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(54) **TRAY DEVICE FOR TRANSPORTING VEHICLE WHEELS, AND USE OF SUCH A TRAY DEVICE**

(57) The invention relates to a tray device (1) for transporting a plurality of vehicle wheels (2, 20), the tray device (1) comprising a first tray (3) comprising a plurality of receptacles (4a-c) arranged one after another along a first direction (5). The receptacles (4a-c) are configured to receive respective first portions (6) of the vehicle wheels (2, 20) along the respective radial direction (7) of the respective vehicle wheel (2, 20). The first tray (3) comprises at least three support groups (8a-c) each comprising a plurality of support legs (9, 10) configured to support the first tray (3) on a ground. The support groups (8a-c) are arranged one after another along the first direction (5) such that the support groups (8a-c), along the first direction (5), bound pickup areas (13a, b) for tines of a fork of a forklift.

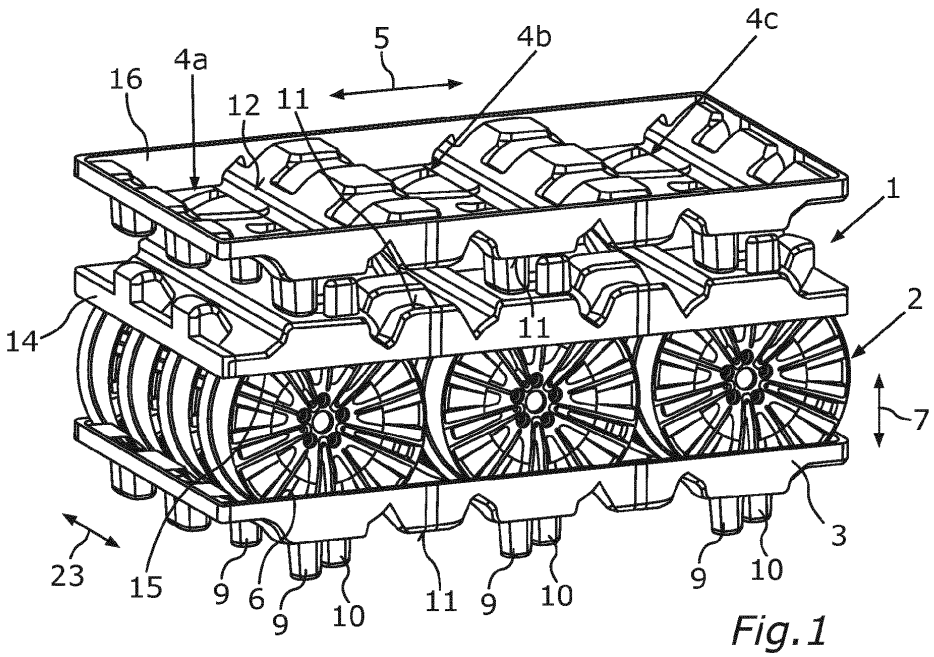

Fig.1

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Description

[0001] The invention relates to a tray device for transporting vehicle wheels. The invention also relates to a use of such a tray device.

[0002] JP 2014/028624 A shows a tray for vehicle wheels. Moreover, US 2004/0255827 A1 shows a tray apparatus adapted to transport a plurality of vehicle components.

[0003] It is an object of the present invention to provide a tray device and a use of such a tray device such that vehicle wheels may be transported in a particularly advantageous way.

[0004] This object is solved by a tray device having the features of patent claim 1 and a use having the features of patent claim 9. Advantageous embodiments with expedient developments of the invention are indicated in the other patent claims.

[0005] A first aspect of the present invention relates to a tray device for transporting a plurality of vehicle wheels. The respective vehicle wheel is also referred to as a wheel used for a vehicle. For example, the respective wheel is used to assemble or manufacture a respective vehicle such that, for example, the tray device according to the present invention is used in a method for assembling or manufacturing at least one vehicle. For example, the respective vehicle is a motor vehicle, in particular a passenger vehicle. This means that the vehicle, in its completely assembled state, comprises the respective wheel.

[0006] The tray device according to the present invention comprises a first tray which comprises a plurality of receptacles. The receptacles are arranged one after another along a first direction. Moreover, the receptacles are spaced away from each other along the first direction. The receptacles are configured to receive respective first portions of the vehicle wheels along the respective radial direction of the respective vehicle wheel. This means that the respective wheel may be partially arranged in the respective receptacle along the respective radial direction of the respective wheel. In again other words, the respective wheel may be arranged in the respective receptacle in such a way that the respective wheel is moved in relation to the first tray along the respective radial direction of the respective wheel, thereby arranging the respective first portion of the respective wheel in the respective receptacle. Preferably, the vehicle wheels may be arranged in the receptacles of the first tray in such a way that the first length portions of first ones of the vehicle wheels are arranged in a first one of the receptacles, and the first portions of second ones of the vehicle wheels are arranged in a second one of the receptacles, wherein the second receptacle is arranged besides the first receptacle along the first direction. For example, the first vehicle wheels form a first wheel row, wherein, for example, the second vehicle wheels form a second wheel row. This means that, for example, the first vehicle wheels are arranged in a first row, wherein, for example, the second vehicle wheels are arranged in a second row. In this regard, for example, the second row is arranged besides the first row along the first direction. Preferably, said rows extend parallel to each other. Moreover, for example, the respective row may extend along a second direction extending perpendicularly to the first direction. Since the respective first portions of the respective vehicle wheels may be or are arranged in the receptacles of the first tray, movements of the vehicle wheels in relation to the first tray may be limited or avoided, in particular along the first direction and, for example, along the second direction and, for example, along a third direction extending perpendicularly to the first and second directions.

[0007] The first tray further comprises at least three support groups which are also referred to as support leg groups. Each support group comprises a plurality of support legs configured to support the first tray on a ground. This means that the first tray may be supported on said ground via support legs, i.e. via the support groups. For example, said ground may be a ground of a building in which the vehicle wheels are transported by the tray device. Preferably, the support groups and thus the support legs are arranged on a lower side of the first tray, the lower side facing away from an upper side of the first tray. For example, the receptacles may be arranged on said upper side of the first tray.

[0008] The support groups are arranged one after another along the first direction. Moreover, the support groups are spaced away from each other along the first direction such that the support groups, along the first direction, bound, in particular at least or exactly, two pickup areas for tines of a fork of a forklift. Thus, said forklift may move its fork and thus the tines of the fork in relation to the first tray along the second direction in such a way that at least the respective length areas of the tines are arranged in the pickup areas and thus between the support groups. Subsequently, the forklift may raise the fork, i.e. move the fork in the vertical direction upwards thereby raising the first tray, i.e. moving the first tray in the vertical direction upwards. Furthermore, one of the support groups is arranged between the pickup areas along the first direction. In other words, a first one of the pickup areas is arranged between a first one of the support groups and a second one of the support groups along the first direction, and a second one of the pickup areas is arranged between the second support group and a third one of the support groups along the first direction. Thus, the first tray and thus the tray device may be transported or handled by the forklift in a particularly advantageous way.

[0009] The tray device according to the present invention further comprises at least one second tray. Preferably, the first and second trays are separate and/or separately manufactured components. The second tray is identical to the first tray. In other words, the first and second trays are identical in design. Moreover, the second tray is configured to be arranged above the first tray, in particular in the vertical direction, in such a way that the

receptacles of the second tray and thus, the upper side of the second tray face towards the receptacles of the first tray and thus the upper side of the first tray, thereby receiving respective second portions of the vehicle wheels in the receptacles of the second tray along the respective radial direction of the respective vehicle wheel. Hence, in order to transport the vehicle wheels, the vehicle wheels are arranged in the receptacles of the first tray as described above, i.e. in such a way that the first portions of the vehicle wheels are arranged in the receptacle of the first tray. Subsequently, the second tray is arranged above the first tray and on the vehicle wheels arranged in the receptacles of the first tray in such a way that the second portions of the vehicle wheels are arranged in the receptacles of the second tray. Thus, the vehicle wheels may be fixed to the trays and thus the tray device in a particularly advantageous way such that relative movements between the vehicle wheels and the tray device are limited or avoided.

[0010] The invention is simple to use, easy to handle and more cost-effective than conventional solutions. In comparison with conventional solutions, a number of items to form or build a load unit may be reduced by the invention. Moreover, in comparison with conventional solutions, the invention requires less space for storage and air pockets may be reduced such that more load units may be transported. Thus, by the invention, the vehicle wheels may be transported in a particularly space- and cost-effective way. Moreover, a particularly low weight of the tray device according to the present invention may be realized such that the tray device and the vehicle wheels may be transported in a particularly cost-effective way.

[0011] In a particularly advantageous embodiment of the present invention, the first and second trays are configured to be stacked on one another in such a way that the lower sides of the first and second trays face towards each other and the respective support legs of the respective tray are arranged besides the support legs of the other tray and supported on the lower side of the other tray. Thus, a second tray device being identical to the first tray device may be arranged on the first tray device in such a way that the lower side of the first tray of the second tray device faces towards the lower side of the second tray of the first tray device and the support legs of the first tray of the second tray device are arranged besides the support legs of the second tray of the first tray device and the support legs of the first tray of the second tray device are supported on the lower side of the second tray of the first tray device and the support legs of the second tray of the first tray device are supported on the lower side of the first tray of the second tray device. Thus, the first and second tray devices may be stacked on one another such that a particularly high number of vehicle wheels may be transported by the first and second tray devices in a particularly cost- and space saving way. Moreover, excessive movements of the first tray of the second tray device in relation to the second tray of the first tray device may be avoided by the support legs of the second tray of the first tray device and the first tray of the second tray device.

