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DESCRIPTION

[0001] The present invention relates to a transport assembly comprising at least one carrier, the carrier comprising a carrier base and a number of wheels arranged thereon.

[0002] Such transport systems are known wherein such carriers, also referred to as dollies, can be driven onto a pallet. Such a pallet is also referred to as a roll-on/roll-off pallet.

[0003] A problem in such known transport assemblies is that the carrier, after being positioned on the pallet, can accidentally roll off the pallet. This can result in hazardous situations, particularly during lifting of the pallet with a carrier positioned thereon.

[0004] In DE102011054255A1 a transport assembly is described comprising a carrier and a pallet therefor. The carrier has a carrier base and a number of wheels arranged thereon. The pallet comprises a lower deck and carrier supports protruding upward from the lower deck. The carrier supports are provided with sliding elements and fixating elements. The sliding elements are arranged for sliding the carrier over the carrier supports into a carrying position in which carrying position the carrier base is positioned over one of the fixating elements. With the carrier in the carrying position a fork of a forklift truck can be inserted in the pallet underneath the carrier supports for lifting the carrier via the pallet. The fixating element is moveable in vertical direction. The fixating element is moved upward by the fork when lifting the pallet such that the fixating element engages the carrier base and fixates the carrier on the pallet during lifting. In the carrying position, the wheels of the carrier extend in recesses that are provided in the lower deck for providing additional stability on the pallet when the carrier is in the carrying position.

[0005] The present invention has for its object, among others, to address the above described problem.

[0006] The present invention provides for this purpose a transport assembly as defined in claim 1. The transport assembly according to the invention makes it possible to drive a carrier in simple manner onto the pallet in order to place it in a carrying position on the pallet, wherein in the carrying position the carrier base of the carrier is supported by the carrier support. Because at least one recess in which a wheel extends in the carrying position is arranged in the lower deck, it is possible that, when the carrier is driven onto the pallet in order to bring the carrier into the carrying position, the carrier base is clear of the support surface while in the carrying position the carrier base is in contact with the support surface. As soon as the carrier support supports the carrier base in the carrying position, the carrier no longer supports only on the wheels thereof. This has the advantage of avoiding the carrier rolling off the pallet during lifting of the pallet with the carrier thereon. The transport assembly is thus configured such that, in order to bring the carrier to the carrying position, the carrier can be driven over the drive-on path wherein the carrier base is clear of the support surface, and wherein in the carrying position the support surface is in contact with the carrier base. In the transport

assembly according to the invention the support surface is stationary relative to the lower deck. No mechanisms are therefore necessary to move the support surface relative to the lower deck in order to bring the support surface into contact with the carrier base of the carrier. The pallet of the transport assembly is hereby of simple construction.

[0007] In a favourable embodiment the lower deck is provided with recesses such that each wheel of the carrier extends in a respective recess in the carrying position of the carrier. This makes it possible for the support surface to support the carrier base at positions in balanced distribution over the surface of the carrier base to be supported. This embodiment particularly makes possible a favourable further embodiment in which the carrier support carries the carrier in the carrying position. When the carrier is carried by the carrier support in the carrying position, and thereby no longer by the wheels, the carrier lies firmly and stably on the pallet in the carrying position. This has the advantage of avoiding particularly effectively the carrier rolling off the pallet during lifting of the pallet with the carrier thereon. The wheels of the carrier are for instance freely suspended here in the recesses or make only slight contact with the lower deck or the ground surface on which the pallet is positioned, without carrying a part of the weight of the carrier base and goods possibly positioned thereon. During lifting of the pallet the lifting forces which lift the pallet are transmitted directly via the carrier support to the carrier base of the carrier. This has the advantage of avoiding bending in the pallet during lifting of the pallet and obtaining a great stability of the pallet with carriers thereon. In the carrying position the wheels are alternatively in contact with the lower deck or the ground surface on which the pallet is positioned so that the wheels carry a first part of the weight of the carrier and the goods possibly placed thereon, and the carrier support carries a second part of this weight. In the case the wheels are in contact in the carrying position with the ground surface on which the pallet is positioned, so that the wheels carry a first part of the weight of the carrier and the goods possibly placed thereon and the carrier support carries a second part of this weight, it is then possible for the wheels to become freely suspended during lifting of the pallet so that the full weight of the carrier and the goods possibly placed thereon is carried by the carrier support.

