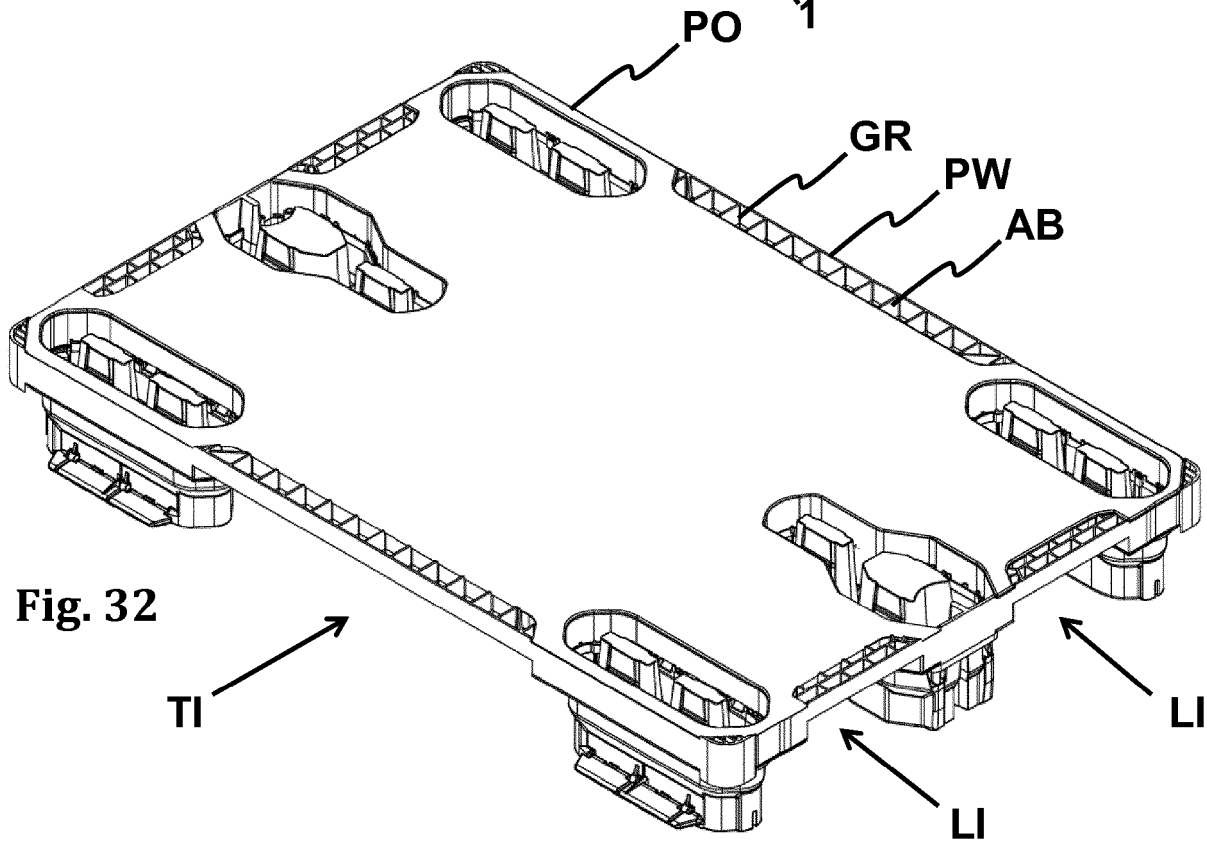


Fig. 32

Fig. 33

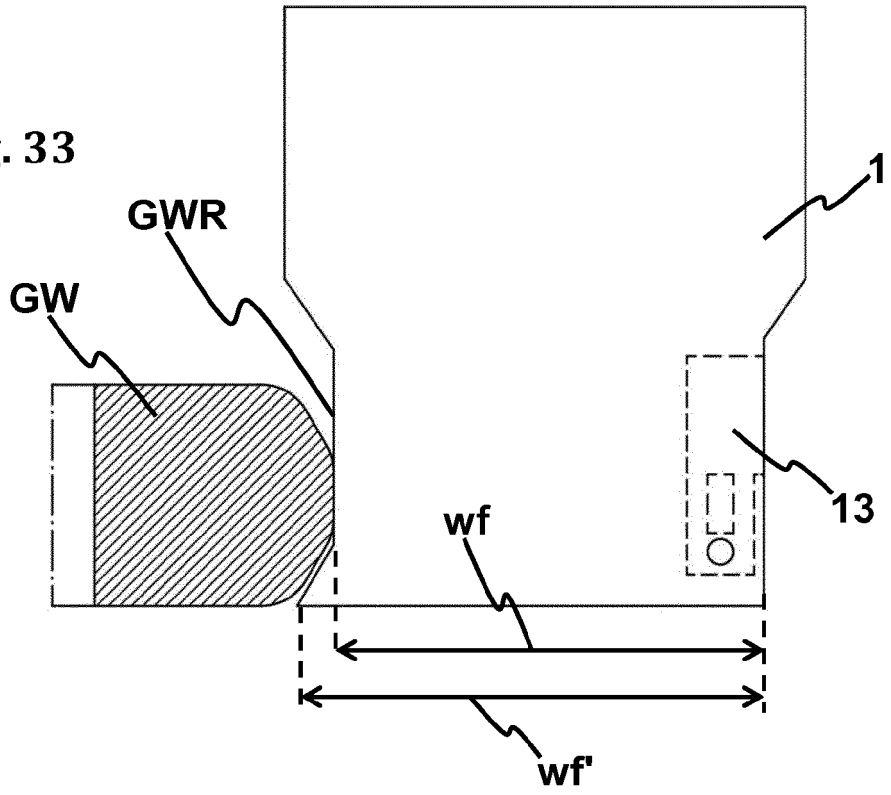


Fig. 34