[0012] In a further advantageous embodiment of the invention, the respective support legs of the respective support group of the respective tray are arranged one after another along the second direction and spaced away from each other along the second direction extending perpendicularly to the first direction. Thus, the respective tray may be supported on said ground in a particularly advantageous way. Moreover, the trays may be stacked on one another in a particularly advantageous way, wherein, by the support legs, excessive relative movements between the trays stacked on one another may be avoided.

[0013] In a particularly advantageous embodiment of the invention, first ones of the support legs of the respective support group of the respective tray form a first support leg row, wherein second ones of the support legs of the respective support group of the respective tray form a second support leg row. This means that the first support legs are arranged in the first support leg row, and the second support legs are arranged in the second support leg row. Thus, the respective tray may be supported on the ground in a particularly advantageous way, and the trays may be stacked on one another in a particularly advantageous way, wherein, by the support legs, excessive relative movements between the trays stacked on one another may be avoided since the support legs of one of the trays may be supported on the support legs of the other tray and vice versa. Preferably, the support leg rows are at least partially arranged besides each other along the first direction, wherein, for example, the support leg rows extend parallel to each other. In other words, preferably, the respective support leg rows of the respective support group are arranged at least partially one after another along the first direction. Preferably, the respective support leg rows of the respective support group are at least predominantly, in particular completely, arranged one after another along the first direction.

[0014] In a further embodiment of the invention, the support leg rows are offset from each other along the second direction. Thus, when stacking the trays on one another, the support legs of the first tray may be particularly advantageously arranged besides the support legs of the second tray and vice versa such that the support legs may limit or avoid relative movements between the trays stacked on one another in a particularly advantageous way. In particular, the support legs may avoid or limit relative movements between the trays stacked on one another in both the first and second directions such that the vehicle wheels may be transported in a particularly advantageous way.

[0015] In order to transport vehicle wheels in a particularly cost-effective way, in a further embodiment of the present invention, the respective tray is formed in one piece.

[0016] Preferably, the respective tray is made from a

plastic material such that the weight of the respective tray and thus the tray device may be kept particularly low.

[0017] In a particularly advantageous embodiment of the invention, the respective tray comprises recesses for receiving straps. This means that at least a length portion of a strap may be received in the respective recess. By the straps, the first and second trays and the vehicle wheels arranged between the first and second trays may be held together or may be held against each other. Since at least respective length portions of straps may be arranged in the recesses, excessive relative movements between the respective strap and the respective tray may be avoided such that the vehicle wheels may be transported in a particularly save and cost- and space-effective way.

[0018] A second aspect of the present invention relates to a use of a tray device according to the present invention, i.e. according to the first aspect of the present invention. In said use, the tray device is used for transporting said vehicle wheels. In other words, the invention also relates to a method for transporting vehicle wheels. In said method, at least one tray device according to the present invention, i.e. according to the first aspect of the present invention is used for transporting the vehicle wheels. Advantages and advantageous embodiments of the first aspect of the present invention are to be regarded as advantages and advantageous embodiments of the second aspect of the present invention and vice versa.

[0019] In order to transport a particularly high number of vehicle wheels, in particular of different vehicle wheels, in a particularly cost- and space-effective way, in a preferred embodiment of the second aspect of the present invention, the tray device, during a first time span, is used for transporting first vehicle wheels having a first diameter, wherein the tray device, during a second time span following the first time span, is used for transporting second vehicle wheels having a second diameter different from the first diameter. This means that the tray device and its first and second trays may be used for transporting different types of vehicle wheels, wherein the types of vehicle wheels differ with respect to the respective diameter. Thus, for example, vehicle wheels of a first one of said types may be simultaneously transported by the tray device during the first time span, and vehicle wheels of a second one of the types may be simultaneously transported by the tray device during the second time span. Thus, an excessive number of different variants of the tray device and thus the trays may be avoided such that the different types of vehicle wheels may be transported in a particularly cost-effective way.

[0020] Conventionally, different variants of trays are necessary for different diameters of vehicle wheels to be transported such that, for example, a first variant of the trays used for vehicle wheels having a diameter of 18 inches, a second variant of the trays is used for transporting vehicle wheels having a diameter of 19 inches, a third variant of the trays is used for transporting vehicle wheels having a diameter of 20 inch, a fourth variant of the trays is used for transporting vehicle wheels having a diameter of 21 inches, and a firth variant of the trays is used for transporting vehicle wheels having a diameter of 22 inches. In this regard, the tray device according to the present invention may be used for transporting vehicle wheels having a diameter ranging from 18 inches to 22 inches such that, for example, vehicle wheels having a diameter of 18 inches, 19 inches, 20 inches, 21 inches and 22 inches may be transported by the same tray device according to the present invention. Thus, handling costs and handling time may be excessively reduced by the present invention in relation to conventional concepts.

[0021] Preferably, the respective receptacle of the respective tray tapers or reduces along the third direction and, preferably, towards the lower side of the respective tray such that vehicle wheels having different diameters may be arranged in the respective receptacle of the respective tray, in particular in such a way that excessive relative movements between the respective vehicle wheel and the respective tray may be avoided.

[0022] Further details of the invention will be adherent from the following description of preferred embodiments and the accompanying drawings. The drawings show in:

Fig. 1 a schematic perspective view of a first embodiment of a tray device for transporting a plurality of vehicle wheels;

Fig. 2 a schematic perspective view of a first tray of the tray device according to the first embodiment;

Fig. 3 a schematic side view of the tray according to Fig. 2;

Fig. 4 a schematic top view of the tray according to Fig. 3;

Fig. 5 a schematic top view of a first type of vehicle wheels arranged in the tray according to Fig. 4;

Fig. 6 a schematic top view of the of a second type of vehicle wheels arranged in the tray according to Fig. 4;

Fig. 7 a schematic side view of the vehicle wheels of the first type arranged in the tray device according to the first embodiment;

Fig. 8 a schematic side view of the vehicle wheels of the second type arranged in the tray device according to the first embodiment;

Fig. 9 a schematic perspective view of a second embodiment of the tray device,

Fig. 10 a schematic perspective view of a tray of the

tray device according to the second embodiment;

Fig. 11 a schematic side view of the tray according to Fig. 10;

Fig. 12 a schematic top view of the tray according to Fig. 11;

Fig. 13 a schematic side view of vehicle wheels of a third type arranged in the tray device according to the second embodiment;

Fig. 14 a schematic top view of the vehicle wheels of the third type arranged in the tray according to Fig. 12; and

Fig. 15 a schematic bottom view of a third embodiment of the tray.

[0023] In the Fig. the same elements or elements having the same function are indicated by the same reference signs.

[0024] Fig. 1 shows, in a schematic perspective view, a first embodiment of a tray device 1 for transporting a plurality of vehicle wheels 2. This means that the tray device 1 is used for transporting the vehicle wheels 2 which are also referred to as wheels. In again other words, the tray device 1 is used in a method for transporting the vehicle wheels 2 wherein, in the method, the vehicle wheels 2 are transported by the tray device 1. As further described in greater detail below, the vehicle wheels 2 are vehicle wheels of a first type. The vehicle wheels 2 of the first type all have a first diameter. As will be described in greater detail below, the tray device 1 is also referred to as a first tray device. The tray device 1 comprises a first tray 3. As shown in Fig. 2, the first tray 3 comprises a plurality of receptacles 4a-c which are arranged one after another along a first direction illustrated by a double arrow 5. Moreover, the receptacles 4a-c are spaced away from each other along the first direction. As shown in Fig. 3, the respective receptacle 4a-c is configured to receive a respective first portion 6 of the respective vehicle wheel 2 along the respective radial direction of the respective wheel 2. In Fig. 1, the respective radial direction of the respective wheel 2 is illustrated by a double arrow 7. Hence, in order to transport the vehicle wheels 2, the respective vehicle wheel 2 is moved along the radial direction of the respective vehicle wheel 2 in relation to the first tray 3 in such a way that the first portion 6 is arranged in the respective receptacle 4a-c and the respective vehicle wheel 2 is supported on the first tray 3 in the respective radial direction of the respective vehicle wheel 2.

[0025] As may be gathered from Figs. 1-4, the first tray 3 comprises at least or exactly three support groups 8a-c. The respective support group 8a-c comprises a plurality of support legs 9, 10 configured to support the first tray 3 on a ground not shown in the figures. This means that the first tray 3 may be supported on the ground via the support legs 9, 10, in particular in the vertical direction downwards. Figs. 1 to 4 show an orientation of the tray device 1 and thus the tray 3, wherein the vehicle wheels 2 are transported by the tray device 1 whilst the tray device 1 and thus the tray 3 are in said orientation. With respect to said orientation, said first direction extends horizontally, wherein the respective radial direction of the respective vehicle wheel 2 extends vertically and thus perpendicularly to the first direction. As shown in Fig. 3, the support groups 8a-c are arranged on a lower side 11 of the tray 3. The lower side 11 faces downwards in the vertical direction whilst the vehicle wheels 2 are transported by the tray device 1 and thus the tray 3, i.e. whilst the tray device 1 is in said orientation. As shown in Figs. 2 and 4, the receptacles 4a-c are arranged on an upper side 12 of the tray 3. The upper side 12 faces upwards in the vertical direction whilst the vehicle wheels 2 are transported by the tray device 1 and thus the tray 3, i.e. whilst the tray device 1 is in said orientation.