[0008] In an alternative embodiment the lower deck is provided with recesses such that in the carrying position of the carrier only the wheels on one side of the carrier base extend in a respective recess. These measures make it possible that in the carrying position one side of the carrier base is supported by the support surface while the opposite side is supported by the wheels on that side. The wheels on this opposite side are supported by the lower deck. In the carrying position the carrier is thus carried by the carrier support on one side of the carrier base and carried by the lower deck on the opposite side of the carrier base. Said embodiment particularly makes possible a further favourable embodiment wherein in the carrying position the wheels on either side of the carrier support on the side of the carrier base which, as seen in drive-on direction, are positioned furthest from the edge of the pallet extend in a respective recess.

[0009] In a further favourable embodiment the recesses are through-holes. The use of through-holes, or recesses open on the underside, in which the wheels extend in the carrying

position makes it possible, in the case of possible deformation of the pallet and/or the carrier, for instance during use, to avoid the wheels coming into contact with the lower deck such that the carrier support no longer supports the carrier base and the carrier can roll off the pallet. Alternatively, the recesses are blind recesses or recesses which are closed on the underside. The recesses must in this case be sufficiently deep if it is wished, in the case of possible deformation of the pallet and/or the carrier, for instance during use, to avoid the wheels coming into contact with the lower deck such that the carrier support no longer supports the carrier base and the carrier can roll off the pallet.

[0010] In a further favourable embodiment a wheel extending in a recess is positioned in the carrying position close to an edge of the recess, as seen in the direction in which the drive-on path extends. This makes it possible, by means of slight sliding of the carrier base over the carrier support by which it is supported, to drive the wheel once again onto the drive-on path so that the carrier base moves clear of the carrying surface and is no longer supported by the carrying surface. This has the advantage that from the carrying position a carrier can once again be driven in simple manner from the pallet by a user. The wheel is preferably in contact with the relevant edge in the carrying position. This makes it possible to drive the wheel onto the drive-on path again with very little sliding of the carrier base over the carrier support by which it is supported.

[0011] In a favourable embodiment the edge of the recess close to which the wheel is positioned in the carrying position is chamfered. This makes it easier to drive the wheel onto the drive-on path again.

[0012] In a further favourable embodiment of the transport assembly according to the invention the drive-on path extends along the edge of the pallet in the direction in which the drive-on path extends and beyond the support surface. This avoids the carrier base coming into contact with the support surface when a number of the wheels are situated on the drive-on path and a number of the wheels are not. This situation occurs for instance when the carrier is being driven onto the pallet.

[0013] In a further favourable embodiment of the transport assembly according to the invention the pallet comprises in the direction in which the drive-on path extends a plurality of carrier supports which protrude upward from the lower deck and which each define a support surface for supporting the carrier base of a respective carrier, wherein the lower deck forms a drive-on path on either side of each carrier support and wherein the respective carrier supports and drive-on paths extend mutually in line. This makes it possible to position a plurality of carriers on the pallet.

[0014] In a favourable embodiment hereof the respective support surfaces are embodied such that in the carrying position two carriers positioned adjacently of each other in the direction in which the drive-on path extends are positioned inclining away from each other, preferably at an angle in the range of 0.5 to 1.5 degrees, more preferably at an angle of substantially 1 degree. This measure makes it possible for goods placed on the respective

carriers to incline away from each other in the carrying position. This has the advantage of avoiding film wrapped round the goods placed on the one carrier adhering to film wrapped round the goods placed on the other carrier.

[0015] Alternatively or additionally, the pallet comprises in the direction in which the drive-on path extends a plurality of carrier supports protruding upward from the lower deck and each defining a support surface for supporting the carrier base of a respective carrier, wherein the lower deck forms a drive-on path on either side of each carrier support and wherein the respective carrier supports and drive-on paths extend parallel to each other.