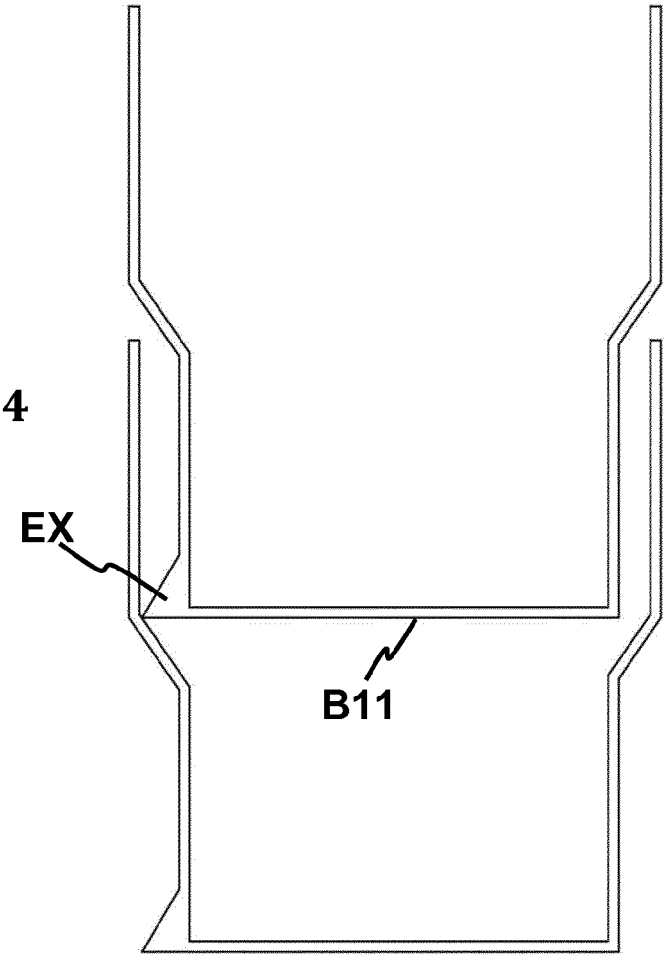


Fig. 35

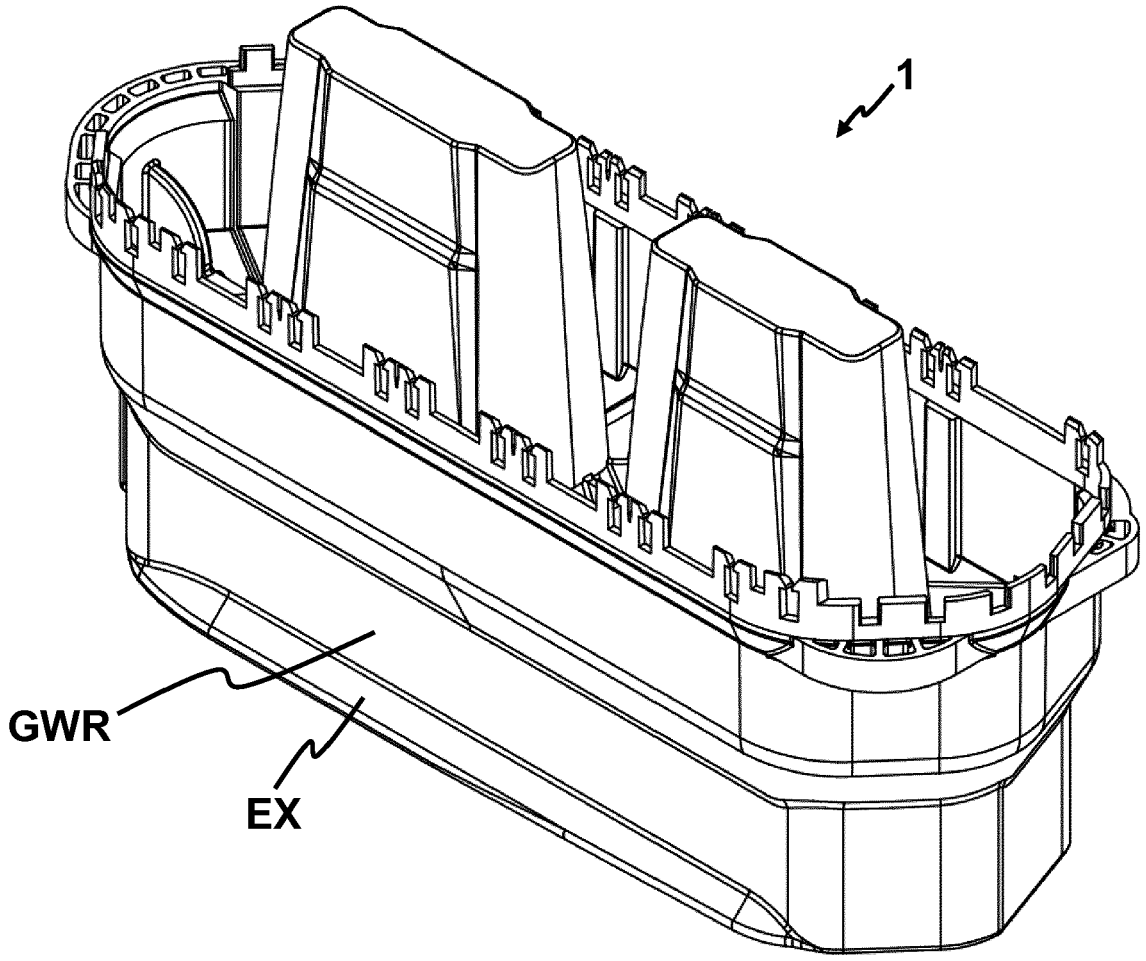


Fig. 36

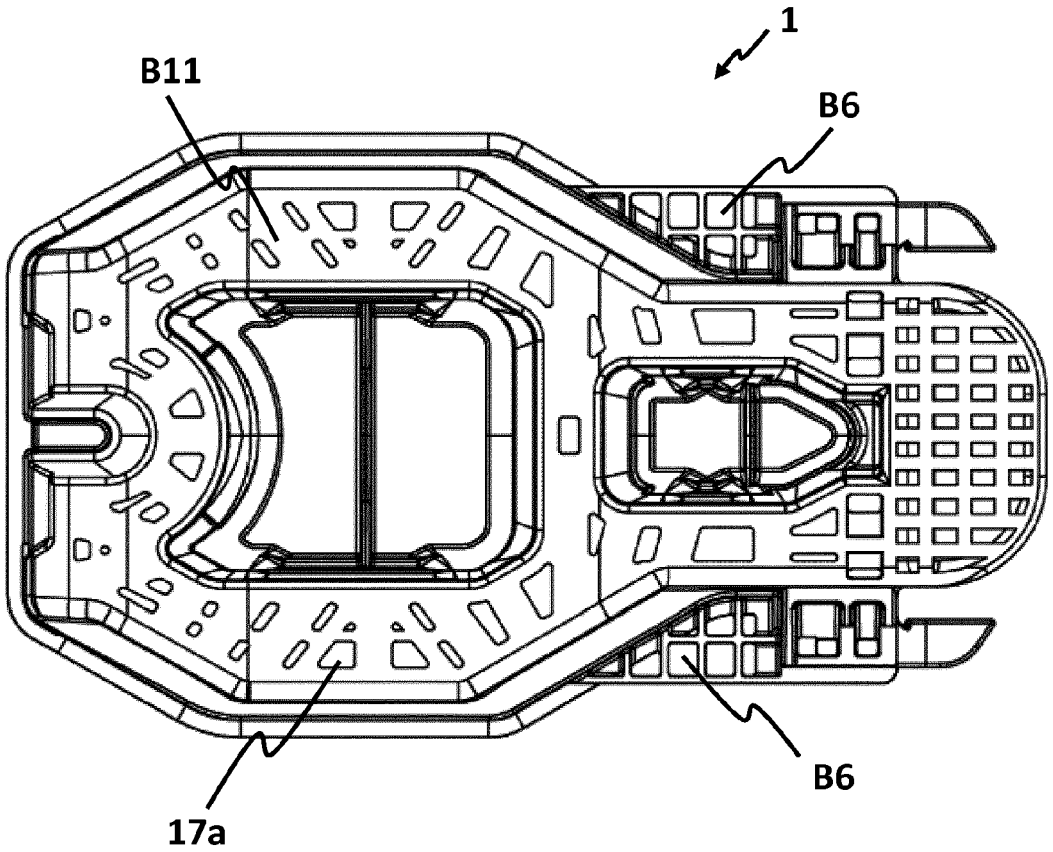