[0026] The support groups 8a-c are arranged one after another along the first direction. Moreover, the support groups 8a-c are spaced away from each other along the first direction such that the support groups 8a-c, along the first direction, bound at least or exactly two pickup areas 13a, b for tines of a fork of a forklift. Thus, said forklift may move its fork along a second direction in relation to the tray 3 such that, along the second direction, the tines are arranged in the pickup areas 13a, b. The second direction is illustrated by a double arrow 23, wherein the second direction extends perpendicularly to the first direction. With respect to said orientation the tray device 1 is in whilst the vehicle wheels 2 are transported by the tray device 1, the first and second directions extend horizontally, i.e. span a horizontal plane. A third direction is illustrated by the double arrow 7. Said third direction coincides with the respective radial direction of the respective vehicle wheel 2, and the third direction extends perpendicularly to the first and second directions. Moreover, with respect to the orientation the tray device 1 is in whilst the vehicle wheels 2 are transported by the tray device 1, the third direction extends vertically, i.e. in the vertical direction. Thus, the third direction coincides with the vertical direction whilst the vehicle wheels 2 are transported by the tray device 1.

[0027] When the forklift moves its fork and thus the tines in the vertical direction upwards whilst the tines are arranged in the pickup areas 13a, b, the tray 3 and thus the tray device 1 and the vehicle wheels 2 arranged in the tray device 1 are raised, lifted or moved in the vertical direction upwards by the forklift. Subsequently, the tray device 1 and thus the vehicle wheels 2 may be transported by the forklift, in particular along said ground. Since the pickup areas 13a, b are bound or limited by the support groups 8a-c, excessive relative movements between the tray device 1 and the fork of the forklift may be avoided whilst the tray device 1 is arranged on the fork. As shown

in Fig. 3, the support group 8b is arranged between the pickup areas 13a, b along the first direction. In other words, the pickup area 13a is arranged between the support groups 8a, b along the first direction, and the pickup area 13b is arranged between the support groups 8b, c along the first direction.

[0028] The tray device 1 (first tray device) further comprises a second tray 14 which is identical to the first tray 3. This means that the trays 3 and 14 are identical in design. As shown in Fig. 1, the second tray 14 is configured to be arranged above the first tray 3 and on the vehicle wheels 2 arranged in the receptacles 4a-c of the tray 3 in such a way that the receptacles 4a-c of the second tray 14 face towards the receptacles 4a-c of the first tray 3 thereby receiving respective second portions 15 of the vehicle wheels 2 in the receptacles 4a-c of the second tray 14 along the respective radial direction of the respective vehicle wheel 2. In other words, in order to transport the vehicle wheels 2 by the tray device 1, the vehicle wheels 2 are arranged in the receptacles 4a-c of the tray 3 in such a way that the first portions 6 are arranged in the receptacles 4a-c of the tray 3 and the vehicle wheels are supported on the tray 3 in the radial direction of the respective vehicle wheel 2. Subsequently, the second tray 14 is, in the vertical direction, arranged above the tray 3 and on the vehicle wheels 2 arranged in the receptacles 4a-c of the tray 3 in such a way that the second portions 15 are arranged in the receptacles 4a-c of the second tray 14, and the vehicle wheels 2 are supported on the second tray 14 in the respective radial direction of the respective vehicle wheel 2, and the upper side 12 of the tray 14 and thus the receptacles 4a-c of the tray 14 face downwards in the vertical direction and towards the upper side 12 of the tray 3 and the receptacles 4a-c of the tray 3. In again other words, the vehicle wheels 2 are arranged between the trays 3 and 14 in such a way that the vehicle wheels 2 are supported on the trays 3 and 14 in the respective radial direction of the respective vehicle wheel 2, and the portions 6 are arranged in the receptacles 4a-c of the tray 3, and the portions 15 are arranged in the receptacles 4a-c of the tray 14. With respect to said orientation the tray device 1 and thus the trays 3 and 14 are in whilst the vehicle wheels 2 are transported by the tray device 1, the vertical direction coincides with the third direction such that the third direction and the vertical direction are illustrated by the double arrow 7. As shown in Fig. 1, the vehicle wheels are arranged between the trays 3 and 14, in particular between the upper sides 12 of the trays 3 and 14, along the third direction and thus along the vertical direction while the vehicle wheels 2 are transported by the tray device 1.

[0029] The trays 3 and 14 are configured to be stacked on one another in such a way that the lower sides 11 of the trays 3 and 14 face towards each other, and the respective support legs 9, 10 of the tray 3 are arranged besides the support legs of the tray 14 and vice versa, and the support legs 9, 10 of the tray 3 are supported on the lower side 11 of the tray 14, and the support legs 9, 10 of the tray 14 are supported on the lower side 11 of the tray 3. This is illustrated and described by a third tray 16 which is identical to the trays 3 and 14. For example, the third tray 16 is a tray of a second tray device which is not shown in the figures. For example, the second tray device is identical to the first tray device 1. As shown in Fig. 1, the trays 3 and 14, the trays 3 and 16 and the trays 14 and 16 are configured to be stacked on one another as described by the example of the trays 3 and 14. In the embodiment shown in Fig. 1, the trays 14 and 16 are stacked on one another in such a way that the lower sides 11 of the trays 14 and 16 face towards each other, the support legs 9, 10 of the tray 14 are arranged besides the support legs 9, 10 of the tray 16, the support legs 9, 10 of the tray 14 are supported on the lower side 11 of the tray 16, and the support legs 9, 10 of the tray 16 are supported on the lower side 11 of the tray 14. With respect to the orientation the trays 3, 14 and 16 and thus the first tray device 1 and the second tray device are in whilst transporting the vehicle wheels 2 and, for example, further vehicle wheels not shown in the figures, the lower side 11 of the tray 3 faces downwards in the vertical direction, the lower side 11 of the tray 14 faces upwards in the vertical direction, and the lower side 11 of the tray 16 faces downwards in the vertical direction. The support legs 9, 10 of the trays 14 and 16 may avoid excessive relative movements between the trays 14 and 16 since the support legs 9, 10 of the trays 14 and 16 are or may be supported on each other, i.e. the support legs 9, 10 of the trays 14 and 16 may overlap each other, for example, along the first direction and/or along the second direction. Thus, by means of the tray devices, a particularly high number of vehicle wheels may be simultaneously transported in a particularly place- and cost-effective way.

[0030] The respective support legs 9, 10 of the respective support group 8a-c are arranged one after another along the second direction and spaced away from each other along the second direction extending perpendicularly to the first direction. Moreover, the support legs 9 of the respective support group 8a-c are arranged in a first row extending in the second direction thereby forming a first support leg row 17. The second support legs 10 of the respective support group 8a-c are arranged in a second row extending in the second direction thereby forming a second support leg row 18, wherein said rows extend in parallel to each other and along the second direction, and wherein the respective first and second support leg rows 17, 18 are arranged at least partially one after another along the first direction. This means that the support leg rows 17, 18 are offset from each along the first direction (double arrow 5). Moreover, the support leg rows 17, 18 are offset from each along the second direction. Thus, excessive relative movements between the trays 14 and 16 stacked on one another may be avoided along both the first and second directions.

[0031] Furthermore, the respective tray 3, 14 and 16

is formed in one piece. For example, the respective tray 3, 14, 16 is made from a plastic material.

[0032] As shown in Fig. 2, the respective tray 3, 14, 16 comprises recesses 19 in which a respective length portion of a respective strap may be or is arranged. By said strap, the trays 3 and 14 and the vehicle wheels 2 arranged there between the trays 3 and 14 are held together. Since the length portions of the straps are arranged in the respective recesses 19, excessive relative movements between the respective strap and the respective tray 3, 14, 16 may be avoided.

[0033] Fig. 4 shows the respective tray 3, 14, 16 in a schematic top view. Moreover, Fig. 5 shows, in a schematic top view, the vehicle wheels 2 of the first type arranged in the tray 3. Fig. 6 shows, in a schematic top view, second vehicle wheels 20 of a second type arranged in the tray 3. The first vehicle wheels 2 of the first type differ from the second wheels 20 of the second type in their respective diameter, in particular outer diameter. As can be gathered from Figs. 7 and 8, the respective first vehicle wheel 2 has a respective first diameter which is preferably a respective first outer diameter. Moreover, the respective second vehicle wheel 20 has a respective second outer diameter which is, preferably, a respective second outer diameter. In the embodiments shown in Figs. 7 and 8, the first diameter is greater than the second diameter such that the respective first vehicle wheel 2 is greater than the respective second vehicle wheel 20 with respect to their respective diameters. As can be gathered from Figs. 1 to 8, both types of vehicles wheels may be transported by the tray device 1. For example, in said method, the tray device 1 is used during a first time span to transport the vehicle wheels 2, i.e. the first type of vehicle wheels. Moreover, for example, in said method, the tray device 1 is used during a second time span to transport the second vehicle wheels 20, i.e. the second type of vehicle wheels, wherein, for example, the second time span precedes or follows the first time span.