[0016] In a favourable embodiment hereof the respective drive-on paths and support surfaces are embodied such that two carriers positioned adjacency of each other transversely of the direction in which the drive-on path extends are positioned inclining away from each other, preferably at an angle in the range of 0.5 to 1.5 degrees, more preferably at an angle of substantially 1 degree. This measure makes it possible for the goods placed on the respective carriers to incline away from each other during driving of the carriers onto the pallet and in the carrying position thereof. This has the advantage of avoiding film wrapped round the goods placed on the one carrier adhering to film wrapped around the goods placed on the other carrier.

[0017] In a further favourable embodiment of the transport assembly according to the invention the carrier support comprises:

- two side walls protruding upward from the lower deck, which side walls are offset relative to each other in the direction transversely of the direction in which the drive-on path extends and extend along the drive-on path; and
- an upper deck part running parallel to the lower deck close to the ends of the side walls remote from the lower deck.

[0018] A thus embodied carrier support makes it possible to insert a fork of a forklift truck between the side walls and below the upper deck in the direction in which the drive-on path extends in order to lift the pallet.

[0019] In a preferred embodiment hereof the lower deck is open between the side walls of the carrier support. This provides the option of inserting a fork of a forklift truck as well as a fork of a pallet truck between the side walls and below the upper deck in the direction in which the drive-on path extends.

[0020] In a further favourable embodiment the side walls of the carrier support are partially open. This provides the option of inserting a fork of a forklift truck below the upper deck transversely of the direction in which the drive-on path extends in order to lift the pallet.

[0021] In a further favourable embodiment the upper deck part defines the support surface.

[0022] In a further favourable embodiment the side walls of the carrier support are of metal. The embodiment of the side walls in metal makes thinner side walls possible compared to the usual use of wood, so that more space is available between the side walls for inserting a fork of a forklift truck or pallet truck therebetween. The upper deck and lower deck can for instance be of wood or (fibre-reinforced) plastic.

[0023] In a further favourable embodiment the lower deck is formed from U-profile beams connected to the side walls. This enables a construction of the pallet from simply designed components which are available commercially in standard form. The U-profile beams are preferably of metal. The embodiment with U-profile beams connected to the side walls particularly makes possible a favourable embodiment in which the U-profile beams are connected by means of plastic beams to the side walls, wherein the plastic beams extend beyond the U-profile beams in the direction away from the upper deck part. The plastic beams thus protruding downward in use simplify sliding of the pallet over a ground surface.

[0024] In a further favourable embodiment the transport assembly also comprises an auxiliary device on which the pallet can be positioned, wherein the auxiliary device comprises an upward protruding member which extends at least partially into the through-hole when the pallet is positioned on the auxiliary device.

[0025] The present invention is further elucidated hereinbelow on the basis of exemplary embodiments as shown schematically in the accompanying figures. These are non-limitative exemplary embodiments. In the figures:

- figure 1 is a side view in partial section of an embodiment of a transport assembly according to the invention;
- figures 2 and 3 show respectively a perspective top view and perspective bottom view of the pallet of the transport assembly of figure 1;
- figure 4 is a top view of the pallet of the transport assembly of figure 1;
- figure 5 is a side view of the pallet of the transport assembly of figure 1;
- figure 6 is a perspective view of the pallet of the transport assembly of figure 1 with exploded parts;
- figures 7 to 15 show side views as in figure 1 in different situations during positioning of a carrier on the pallet;
- figure 16 is a perspective view of an alternative embodiment of the pallet as shown in figures 1-15;
- figure 17 is a top view of an alternative embodiment of the pallet as shown in figure 16;
- figure 18 is a perspective top view of an alternative embodiment of the pallet of the transport assembly of figure 1;
- figure 19 is a side view of the pallet of figure 18;
- figure 20 is a side view of the pallet of figure 18;
- figures 21 to 25 show side views as in figure 19 in different situations during positioning of carriers on the pallet;

- figures 26-28 show side views as in figure 20 in different situations;
- figures 29 and 30 show respectively a front view and side view in partial section of an alternative embodiment of the transport assembly of figures 1-15;
- figures 31 and 32 show the transport assembly of figures 29 and 30 with an auxiliary device.

