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(54) **Device for clamping loads for lift trucks**

(57) A collecting and clamping device that allows to hoist and move one or more loads, composed of two vertical opposed plates (2,3) coupled to sliding elements (4,5) designed to slide on horizontal guides (6,7), said plates (3,4) each comprising a grasping jaw (8,9) shaped

so as to include three or more pressure elements (10,11) machined in a monolithic body and each being designed to exert pressure on a grasping segment (12,13) made of elastic material and designed to be preloaded so that it is placed on a concave surface with respect to said loads.

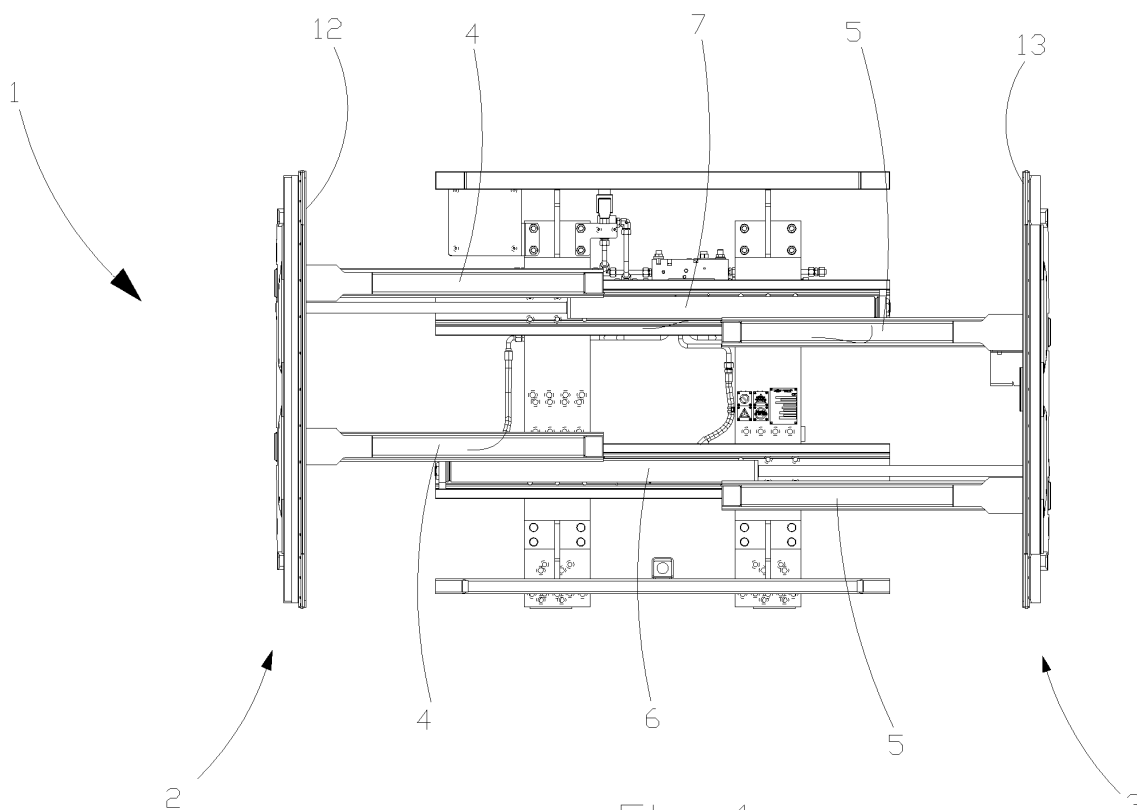


Fig. 1

Description

[0001] This present invention relates to a device for collecting and clamping loads for lift trucks or the like that allow to hoist and handle loads in the form of packages and, in particular, packed household appliances, inside warehouses and storehouses where goods are stored.

[0002] The innovation in question finds specific application in the sector of storage and handling of large household appliances such as refrigerators, dishwashers, washing machines but also small appliances such as microwave ovens, televisions or any other package that is usually but not necessarily prismatic in form, to be moved both individually and together with others.

[0003] As is known lift trucks are self-propelled machines designed to handle packages mainly in storage warehouses or storehouses containing materials of a wide variety of types.

[0004] Known lift trucks include, on their fronts, plates which permit them to grasp packages to be handled only if said packages have vertical dimensions comparable to those of the plates, to avoid the packages from slipping out or being crushed given that no uniform pressure is being exerted on their side surfaces by the plates.