Fig. 37

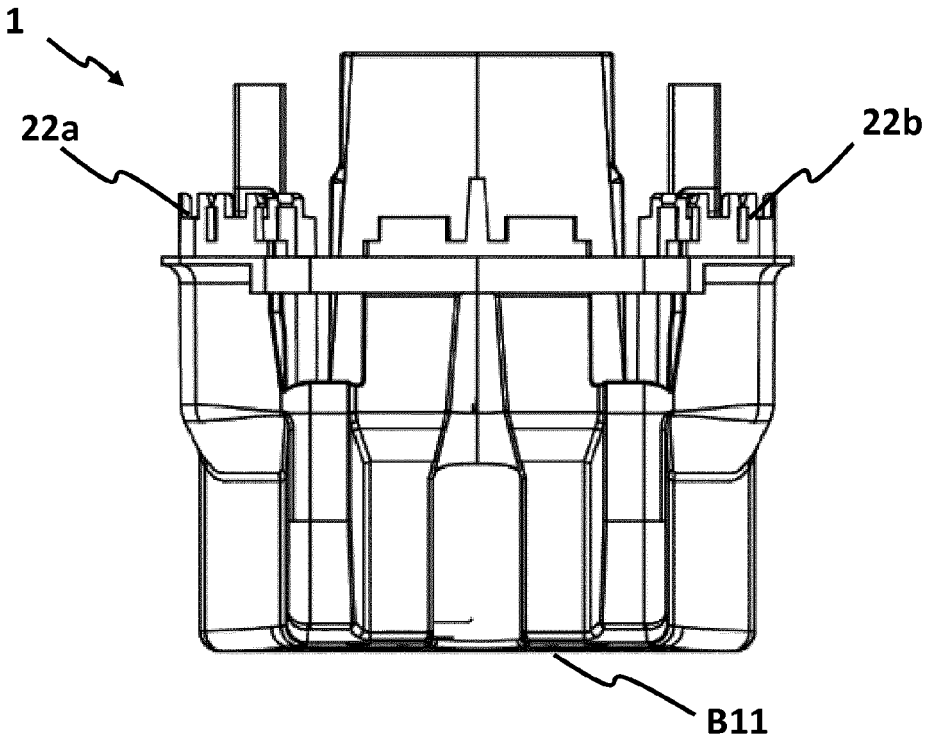


Fig. 38

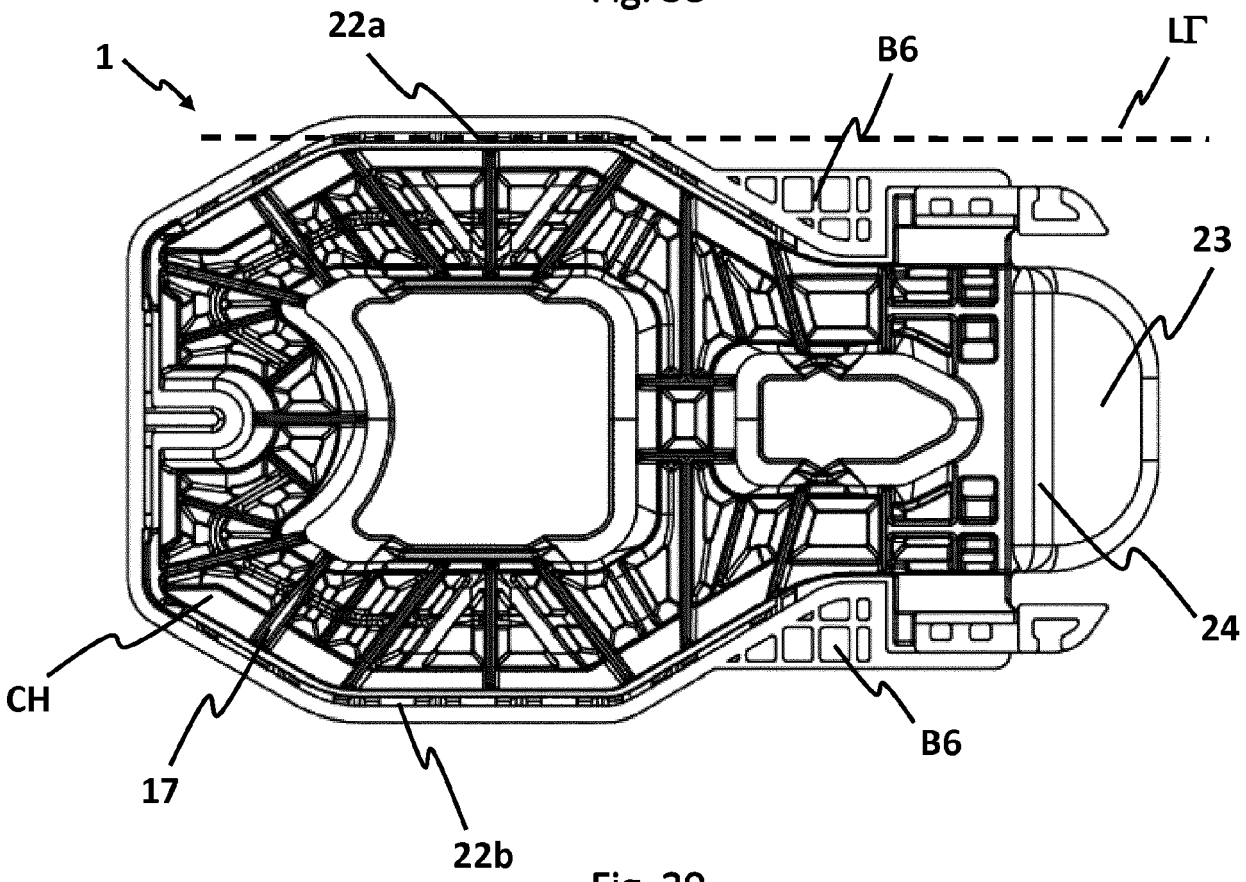