[0026] Shown in figure 1 is a transport assembly 1 comprising a carrier 3 and a pallet 5 therefor. Carrier 3 has a carrier base 7 and a number of wheels 9 arranged thereon. Because of the wheels 9 carrier 3 can be rolled over ground surface 11. A quantity of goods 13 is shown schematically on carrier 3.

[0027] Figures 2, 3, 4, 5 and 6 show different views of pallet 5 of figure 1.

[0028] Pallet 5 has a lower deck 15. The lower deck is formed by means of three lower deck parts 15a, 15b and 15c. Four carrier supports 17a, 17b, 17c, 17d protrude upward from lower deck 15. Each of the carrier supports 17 defines a support surface 19a, 19b, 19c, 19d for supporting carrier base 7 of carrier 3 when carrier 3 is positioned in a carrying position relative to the carrier support. This latter will be elucidated hereinbelow in the description of figures 7 to 14.

[0029] Lower deck 15 forms on either side of carrier supports 17 drive-on paths 21a, 21b, 21c, 21d for driving carrier 3 onto lower deck 15. Lower deck 15 is provided with through-holes 23a, 23b, 23c, 23d which define ends of drive-on paths 21. Arranged on lower deck 15 along drive-on paths 21 are strips 25, 27, 29 which serve as guiding for wheels 9 of carrier 3 when driving onto drive-on path 21.

[0030] Side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55 protrude upward from lower deck 15 along drive-on paths 21. Side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55 extend along drive-on paths 21. Side wall parts 31, 35 and 39 are offset through a distance a relative to side wall parts 33, 37 and 41 in direction A transversely of the direction B in which drive-on paths 21 extend.

[0031] Side wall parts 31, 33, 43 and 45 are offset relative to side wall parts 35, 37, 47 and 49 through a distance b in the direction B in which drive on-paths 21 extend. Side wall parts 31, 33, 35 form two side walls of carrier support 17a which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open over the distance b. Side wall parts 35, 37, 39, 41 form two side walls of carrier support 17b which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open over the distance b.

[0032] Side wall parts 43, 47 and 51 are offset through a distance a relative to side wall parts 45, 49 and 53 in the direction A transversely of the direction B in which drive-on paths 21 extend. Side wall parts 39, 41, 51 and 53 are offset through a distance b relative to side wall parts 35, 37, 47 and 49 in the direction B in which drive-on paths 21 extend. Side wall parts 43, 45, 47, -49 form two side walls of carrier support 17c which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open through the distance b. Side wall parts 47, 49, 51, 53 form two side walls of carrier support 17d which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open through the distance b.

[0033] Close to the ends of side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53 remote from lower deck 15 the pallet 5 has an upper deck 55 running parallel to lower deck 15. Upper deck 55 is embodied by means of six upper deck parts 55a, 55b, 55c, 55d and 55e. Upper deck parts 55a, 55b, 55c and 55d define the respective support surfaces 19a, 19b, 19c, 19d. Upper deck parts 55a, 55b, 55c and 55d are connected to upper deck parts 55e and 55f which are in turn connected to connecting wall parts 57, 59, 61, 63, 65, 67 extending between the respective pairs of side wall parts 31 and 33, 35 and 37, 39 and 41, 43 and 45, 47 and 49, 51 and 53.

[0034] Lower deck part 15a is connected to connecting wall parts 69, 71, 73 extending from the respective side wall parts 31, 35 and 39. Lower deck part 15b is connected to connecting wall parts 75-79 extending between the respective pairs of side wall parts 33 and 43, 37 and 71, 41 and 51. Lower deck part 15c is connected to connecting wall parts 81-85 extending from the respective side wall parts 45, 49 and 53.

[0035] Connecting wall parts 57, 59, 61, 63, 65, 67 can alternatively be omitted, wherein each side wall part 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51,53 can then be connected by means of its own connecting wall part to the respective upper deck parts 55e and 55f. Connecting wall parts 75, 77, 79 can also be omitted, wherein each side wall part 33, 37, 41, 45, 49 and 53 can then be connected by means of its own connecting wall part to lower deck part 15b.