[0034] In order to transport both types of vehicle wheels by the same tray device 1, and in order to avoid excessive relative movements between the respective type and the tray device 1, the respective receptacle 4a-c tapers or reduces along the third direction (double arrow 7) towards the respective lower side 11 of the respective tray 3, 14, 16. Thus, both types of vehicle wheels, i.e. both the respective first vehicle wheel 2 and the respective second vehicle wheel 20 may be accommodated in the respective receptacle 4a-c in a particularly advantageous way. Moreover, preferably, respective wall areas 21 bounding respective portions of the respective receptacle 4a-c may be concave, in particular in such a way that the respective wall area 21 is circular. For example, the first diameter and the second diameter range from 18 inches to 22 inches.

[0035] Figs. 9 to 14 show a second embodiment of the tray device 1. In the second embodiment, the tray device 1 is configured to transport third vehicle wheels 22 of a third type. The respective third vehicle wheel 22 has a third diameter, in particular a third outer diameter. For example, the third diameter is greater than 21 inches. For example, the third diameter is 22 inches. For example, in order to transport the third type of vehicle wheels and the first type of vehicle wheels simultaneously and/or to transport the third type of vehicles wheels and the second type of vehicle wheels simultaneously, the respective tray 3, 14, 16 according to the second embodiment and the respective tray 3, 14, 16 according to the first embodiment are configured to be stacked on one another in the above-mentioned way.

[0036] As shown in Figs. 5 and 6, the vehicle wheels 2, 20 are transported by the tray device 1 according to the first embodiment in such a way that the vehicle wheels 2, 20 are arranged in the receptacles 4a-c in such a way that first ones of the vehicles of the vehicle wheels 2, 20 are arranged in a first wheel row R1, second ones of the vehicle wheels 2, 20 are arranged in a second wheel row R2, and third ones of the vehicle wheels 2, 20 are arranged in a third wheel row R3. The first vehicle wheels 2, 20 forming the first wheel row R1 are arranged in the receptacle 4a, the second vehicles wheels 2, 20 forming the second wheel row R2 are arranged in the receptacle 4b, and the third vehicle wheels 2, 20 forming the third wheel row R3 are arranged in the receptacle 4c. As shown in Figs. 5 and 6, the respective wheel row R1, R2, R3 formed by the respective vehicle wheels 2 comprises four vehicle wheels 2, wherein the respective wheel row R1, R2, R3 formed by the respective vehicle wheels 20 comprises five vehicle wheels 20. The wheel rows R1, R2 and R3 are arranged one after another along the first direction, wherein the wheel rows R1, R2, R3 are not offset from each other. Moreover, the respective tray 3, 14 and 16, according to the first embodiment has a first length extending in the first direction, and a second length extending in the second direction.

[0037] The respective tray 3, 14 and 16 according to the second embodiment has the same outer dimensions as the respective tray 3, 14 and 16 according to the first embodiment.

[0038] However, the first length of the tray 3, 14 and 16 according to the second embodiment equals the second length of the respective tray 3, 14, 16 according to the first embodiment, and the second length of the respective tray 3, 14, 16 according to the second embodiment equals the first length of the respective tray 3, 14, 16 according to the first embodiment. Thus, the first and second embodiments of the tray device may be stacked on one another in a particularly space-saving way.

[0039] In the first embodiment, the respective wheel row R1, R2, R3 extends along the second direction. This is also true for the second embodiment. However, as shown in Fig. 14, in the second embodiment, the wheel rows R1 and R2 are offset from each other along the second direction (double arrow 23). Moreover, in the first embodiment, the first length is greater than the second length. Thus, in the second embodiment, the second length is greater than the first length. Preferably, the re-

spective tray 3, 14, 16 is made of a plastic material. For example, said plastic material may be HDPE (high-density polyethylene).

[0040] A further difference between the first embodiment and the second embodiment is that the three support groups 8a-c of the second embodiment are arranged one after another along the second direction (double arrow 23), and the support groups 8a-c of the second embodiment are spaced away from each other along the second direction such that the pickup area 13a is arranged between the support groups 8a and 8b along the second direction, and the pickup area 13b is arranged between the support groups 8b and 8c along the second direction. Moreover, the respective support legs 9, 10 are arranged one after another along the first direction and spaced away from each other along the first direction. Moreover, the respective support leg rows 17 and 18 of the respective support group 8a-c are offset from each other in the first direction (double arrow 5). Thus, the respective tray 3, 14 and 16, according to the second embodiment may be transported or handled in the same way as the respective tray 3, 14 and 16 according to the first embodiment. However, by the second embodiment, the third vehicle wheels 22 being larger than the vehicle wheels 2, 20 may be transported.

[0041] Fig. 15 shows a third embodiment of the respective tray 3, 14, 16. Basically, the third embodiment and the first embodiment are identical in construction. However, As shown in Fig. 15, the lower side 11 facing away from the receptacles 4a-c comprises two stripes having a first color, the stripes 24 being spaced away from each other along the second direction (double arrow 23). Furthermore, the lower side 11 has a portions 25, 26 and 27. Each portion 25, 26, 27 has a second color different from the first color. For example, the first color is orange. Moreover, for example, the second color is grey. As shown in Fig. 15, the portion 25 is arranged between the stripes 24 along the second direction. Moreover, one of the stripes 24 is arranged between the portions 25 und 26 along the second direction, and the other stripe 24 is arranged between the portions 25 and 27 along the second direction. Preferably, the respective stripe 24 extends upwards from the lower side 11 such that respective outer faces of side walls of the tray 3, 14, 16 are also provided with the stripes 24, said outer faces of said side walls facing away from the receptacles 4a-c, in particular along the first direction (double arrow 5). For example, the stripes 24 illustrate banding locations at which said straps are to be arranged.

List of reference signs

[0042]

1	tray device
2	vehicle wheel
3	first tray
4a-c	receptacle
5	double arrow
6	first portion
7	double arrow
8a-c	support group
9	support leg
10	support leg
11	lower side
12	upper side
13a, b	pick-up area
14	second tray
15	second portion
16	third tray
17	first support leg row
18	second support leg row
19	recess
20	second vehicle wheels
21	wall area
22	third vehicle wheels
23	double arrow
24	stripe
25	portion
26	portion
27	portion
R1	first wheel row
R2	second wheel row
R3	third wheel row

Claims

1. A tray device (1) for transporting a plurality of vehicle wheels (2, 20), the tray device (1) comprising:

- a first tray (3) comprising:

  ◦ a plurality of receptacles (4a-c) arranged one after another along a first direction (5) and spaced away from each other along the first direction (5), the receptacles (4a-c) being configured to receive respective first portions (6) of the vehicle wheels (2, 20) along the respective radial direction (7) of the respective vehicle wheel (2, 20); and

  ◦ at least three support groups (8a-c) each comprising a plurality of support legs (9, 10) configured to support the first tray (3) on a ground, the support groups (8a-c) being arranged one after another along the first direction (5) and spaced away from each other along the first direction (5) such that the support groups (8a-c), along the first direction (5), bound pickup areas (13a, b) for tines of a fork of a forklift, wherein one of the support groups (8a-c) is arranged between the pickup areas (13a, b) along the first direction (5), and

- at least one second tray (14) which is identical

to the first tray (3), wherein the second tray (14) is configured to be arranged above the first tray (3) in such a way that the receptacles (4a-c) of the second tray (14) face towards the receptacles (4a-c) of the first tray (3) thereby receiving respective second portions (15) of the vehicle wheels (2, 20) in the receptacles (a-c) of the second tray (14) along the respective radial direction (7) of the respective vehicle wheel (2, 20).

2. The tray device (1) according to claim 1, wherein the respective tray (3, 14) comprises a respective lower side (11) on which the respective support groups (8a-c) of the respective tray (3, 14) are arranged, wherein the trays (3, 14) are configured to be stacked on one another in such a way that lower sides (11) face towards each other and the respective support legs (9, 10) of the respective tray (3, 14) are arranged besides the support legs (9, 10) of the other tray (14, 3) and supported on the lower side (11) of the other tray (14, 3).

3. The tray device (1) according to claim 1 or 2, wherein the respective support legs (9, 10) of the respective support group (8a-c) of the respective tray (3, 14) are arranged one after another along a second direction (23) and spaced away from each other along the second direction (23) extending perpendicularly to the first direction (5).

4. The tray device (1) according to claim 3, wherein first ones of the support legs (9, 10) of the respective support group (8a-c) of the respective tray (3, 14) form a first support leg row (17), wherein second ones of the support legs (9, 10) of the respective support group (8a-c) of the respective tray (3, 14) form a second support leg row (18), wherein the respective support leg rows (17, 18) of the respective support group (8a-c) are arranged at least partially one after another along the first direction (5).

5. The tray device (1) according to claim 4, wherein the support leg rows (17, 18) of the respective support group (8a-c) are offset from each other along the second direction (23).