Fig. 39

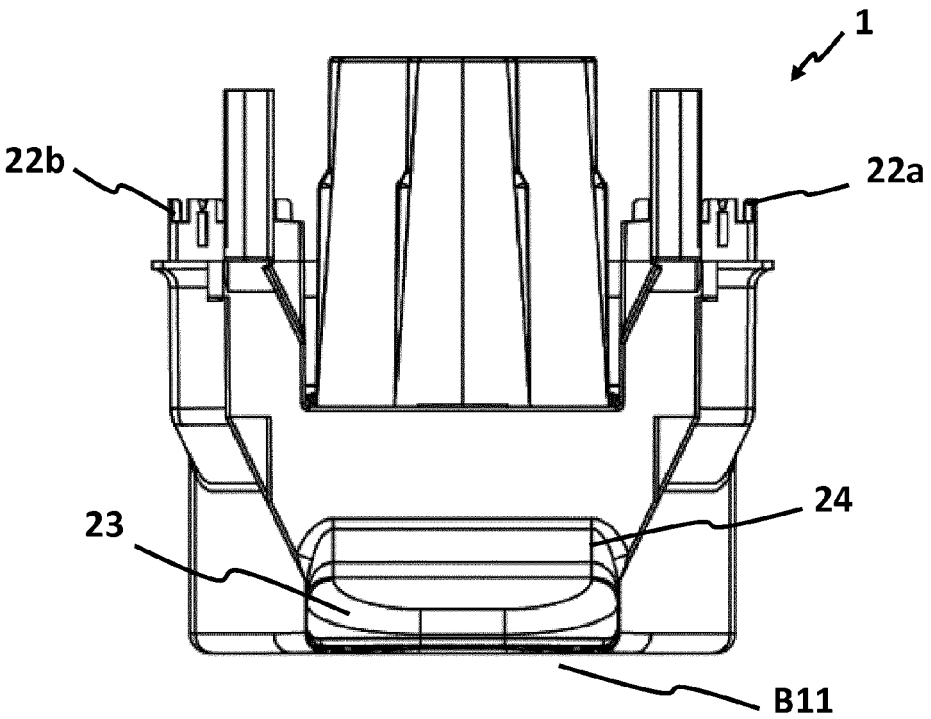


Fig. 40

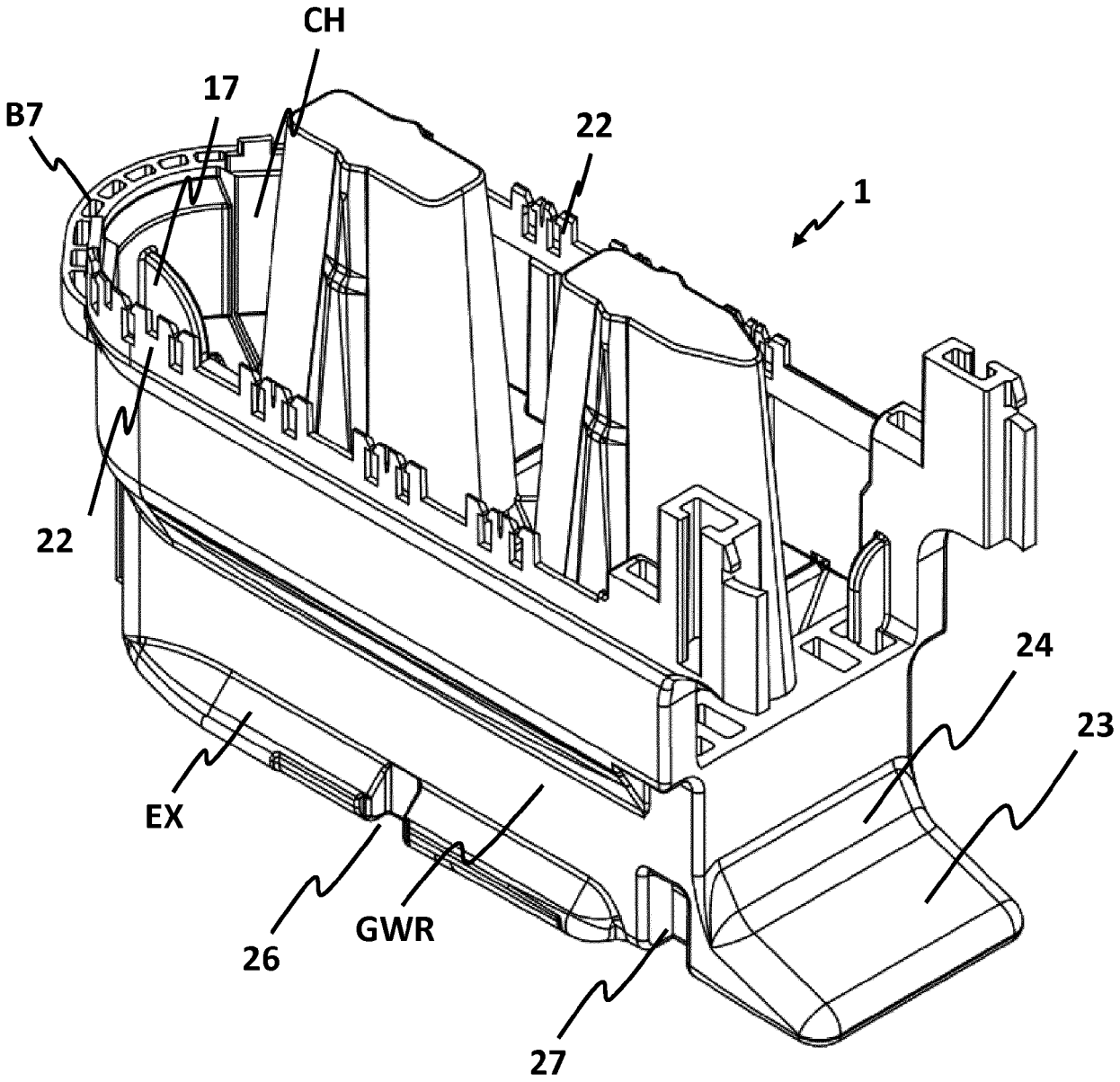


Fig. 41