[0005] The scope and function of the invention is to overcome the previously described problems and others by providing for a collecting and clamping device, according to claim 1, that permits hoisting and movement of one or more loads of whatever shape, and in particular loads that are prismatic in shape, which consists of two vertical opposed plates coupled to sliding elements designed to slide on horizontal guides in a manner controlled by the user by specific controls. Said sliding elements are placed in a central position with respect to said plates, each of which includes at least one grasping jaw with at least two pressure elements and a grasping segment on which the grasping jaw exerts pressure. Said grasping segment is made of elastic material and it can be preloaded so that it is placed on a basically concave surface with respect to said loads generating the technical effect of exerting basically uniform pressure on each point of contact between said grasping segment and said loads. Thus the device is able to hoist and move one or more packages of different size and/or shapes and/or positioned according to whatever layout in the volume that is laterally defined by the two completely outspread plates.

[0006] The combination of the central position of the sliding elements with respect to the plates and the presence of at least two pressure elements provides uniform distribution, over the area of the grasping segments, of the pressure generated by clamping the plates on the packages to be hoisted and transported so that there are no important specific pressure gradients, with respect to the average value, which could generate either the risk of crushing the packages, if positive, or a less efficient grasping effect on the packages, if negative.

[0007] In addition, thanks to the convex shape (concave surface) generated by preload of the grasping seg-

ments, the invention is able to exert, on the upper and lower ends of the packages hoisted and transported, compound horizontal and vertical pressure that provides improved retention of the packages.

[0008] Said preload advantageously provides, in this innovation, a limited but effective elastic deformation capacity by said grasping segments when these clamp on the packages to be hoisted and transported in order to avoid the risk of crushing them.

[0009] The invention, therefore, avoids the risk of package slipping or crushing that exists with the known technique.

[0010] Other characteristics of the invention can be better understood from the following description which is given as a non-limiting example and which refers to the attached drawings where:

Fig. 1 gives a schematic view of the front side of the clamping device according to the invention;

Fig. 2 gives a schematic view of the left side of the device;

Fig. 3 gives a schematic view of the right side of the device;

Fig. 4 is an axonometric view of the left side of the device.

[0011] Number 1, with reference to the attached illustrations, indicates a clamping device that allows to hoist and move loads of whatever shape, and in particular with a basically prismatic form, composed of two vertical opposed plates 2 and 3 each coupled to two sliding elements 4 and 5 each designed to slide on horizontal guides 6 and 7 in a manner controlled by the user by specific controls (not illustrated because they are known). Said sliding elements 4 and 5 are placed in a central position with respect to said plates 2 and 3 which each includes grasping jaw 8, 9 shaped in order to have three separate pressure elements 10, 11 machined in a monolithic body so that they spread out at least forward from each of said grasping jaws 8, 9. Each grasping jaw 8, 9 exerts pressure on a respective grasping segment 12, 13 made of elastic material to which it is connected and designed to be preloaded so that it is placed on a concave surface (not shown in the figures) with respect to said loads, generating the technical effect of exerting basically uniform pressure on each point of contact between said grasping segment 12, 13 and said loads. Consequently the device is able to hoist and move one or more packages of different size and/or shapes and/or positioned according to whatever layout in the volume that is laterally defined by the two completely outspread plates.

[0012] More specifically said horizontal axis sliding elements 4 and 5 slide on said horizontal guides 6 and 7 (see fig. 1) in a transversal direction with respect to the front part of the vehicle, making movements in two opposite directions in a reciprocal approach or distancing motion and each grasping segment 12, 13 has a surface suitable for grasping the packages to be transported.

[0013] In a preferred embodiment, illustrated in figure 1, the grasping segments 12, 13 are reciprocally facing each other and occupy the same surface area and are consequently symmetrical and specular with respect to the center of gravity of the lift truck on which they are mounted.

[0014] The packages to transport are therefore laterally retained between said plates which are provided with suitable anti-slip seals designed for the purpose and package grasping and retaining are ensured by the equal and contrasting thrust received from the pistons placed on horizontal guides 6 and 7.

[0015] As a consequence to retain the packages the grasping segments 12, 13 come closer to each other whereas to release the packages the plates move apart while the package is deposited on the floor or on a specific support.

[0016] It is therefore sufficient, to use the system described, to introduce between the open grasping segments 12, 13 the package or packages to be transported and to control the plates to come together until they contact.