[0036] Arranged in the undersides of lower deck parts 15a, 15b and 15c are recesses in which the connecting wall parts 69, 71, 73, 75, 77, 79, 81, 83, 85 are positioned so that the underside of pallet 5 is flat and, when pallet 5 is placed on a flat ground surface 11, the lower deck lies flat on the ground surface.

[0037] Forks of a forklift truck can be inserted, in the direction B in which drive-on paths 21 extend, into the space 87 between side wall parts 31, 33, 35, 37, 39, 41 and below upper deck part 55f and into the space 89 between side wall parts 43, 45, 47, 49, 51, 53 and below upper deck part 55e. Since lower deck 15 is open between side wall parts 31, 33, 35, 37, 39, 41 and below upper deck part 55f and between side wall parts 43, 45, 47, 49, 51, 53 and below upper deck part 55e, forks of a pallet truck can also be inserted into the spaces 87 and 89 in the

direction B in which drive-on paths 21 extend.

[0038] A fork of a forklift truck can be inserted, in the direction A transversely of the direction B in which drive-on paths 21 extend, into passage 91 between lower deck 15 and upper deck 55 and the respective side wall part pairs 31 and 33, 33 and 37, 43 and 47, 45 and 49. A fork of a forklift truck can be inserted, in the direction A transversely of the direction B in which drive-on paths 21 extend, into passage 93 between lower deck 15 and upper deck 55 and the respective side wall part pairs 35 and 39, 37 and 41, 47 and 54, 49 and 53. The side wall parts extending mutually in line can alternatively be form integrally and thus form a side wall without openings for the insertion of forks of a forklift truck. Passages 91 and 93 will then be omitted. The stiffness of pallet 5 in the direction B in which drive-on paths 21 extend is greater with such continuous side walls.

[0039] Side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53 and connecting walls 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79 are of metal. Lower deck parts 15a-15c and upper deck parts 55a-55f are of wood. The side wall parts can alternatively be of wood, or a number of the side wall parts can be of wood, for instance side wall parts 31, 35, 39, 45, 49 and 53, and the other side wall parts of metal, for instance side wall parts 33, 37, 41, 43, 47 and 51. It is also possible for the pallet to be wholly or partially of plastic, in particular reinforced plastic.

[0040] Figures 7 to 10 show that, from the situation as shown in figure 1, the carrier is driven in the direction of arrow C to a carrying position on pallet 5, wherein in figure 7 the front wheels 9a of carrier 3 are situated in the through-hole 23a at an end of drive-on path 21a and is about to drive onto drive-on path 21a and wherein in figure 10 carrier 3 is located in the carrying position on pallet 5. As illustrated by means of the intervening figures 8 and 9, carrier 3 and pallet 5 are configured such that, during travel of carrier 3 over drive-on path 21a in the direction of the carrying position, the carrier base 7 is clear of support surface 19a. Because the drive-on path extends along the edge of the pallet in the direction B in which drive-on path 21 extends and beyond support surface 19a, when carrier 3 is driven onto pallet 5 the carrier base 7 does not come into contact with the upper deck part defining support surface 19a.

[0041] As soon as the carrier is driven from the situation as shown in figure 9 in the direction of arrow C, the rear wheel 9b comes to lie in the through-hole 23a at the one end of drive-on path 21a and the front wheel 9a in the through-hole 23a at the other end of drive-on path 21a. The underside of carrier base 7 comes into contact here with support surface 19a of carrier support 17a, wherein carrier 3 moves into the carrying position as shown in figure 10A. Carrier 3 and pallet 5 are configured such that in the carrying position the wheels 9 of carrier 3 extend in recesses 23a, and carrier support 17a carries carrier 3. In the carrying position the wheels 9 no longer carry the weight of carrier base 7 and the goods positioned thereon. As shown in the two detail views in figures 10B and 10C, wheels 9 hang clear of lower deck 15 and ground surface 11. The distance c between the underside of wheels 9 and the part of the underside of carrier base 7 which is in contact with carrier support 19a is thus smaller than the distance d between support surface 19a and the bottom surface of lower deck 15 which is in contact with ground surface 11.