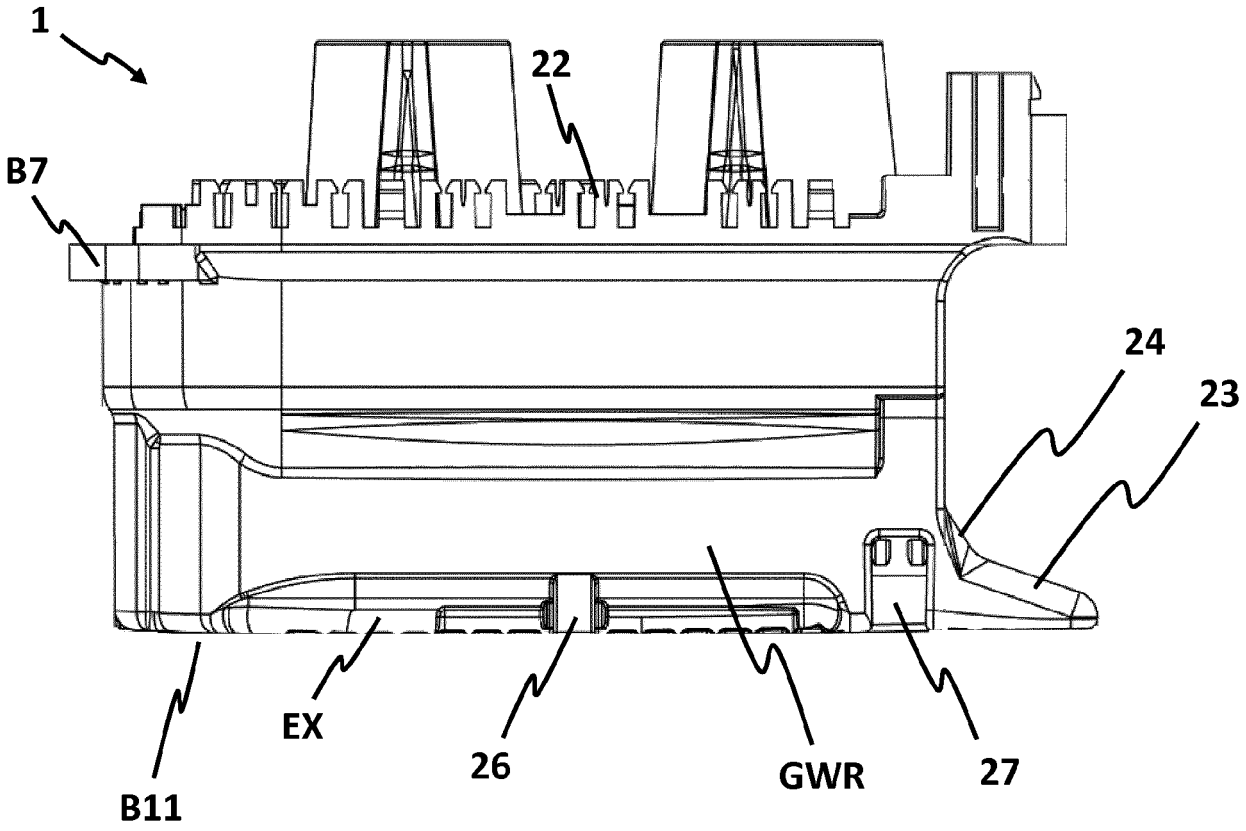


Fig. 42

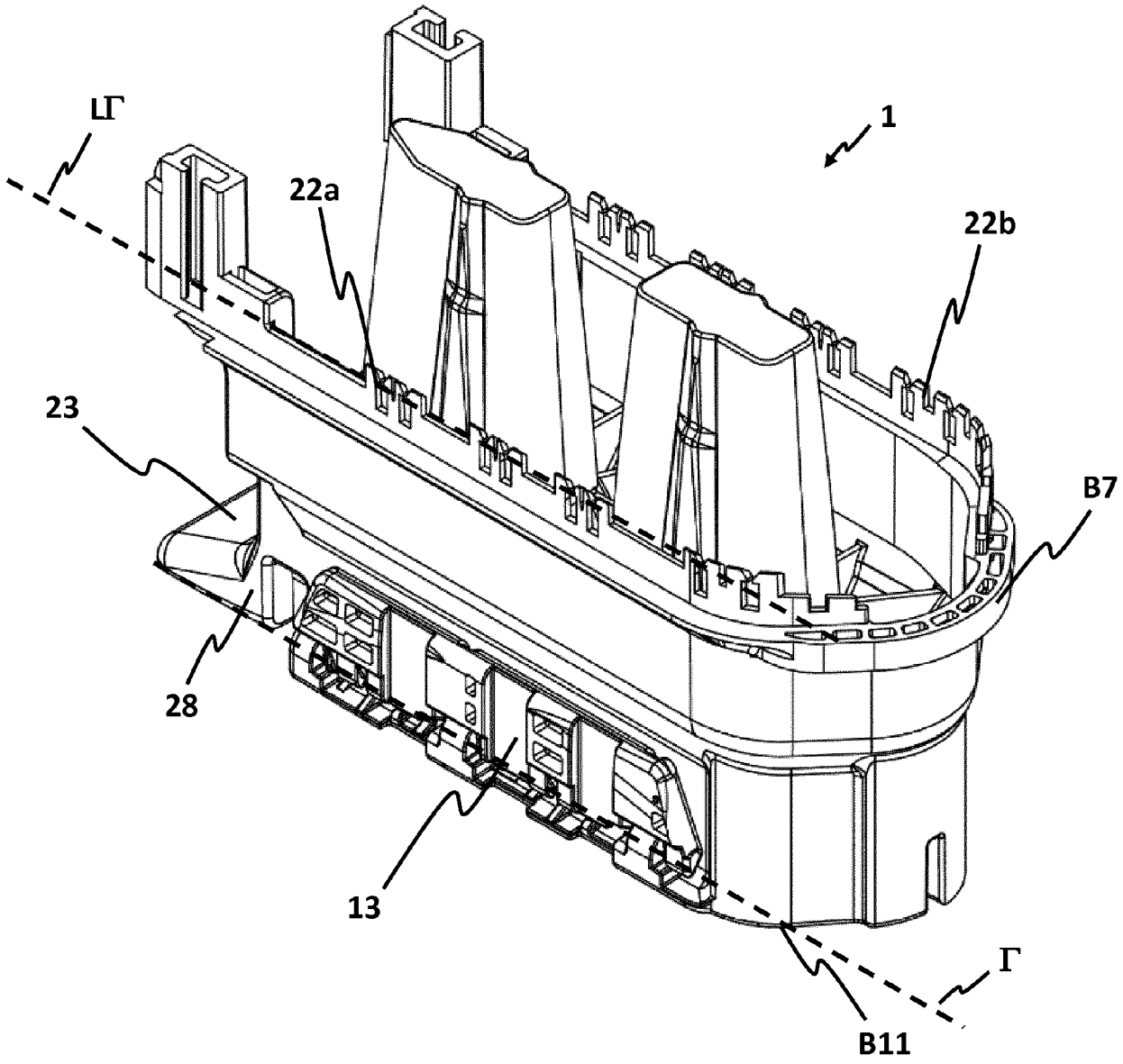
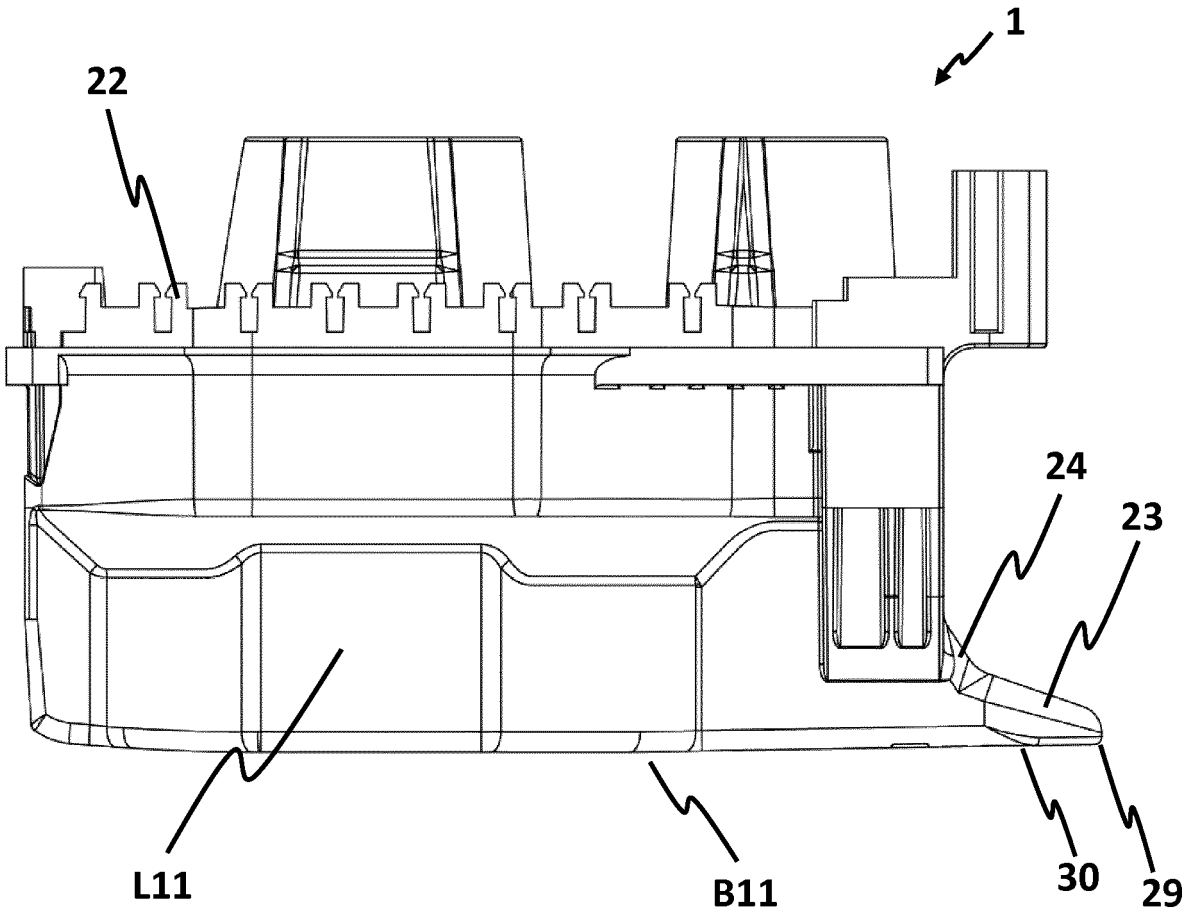