[0017] The combination of the central position of sliding elements 4 and 5 with respect to plates 2 and 3 and the presence of three or more pressure elements 10, 11 provides uniform distribution over the area of grasping segments 12 and 13 of the pressure generated by clamping plates 2 and 3 on the packages to be hoisted and transported so that there are no important specific pressure gradients with respect to the average value, which could generate either the risk of crushing the packages, if positive, or a less efficient grasping effect on the packages, if negative.

[0018] The grasping segments 12, 13 are made of elastic material and, being preloaded, they have a convex shape which creates a cavity. As a consequence, the invention is able to exert, on the upper and lower ends of the packages hoisted and transported, compound horizontal and vertical pressure that provides improved retention of the packages.

[0019] Said preload advantageously provides, in this innovation, a limited but effective elastic deformation capacity by said grasping segments 12 and 13 that avoids the risk of crushing the packages when these clamp on the packages to be hoisted and transported.

[0020] The cavity of the grasping elements 12, 13 lengthens both in horizontal direction and in vertical direction. In particular the vertical radii of curvature are greater than or equal to the horizontal radii of curvature.

[0021] In a preferred embodiment illustrated in figures 2, 3 and 4 each of said grasping jaws 10, 11 is coupled and hinged to a covering element 14, 15 using means of connection and fastening, such as, for example a vertical pin, indicated by the reference number 19 in figure 4, coupled to the front ends of said pressure elements 10 and 11. Said covering element 14, 15, being in contact with the grasping segments 12 and 13, generates a more effective uniform distribution of clamping pressure on

grasping segments 12 and 13.

[0022] Thanks to the coupling elements 14, 15 to the related jaw it is possible to vary the dimension of the cavity of the grasping segments 12 and 13.

5 **[0023]** In the example illustrated said pressure elements 10 and 11 spread out from their relevant grasping jaw 8, 9 like the fingers from the palm of a hand.

10 **[0024]** They have about equal dimensions and are preferably but not exclusively odd in number and can be, for example, three as in figures 2 and 3.

[0025] The pressure elements 10, 11 are partially covered and connected together by specific flat shaped connecting elements 16, 16' and 17, 17' (see figures 2 and 3).

15 **[0026]** In another possible embodiment the presence of at least one proportional valve or at least one mechanical valve or at least another similar device is advantageously provided and functions to give the pistons the mechanical control to move the plates.

20 **[0027]** A technician in the sector may foresee several modifications and variations to what has been described and illustrated, obtaining solutions that are to be held to be included within the realm of protection of the invention which is further defined, in its specific characteristics, by the following claims.

Claims

- 25 1. Collecting and clamping device that allows to hoist and move one or more loads, composed of two vertical opposed plates (2,3) coupled to sliding elements (4,5) designed to slide on horizontal guides (6,7), **characterized by** the fact that said plates (3,4) each include a grasping jaw (8,9), each one comprising at least two separate pressure elements (10,11) machined in a monolithic body spreading out frontally from each of said grasping jaws (8,9), being coupled to a grasping segment (12, 13) made of elastic material to which it exerts pressure, each of said segment (12, 13) being placed on the internal side of each jaw (8, 9) and designed to be preloaded so that it is placed on a basically concave surface with respect to said loads.
- 30 2. Collecting and clamping device according to claim 1, wherein each of said grasping jaws (8,9) is coupled and hinged to a jointed element (14,15), by connection and fastening means (19) at the front ends of said pressure elements (10,11) and said jointed element (14,15) is in contact with said grasping segments (12,13).
- 35 3. Collecting and clamping device according to claim 2, wherein in the pressure elements (10,11) a passing hole is obtained in which a pin (19) is inserted in order to connect the jointed elements (14,15) in which passing holes are obtained for the insertion of said pin (19).
- 40 45 50 55

4. Collecting and clamping device according to one of the preceding claims, wherein said pressure elements (10,11) are covered and connected together by connection elements (16,16') and (17,17'). 5
5. Collecting and clamping device according to one of the preceding claims, wherein in each jaw (8, 9) said pressure elements (10, 11) are in an odd number.
6. Collecting and clamping device according to one of the preceding claims, wherein said basically concave surface has vertical radii of curvature greater than or equal to the horizontal radii of curvature. 10
7. Collecting and clamping device according to one of the preceding claims, wherein said concave surface has variable vertical radii of curvature and constant horizontal radii of curvature. 15
8. Collecting and clamping device according to one of the preceding claims, wherein the sliding elements (4,5) are placed in a central position with respect to each plate (3,4). 20