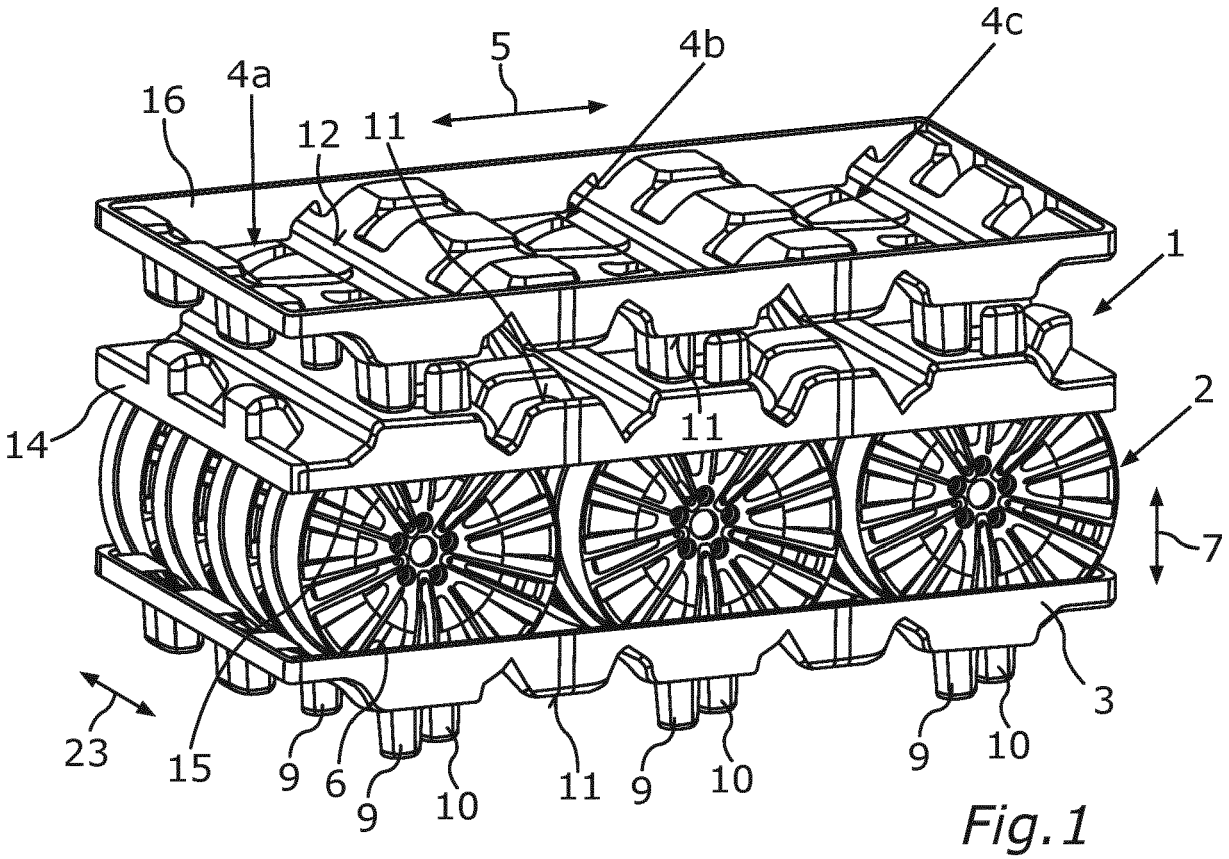
6. The tray device (1) according to any one of the preceding claims, wherein the respective tray (3, 14) is formed in one piece.

7. The tray device (1) according to any one of the preceding claims, wherein the respective tray (3, 4) is made from a plastic material.

8. The tray device (1) according to any one of the preceding claims, wherein the respective tray (3, 14) comprises recesses (19) for receiving straps.

9. A use of a tray device (1) according to any one of the preceding claims, wherein the tray device (1) is used for transporting the vehicle wheels (2, 20).

10. The use according to claim 9, wherein the tray device (1), during a first time span, is used for transporting first vehicle wheels (2) having a first diameter, and wherein the tray device (1), during a second time span following the first time span, is used for transporting second vehicle wheels (20) having a second diameter different from the first diameter.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4b
4a
16
12
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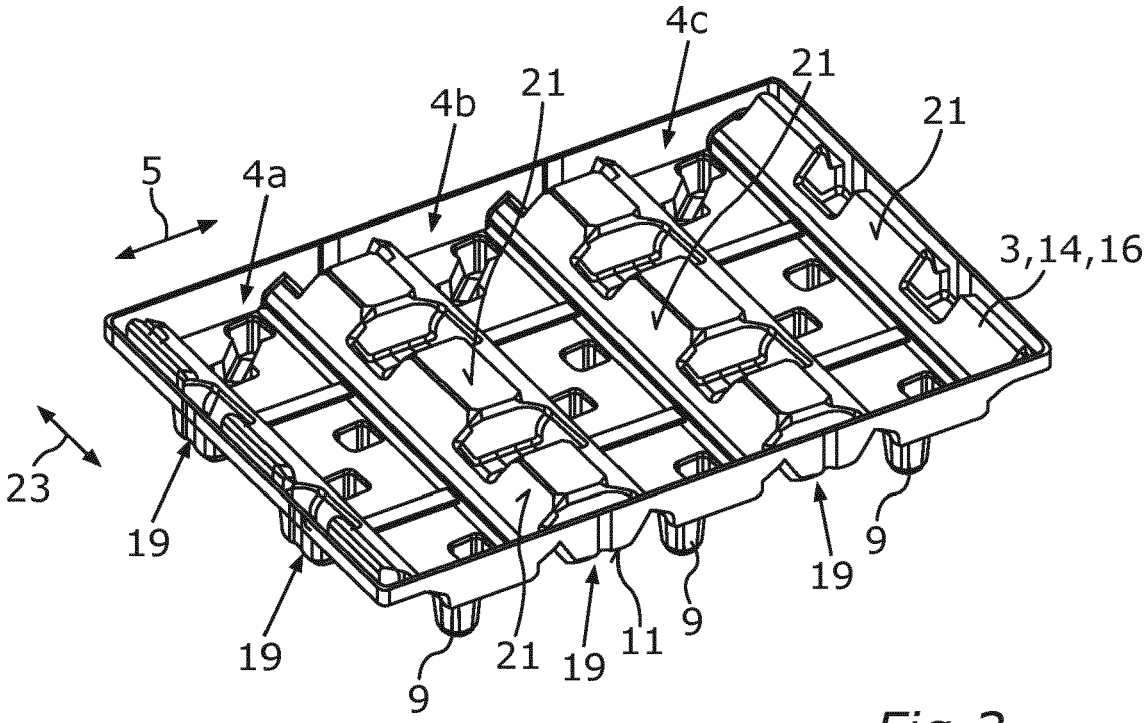
Fig.1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4b
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4a
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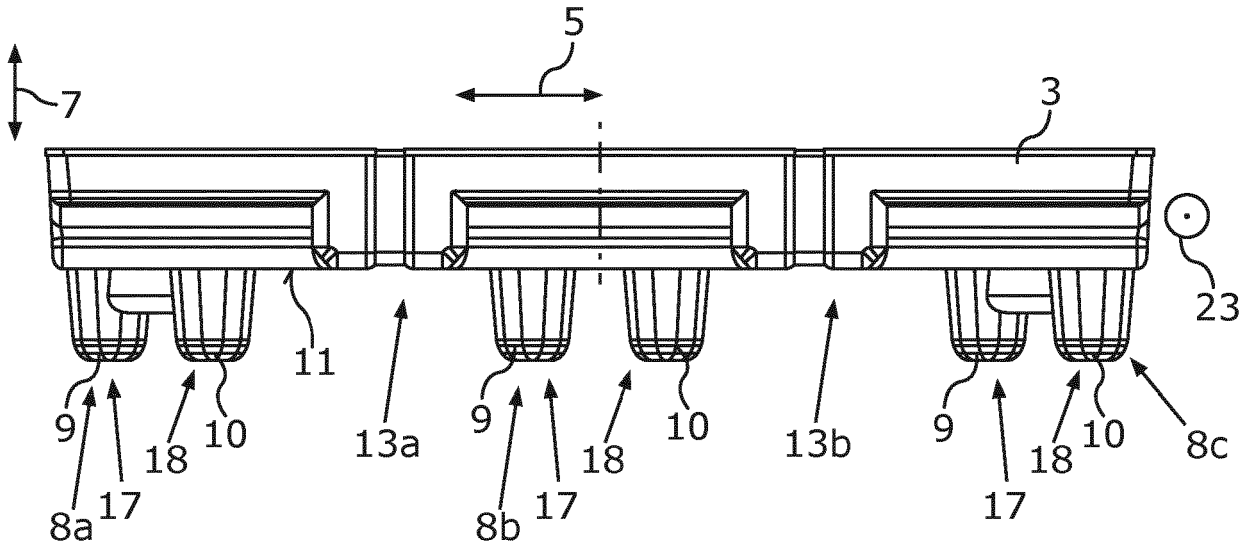
19
9