Fig. 43



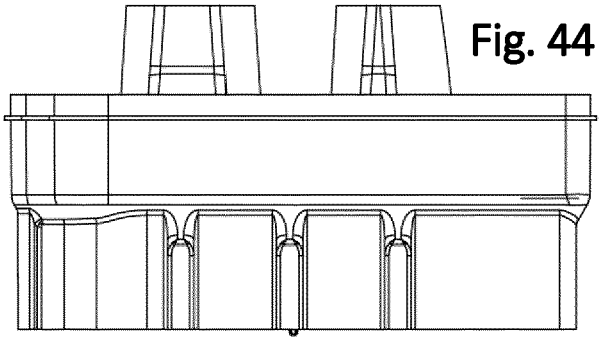


Fig. 44

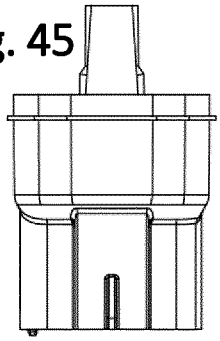


Fig. 45

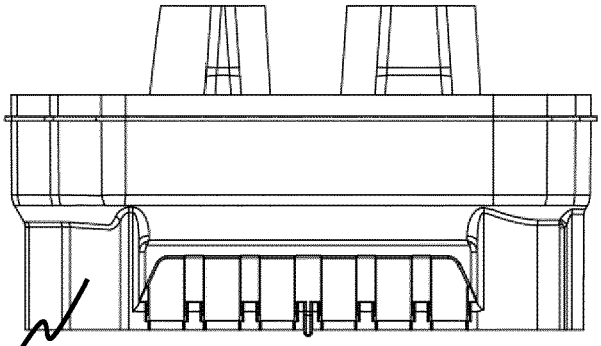


Fig. 46

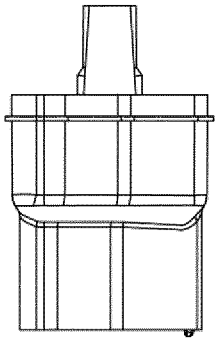


Fig. 47

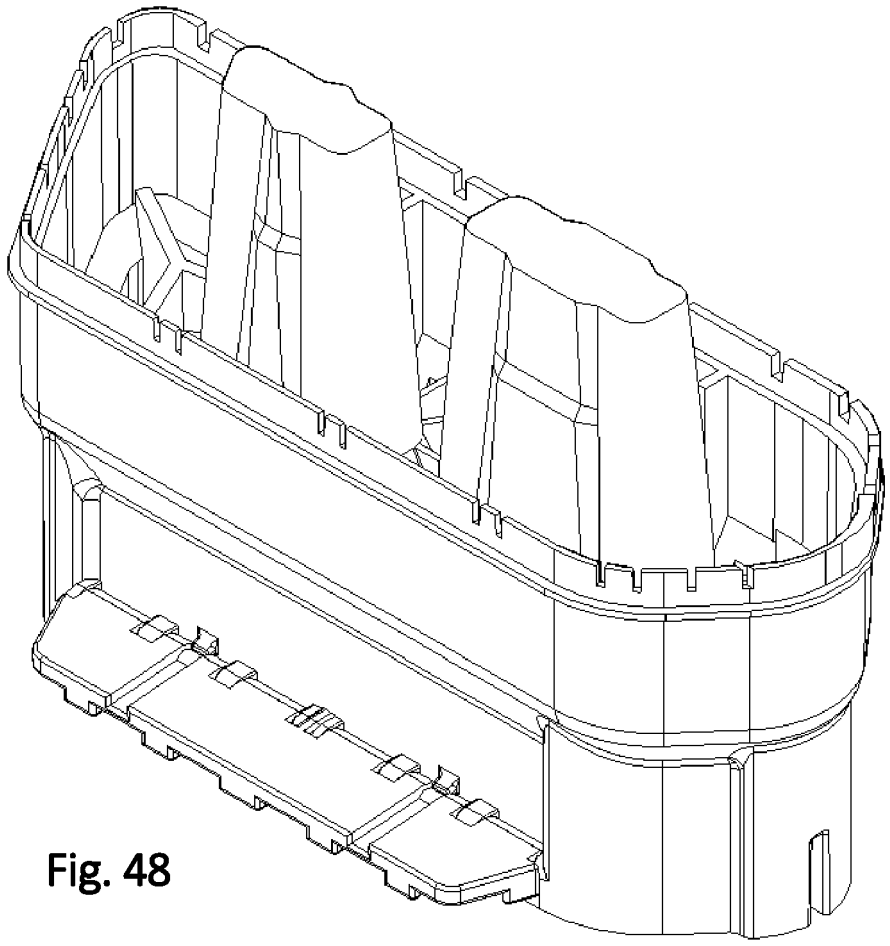


Fig. 48

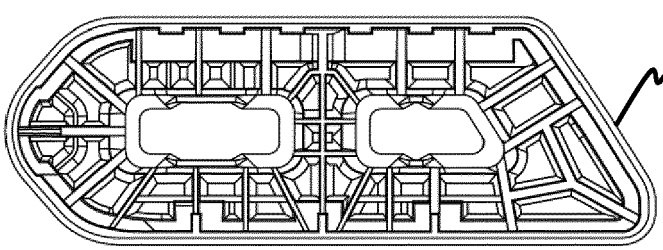


Fig. 49

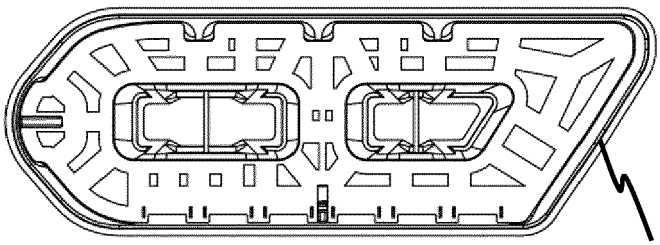


Fig. 50

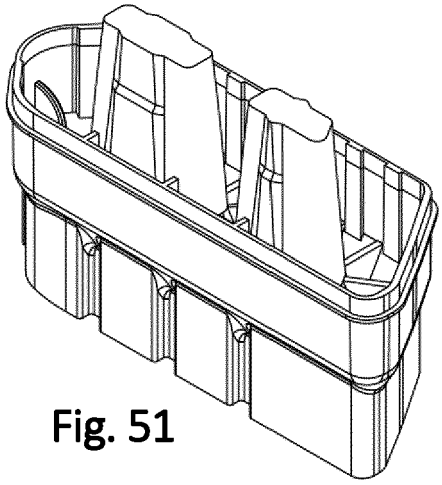


Fig. 51

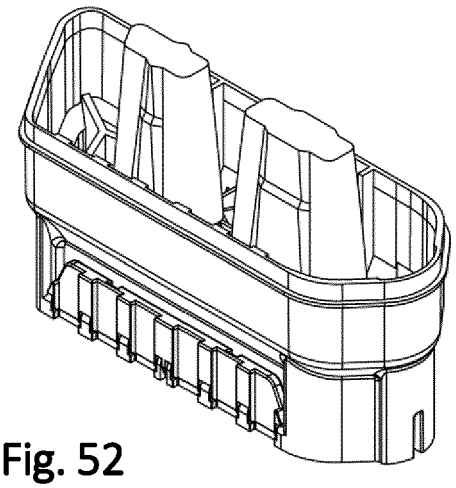


Fig. 52

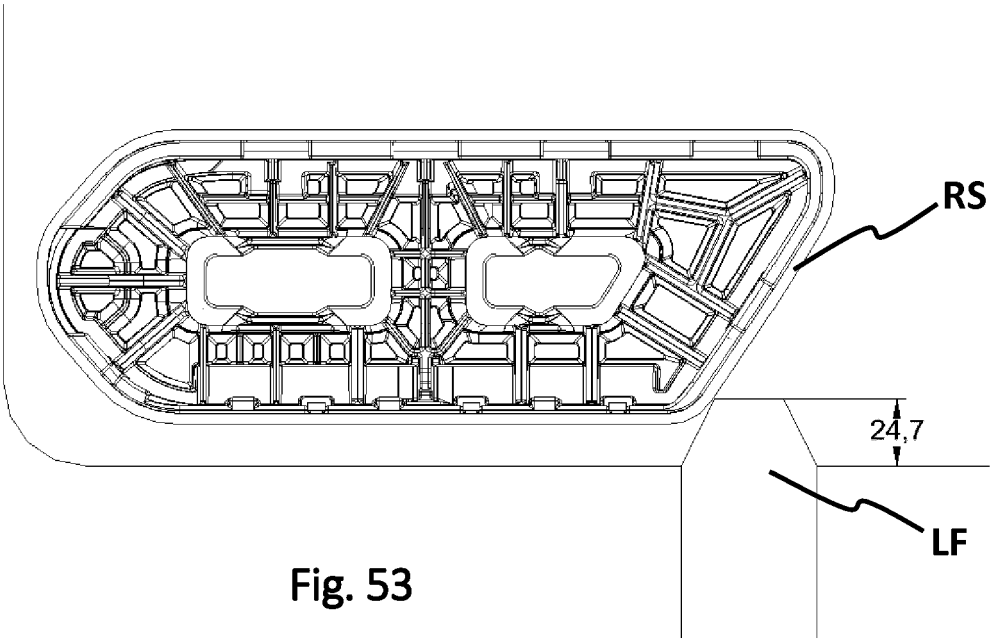


Fig. 53

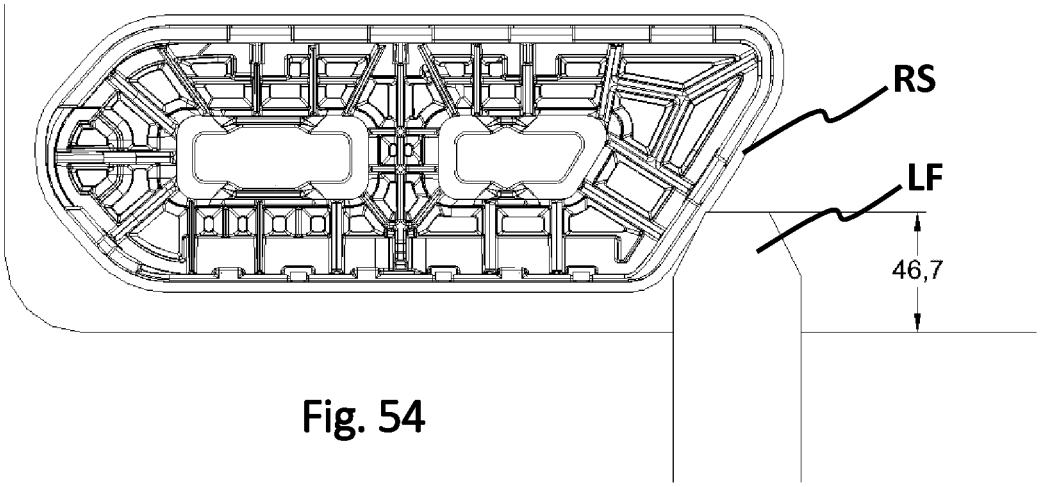


Fig. 54

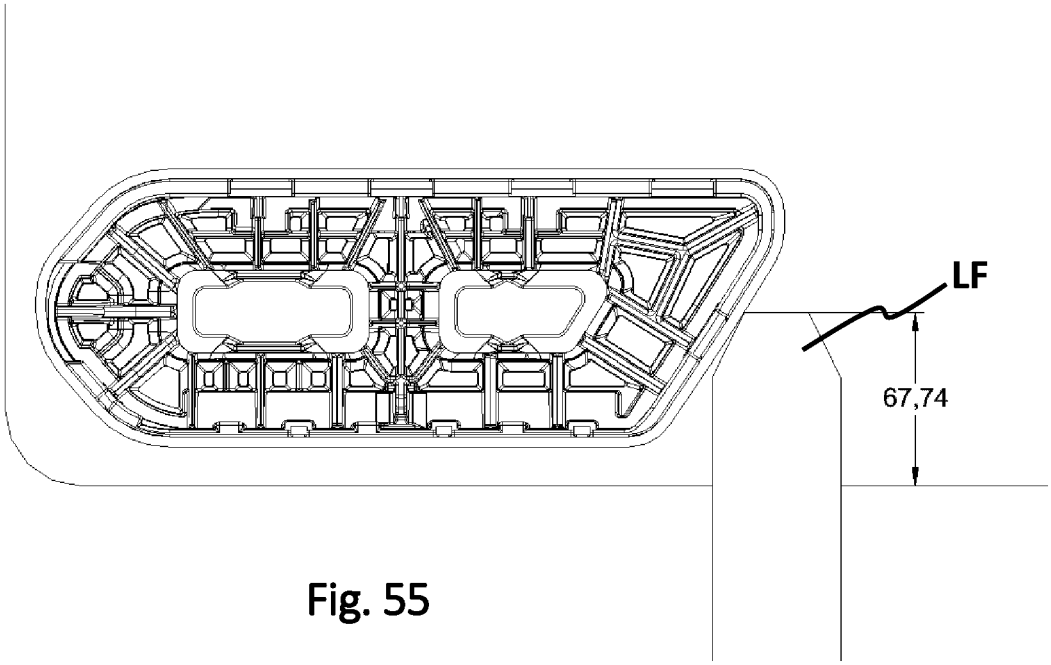


Fig. 55

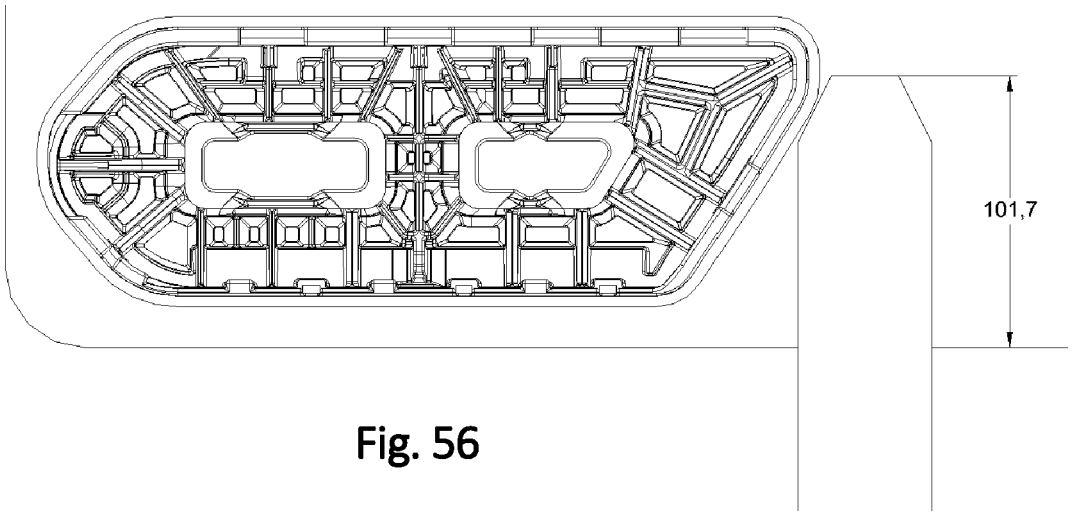


Fig. 56

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 38 2981

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/245932 A1 (NIELSEN LARRY [US]) 25 October 2007 (2007-10-25) * paragraph [0028] - paragraph [0043] * * figures 1-14 *	15	INV. B65D19/40 B65D19/38 B65D19/32