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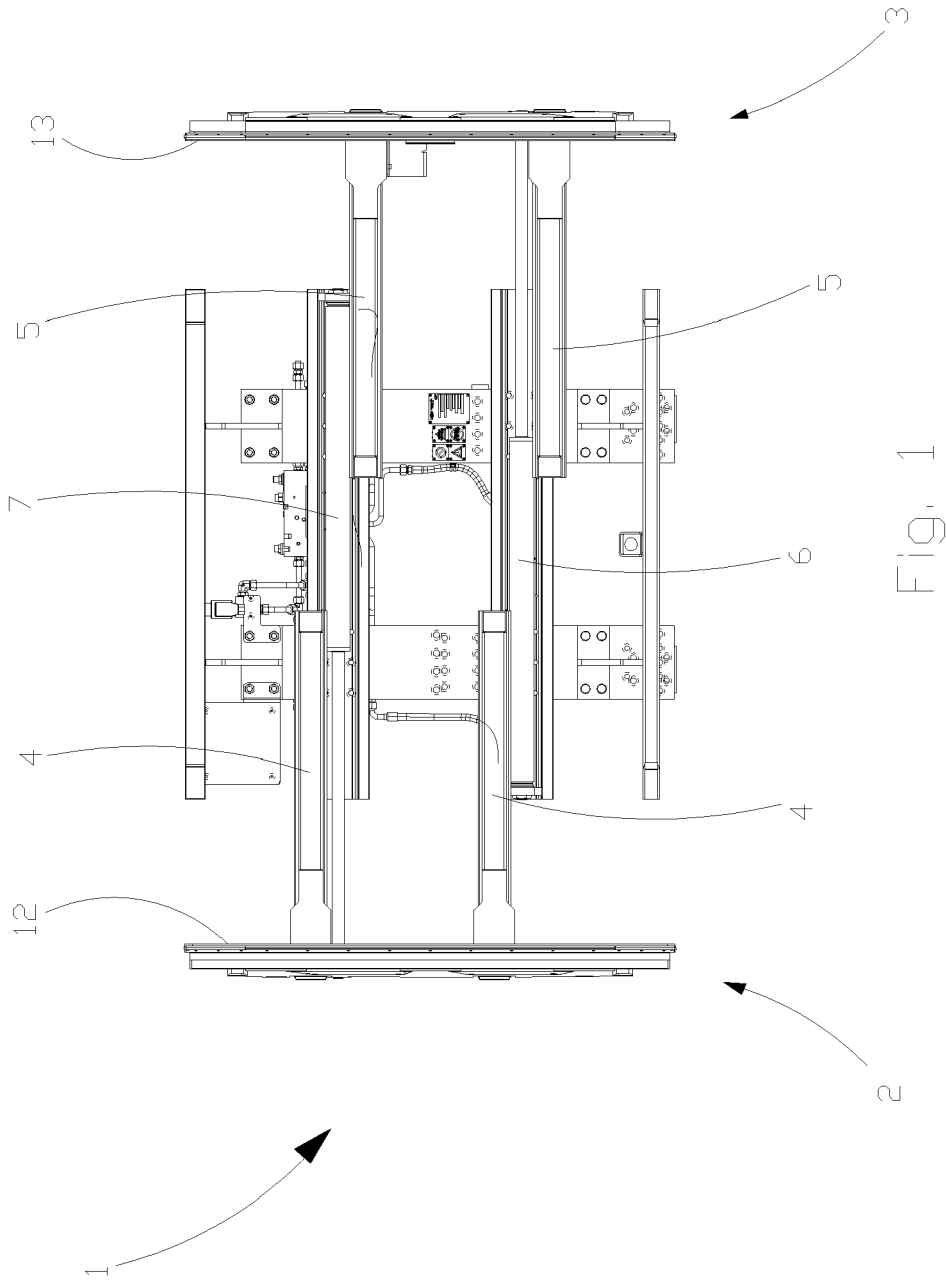
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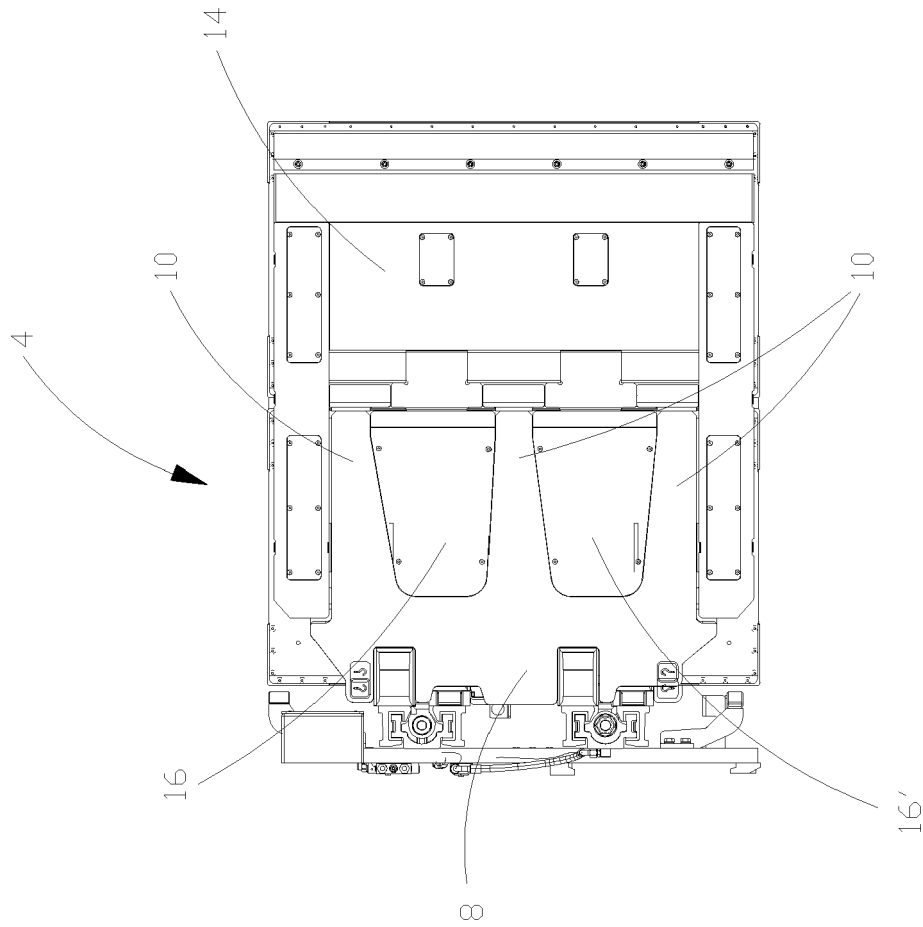