Fig.2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23
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9
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13b
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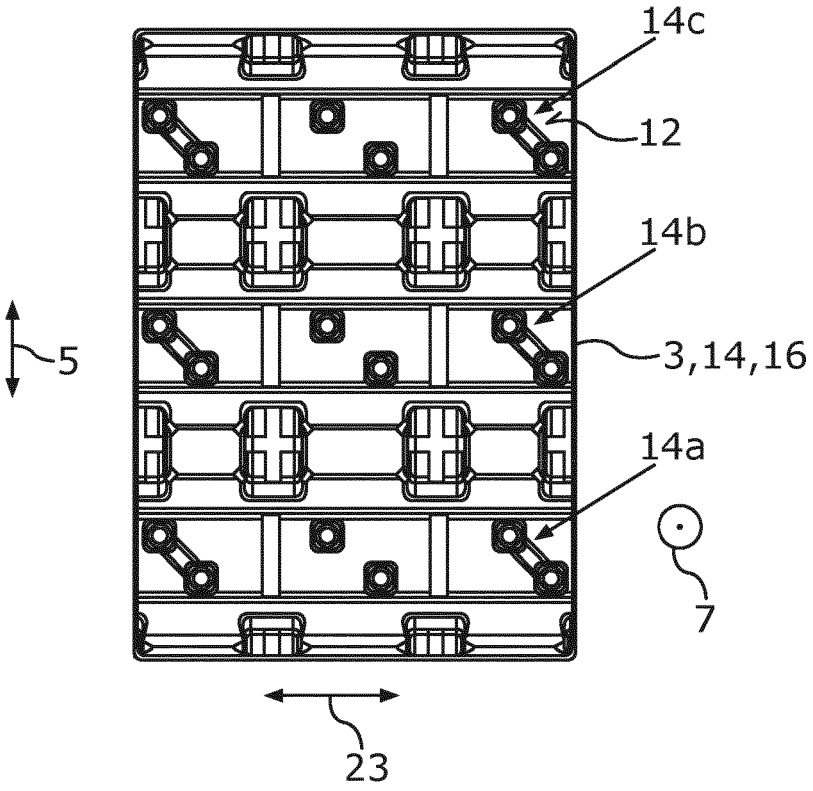
8b
17
17