X	US 2010/218705 A1 (MANI AYYAKANNU [US]) 2 September 2010 (2010-09-02) * paragraph [0095] - paragraph [0098] * * figures 1,2,14a,14b *	15	
Y	EP 2 767 482 A1 (VIOLA TERES JOSEP RAMON [ES]) 20 August 2014 (2014-08-20) * paragraph [0036] - paragraph [0073] * * figures 1-21 *	1-3,6-14	
Y	DE 41 09 504 A1 (HECKER & KROSCH GMBH & CO KG [DE]) 24 September 1992 (1992-09-24) * column 3, line 43 - column 4, line 47; figures 1-7 *	1-3,6-14	
A	DE 20 07 788 A1 (WESTFORM PLASTIKWERKE GMBH) 26 August 1971 (1971-08-26) * page 1 - page 4; figures 1,2 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B65D
A	US 2012/260462 A1 (NIELSEN BIRGER [SE]) 18 October 2012 (2012-10-18) * paragraph [0036] - paragraph [0062]; figures 1-10b *	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 April 2019	Fitterer, Johann

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 38 2981

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-04-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007245932 A1	25-10-2007	CA 2650150 A1	01-11-2007
		US 2007245932 A1	25-10-2007
		US 2009205540 A1	20-08-2009
		WO 2007123587 A1	01-11-2007
US 2010218705 A1	02-09-2010	AU 2004282221 A1	28-04-2005
		BR PI0415460 A	19-12-2006
		CA 2542496 A1	28-04-2005
		EP 1682434 A2	26-07-2006
		JP 2007508215 A	05-04-2007
		US 2010218705 A1	02-09-2010
		WO 2005037687 A2	28-04-2005
EP 2767482 A1	20-08-2014	CN 103857596 A	11-06-2014
		EP 2767482 A1	20-08-2014
		ES 2402038 A1	26-04-2013
		PL 2767482 T3	31-07-2017
		PT 2767482 T	14-11-2016
		US 2015033991 A1	05-02-2015
		WO 2013053970 A1	18-04-2013
DE 4109504 A1	24-09-1992	NONE	
DE 2007788 A1	26-08-1971	NONE	
US 2012260462 A1	18-10-2012	BR 112012008745 A2	08-03-2016
		CN 102712389 A	03-10-2012
		DK 2488418 T3	25-09-2017
		EP 2488418 A1	22-08-2012
		ES 2639753 T3	30-10-2017
		PL 2488418 T3	30-11-2017
		SI 2488418 T1	30-10-2017
		US 2012260462 A1	18-10-2012
		WO 2011046500 A1	21-04-2011

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82