Fig. 2

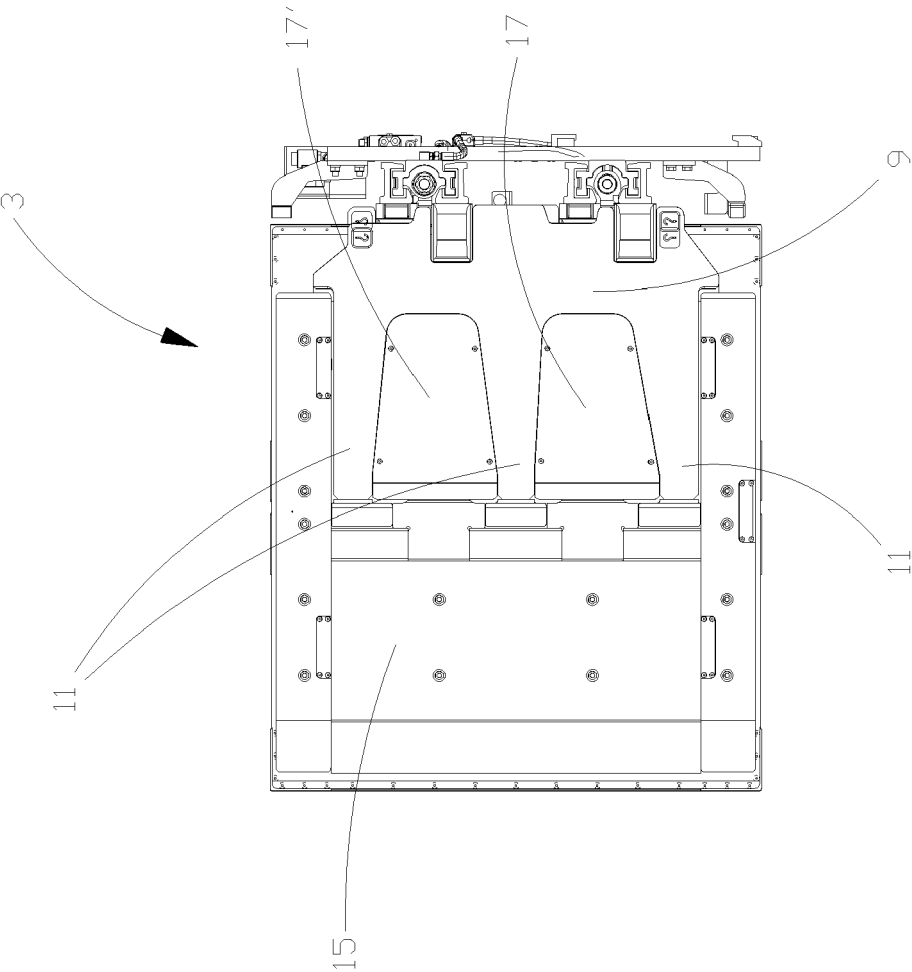