Fig.3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14a
7
23

Fig.4

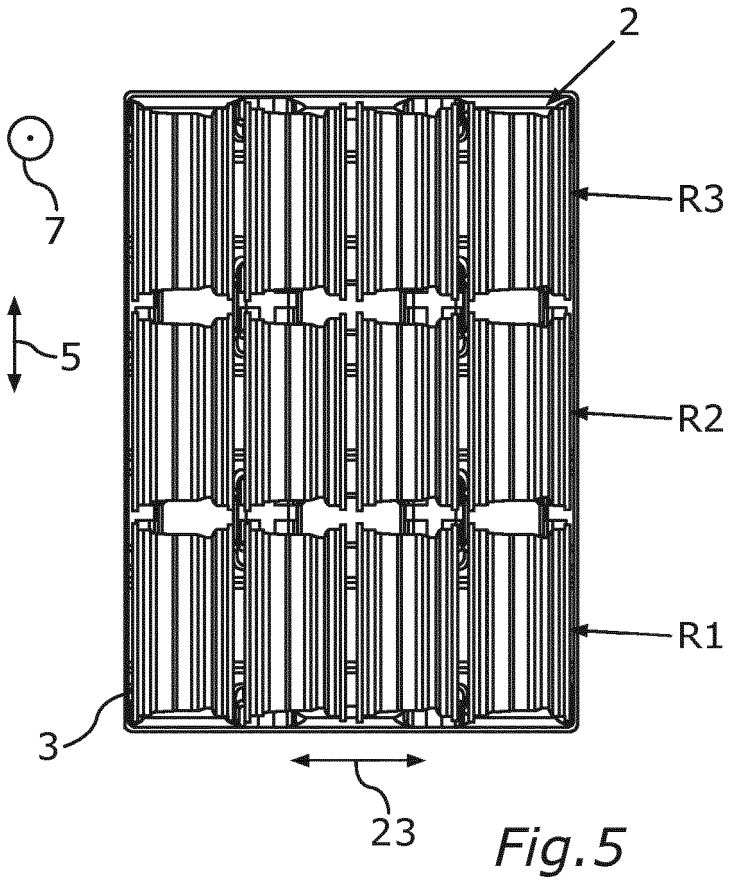


Fig.5

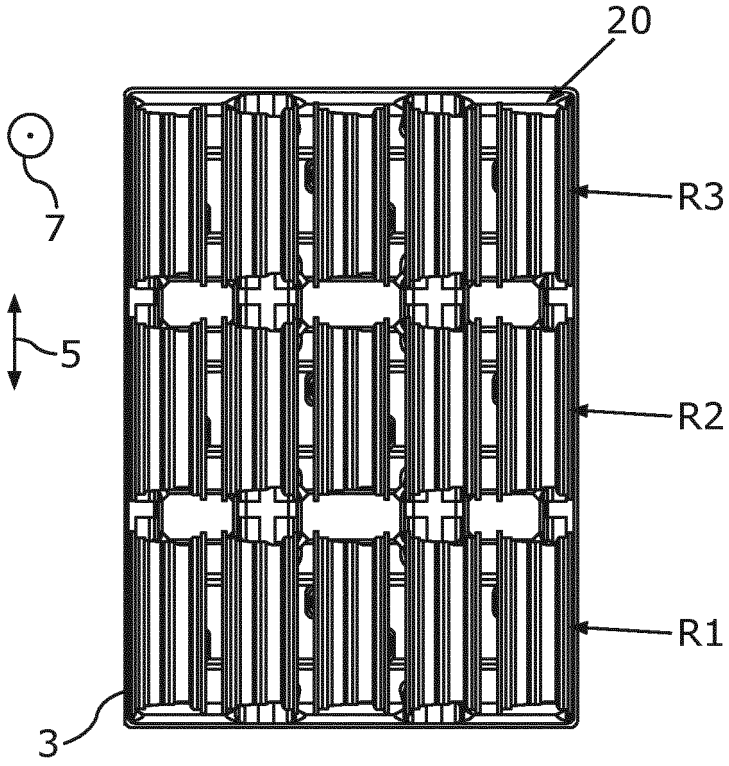


Fig.6

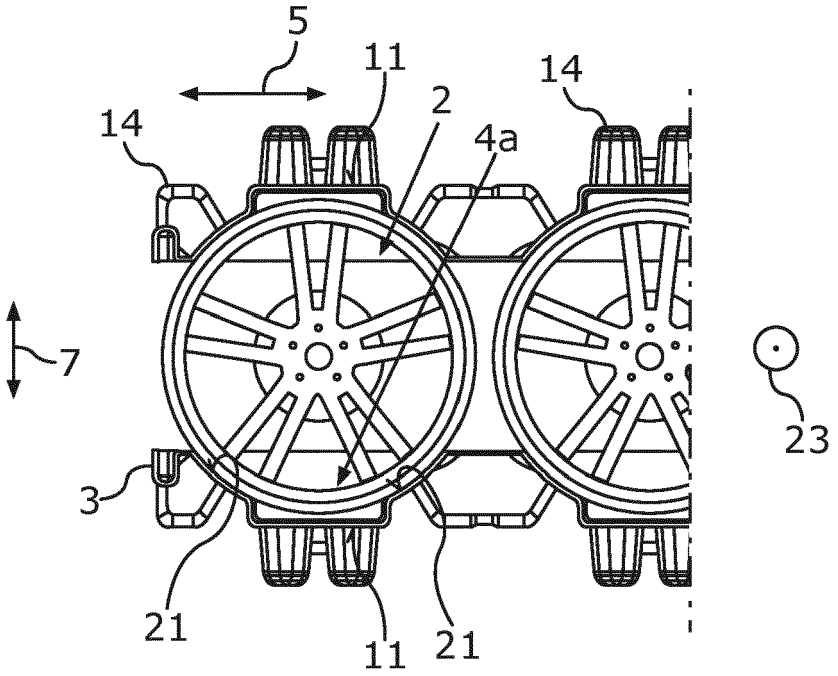


Fig.7

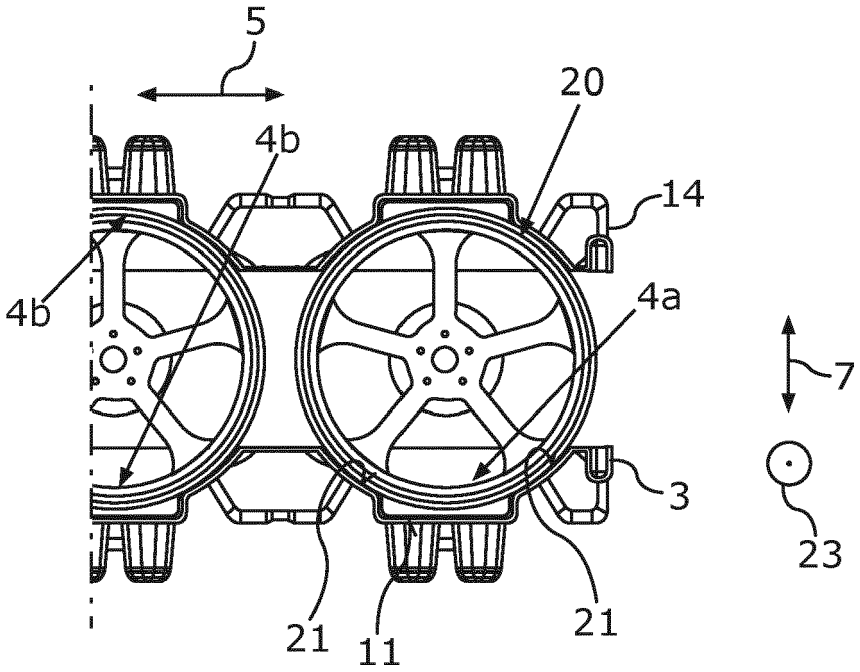
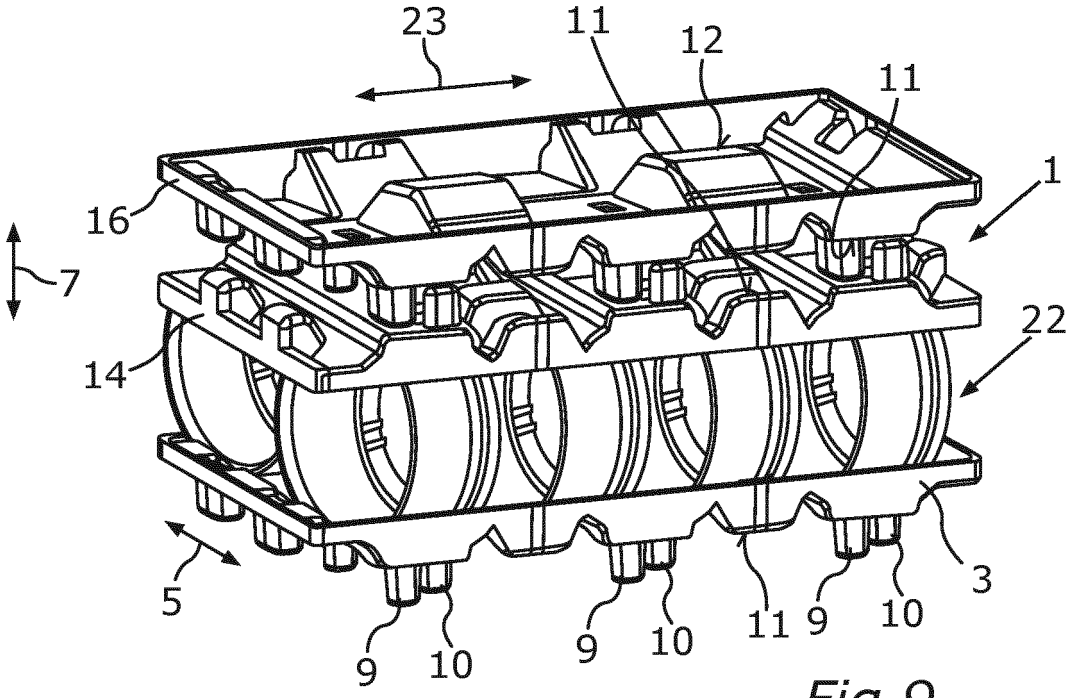


Fig.8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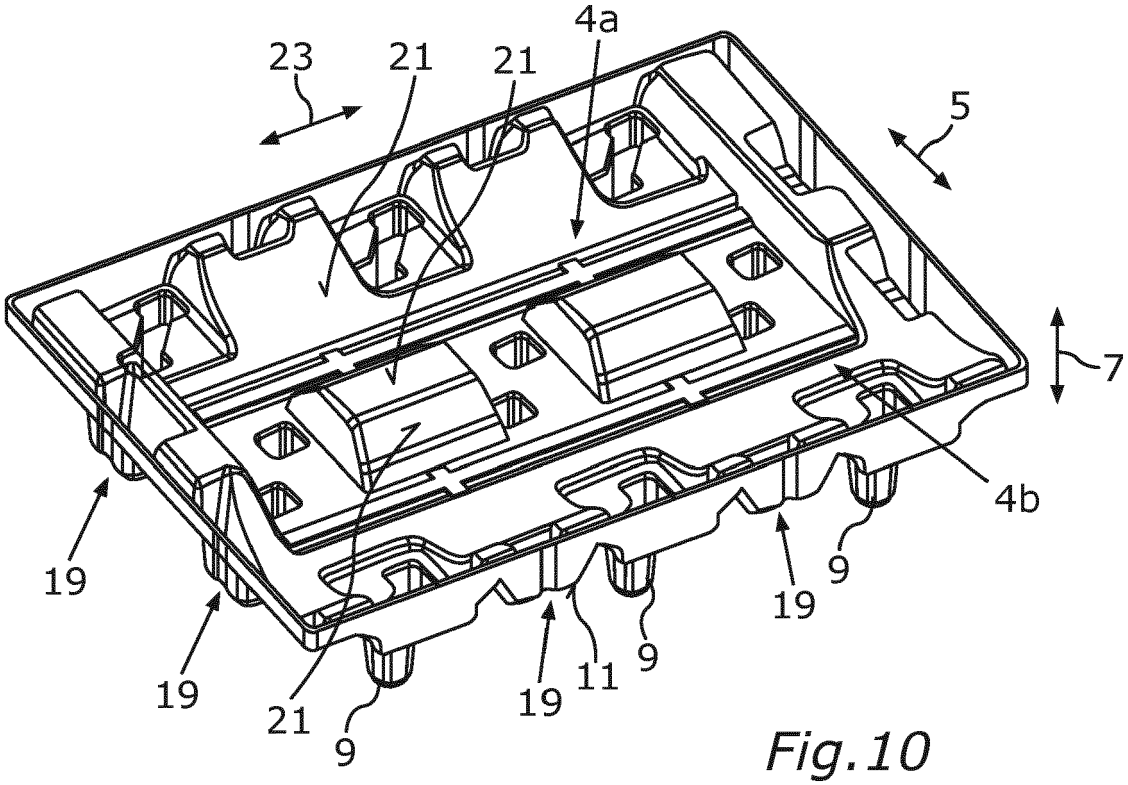
11
9
10

Fig.9


4a
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21
5
7
4b
19
19
19
19
21
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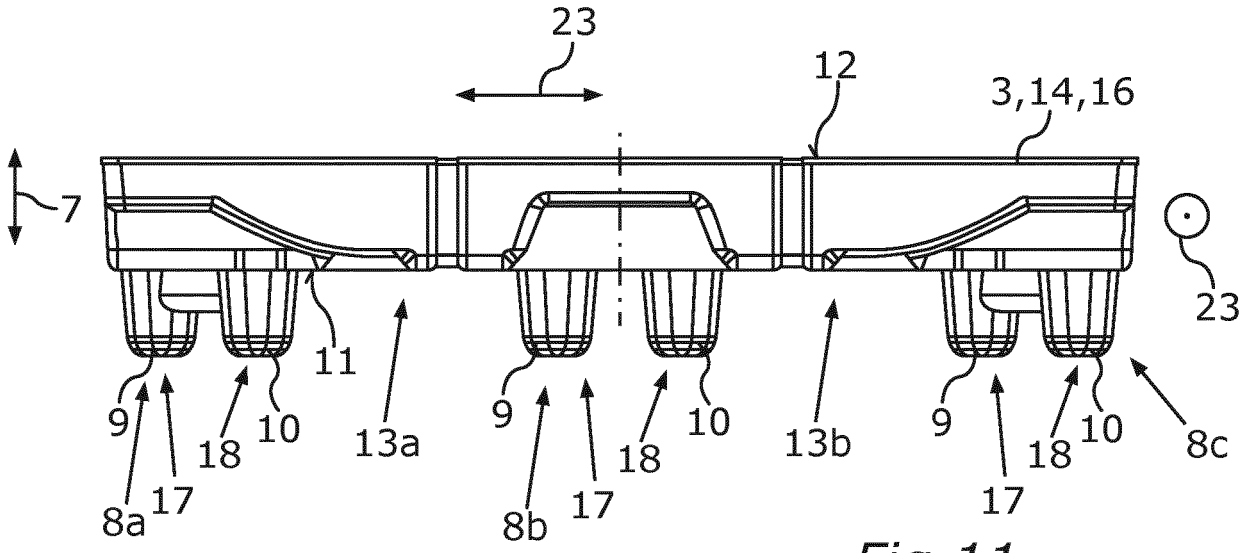
11
9
9

Fig.10


23
12
3,14,16
7
23
11
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18
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13a
9
18
10
13b
9
18
10
8c
8a
17
8b
17
17