Fig. 3

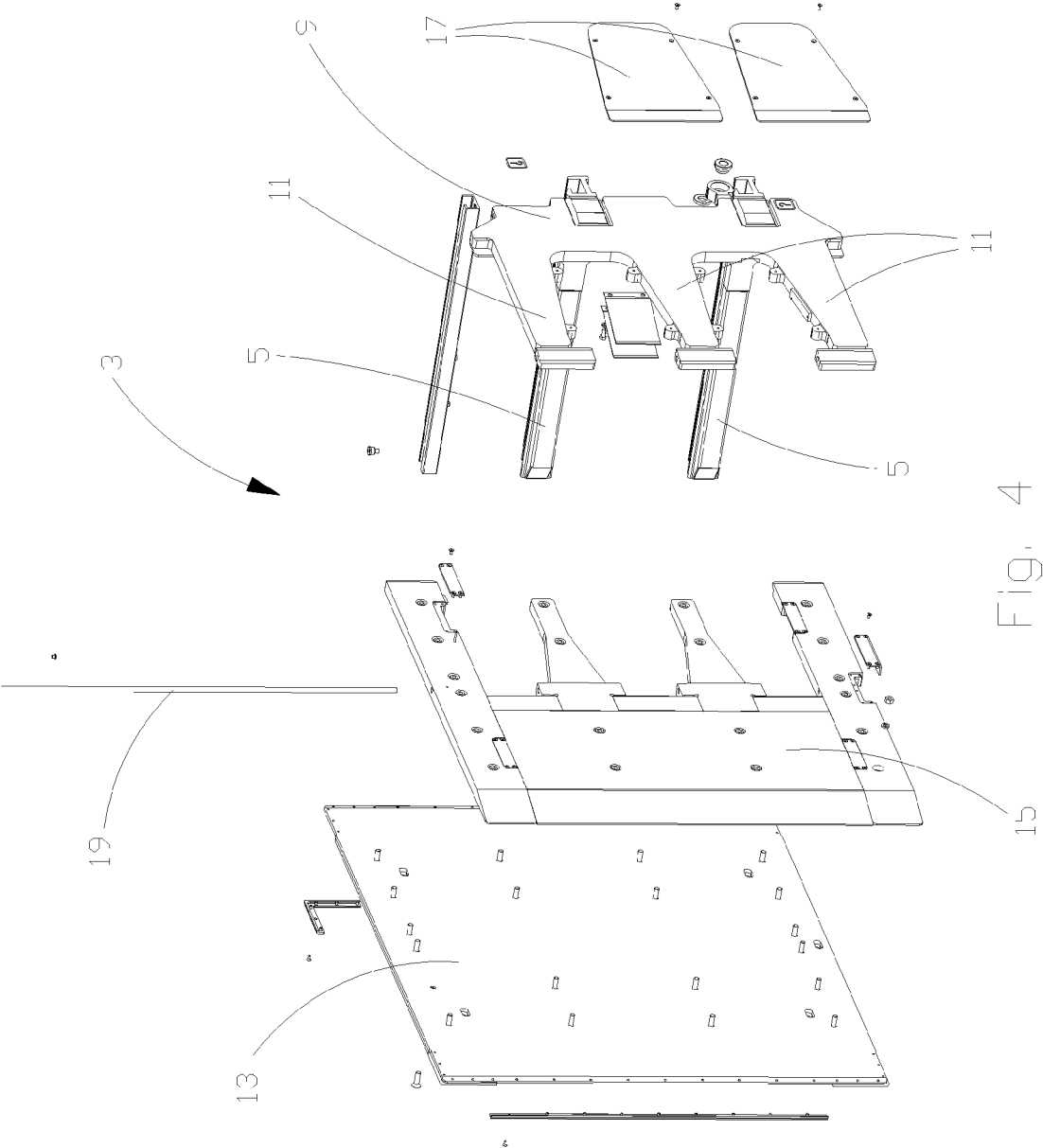


Fig. 4