Fig.11

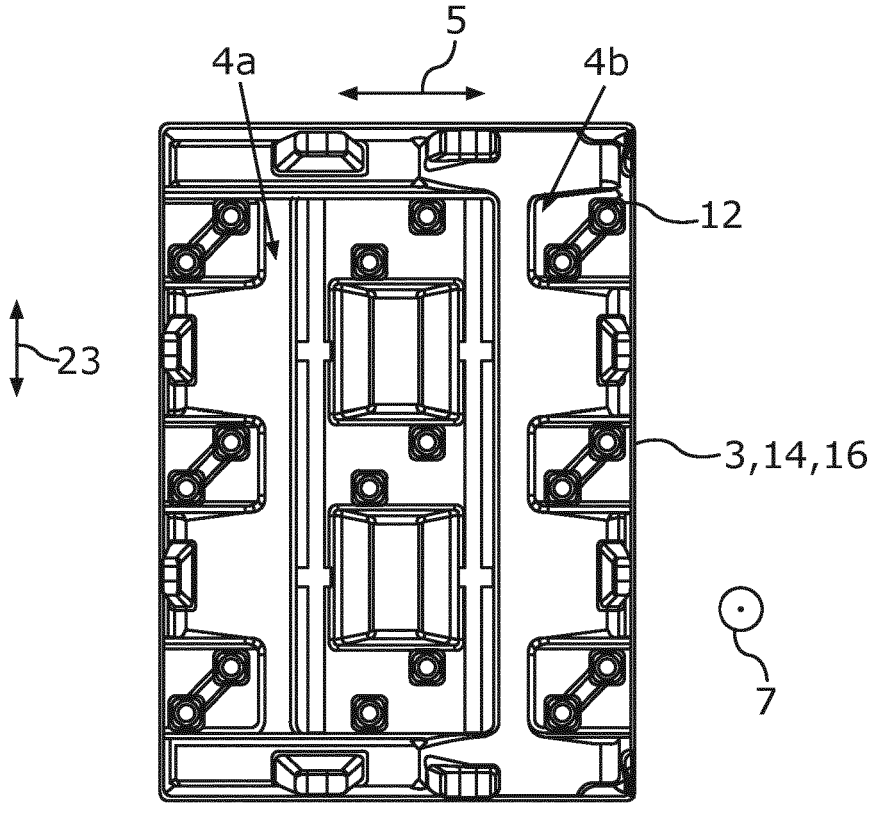
5
4a
4b
12
23
3,14,16
7

Fig.12

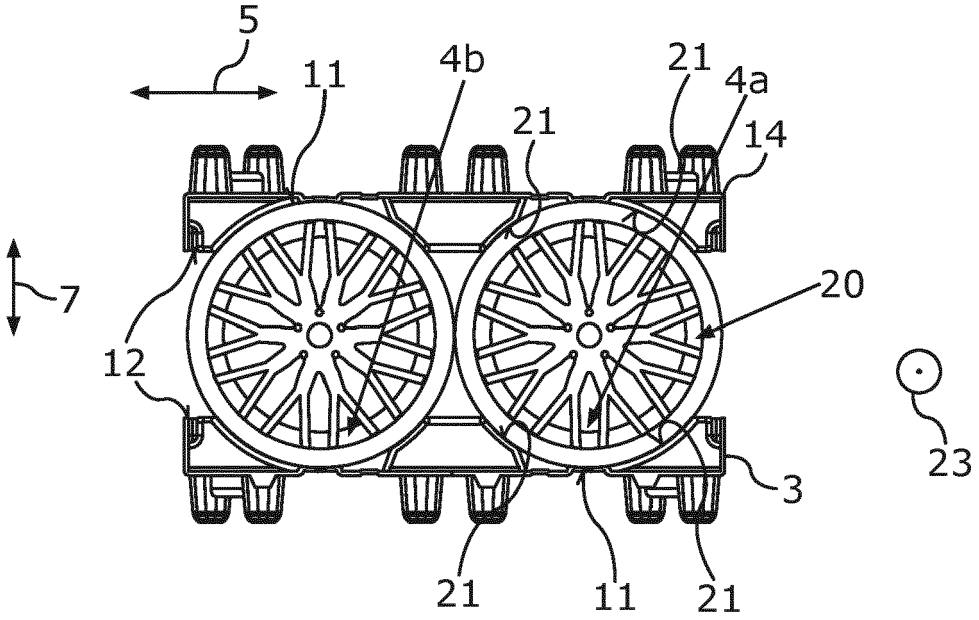

Fig.13

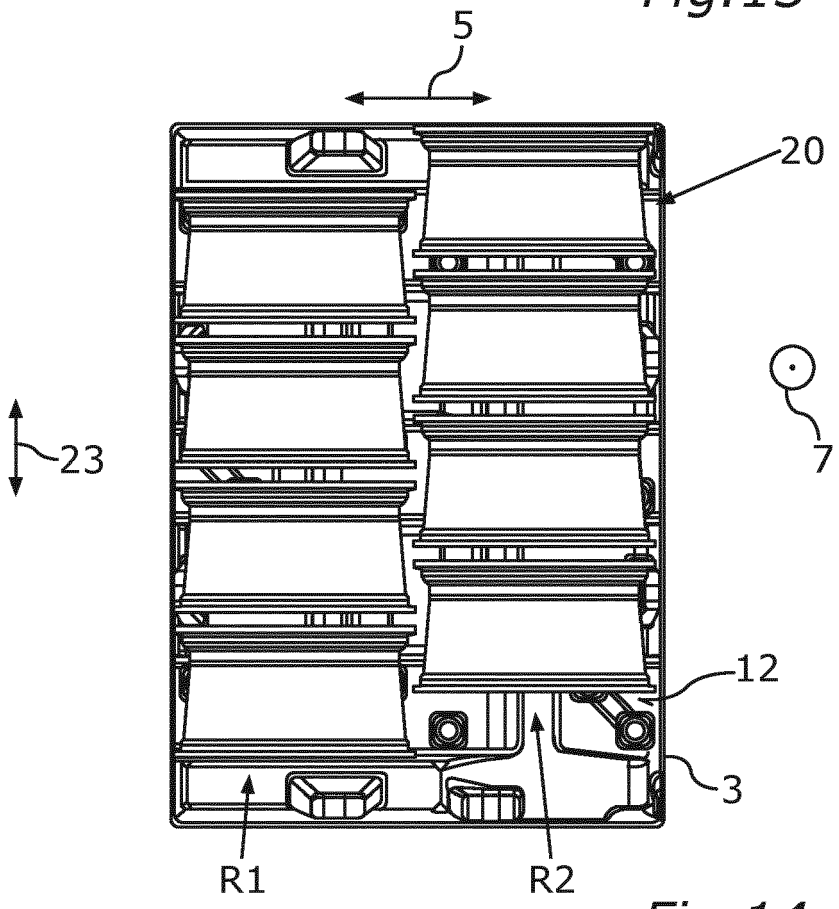

Fig.14

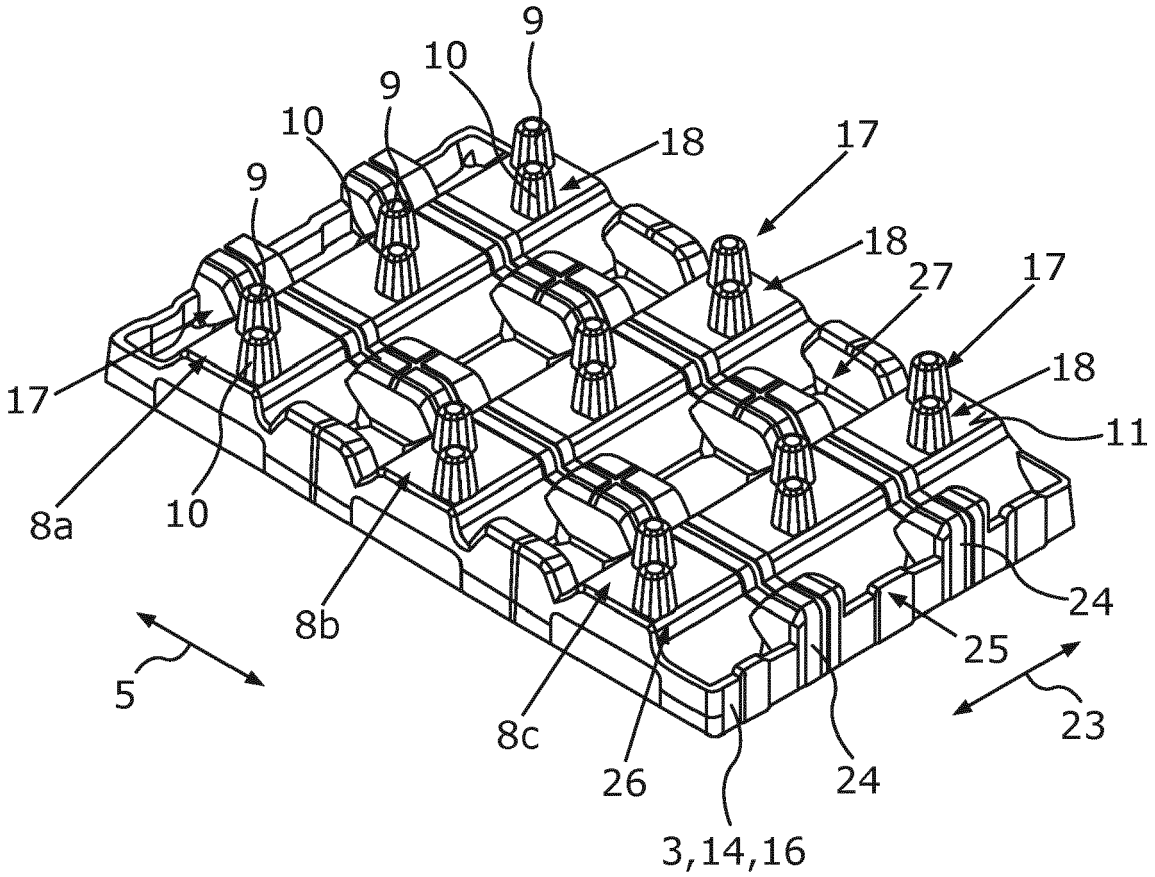

Fig.15

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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 8412

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 September 2021	Lämmel, Gunnar

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21-09-2021

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