[0042] Situated close to the wheels are chamfered edges 95 of lower deck 15 which form the ends of drive-on path 21a. The wheels can alternatively be in light contact with edges 95 in the carrying position.

[0043] Although in the shown embodiment the wheels are not in contact with the ground surface 11 in the carrying position, the pallet and the carrier can also be adapted to each other such that in the carrying position the wheels are in contact with ground surface 11 while carrier base 7 is also in contact with support surface 19a. Carrier support 19a does then support carrier base 7 but does not fully carry the carrier 3. Carrier support 19a does not then carry the wheels nor the part of the weight of carrier base 7 carried by the wheels.

[0044] Although in the shown embodiment the recesses 23 are through-holes, so that the lower deck does not extend below the wheels, the recesses can also be blind recesses.

[0045] By sliding the carrier 3 from the situation as shown in figure 10A over support surface 19a in the direction of arrow D, the front wheel 9a comes into contact with the chamfered edge 95 and, when further displaced in the direction of arrow D, moves onto drive-on path 21a so that the situation as shown in figure 9 results. Carrier base 7 here moves clear of support surface 19a. With still further displacement in the direction of arrow D the carrier 3 is driven off pallet 5.

[0046] By sliding the carrier 3 from the situation as shown in figure 10A over support surface 19a in the direction of arrow C, the rear wheel 9b comes into contact with the chamfered edge 95 and, when further displaced in the direction of arrow C, moves onto drive-on path 21a so that the situation as shown in figure 11 results. Carrier base 7 here moves clear of support surface 19a and front wheel 9a comes into contact with the chamfered edge 97 of lower deck 15 at an end of drive-on path 21b of carrier support 17b. With still further displacement in the direction of arrow C the front wheel 9 moves onto drive-on path 21b and rear wheel 9b moves off drive-on path 21a so that the situation results as shown in figure 12. Carrier base 7 here remains clear of support surface 19a of carrier support 17a and clear of support surface 19b of carrier support 17b.

[0047] As soon as carrier 3 is driven from the situation as shown in figure 12 in the direction of arrow C, the rear wheel 9b comes to lie in the through-hole 23b at the one end of drive-on path 21b and the front wheel 9a in the through-hole 23b at the other end of drive-on path 21b. The underside of carrier base 7 comes into contact here with support surface 19b of carrier support 17b, wherein carrier 3 moves into the carrying position as shown in figure 13. Carrier 3 and pallet 5 are configured such that in the carrying position the wheels 9 of carrier 3 extend in recesses 23b, and carrier support 17b carries carrier 3. In the carrying position the wheels 9 no longer carry the weight of carrier base 7 and the goods positioned thereon. Just as in the carrying position on carrier support 17a as shown in figure 10A, wheels 9 hang clear of lower deck 15 and ground surface 11.

[0048] As shown in figures 14 and 15, it is possible from the situation as shown in figure 13 to drive a second carrier 3b in the direction of arrow C onto pallet 5 and to bring it into a carrying position wherein carrier 3b is carried by carrier support 17a.

[0049] Positioning of two carriers 3, 3b on pallet 5 as shown in figures 7 to 15 is possible since pallet 5 as shown in figures 2 to 6 comprises in the direction B in which drive-on path 21a extends a plurality of, in particular two, carrier supports 17a and 17b protruding upward from lower deck 15 and each defining a support surface 19a, 19b for supporting carrier base 7 of a respective carrier, wherein lower deck 15 forms a drive-on path 21a, 21b on either side of each carrier support 17a, 17b and wherein the respective carrier supports 17a and 17b and drive-on paths 21a and 21b extend mutually in line.

[0050] A partition extending transversely of the direction B in which drive-on paths 21 extend can be arranged between the side wall parts pair 37 and 47. This partition imparts stiffness to pallet 5 in the direction A transversely of the direction B in which drive-on paths 21 extend. Two carriers can then not be driven onto the pallet in the manner as shown in figures 7 to 15. The carriers must then be driven onto the pallet from opposite sides thereof. Such a partition also forms a stop for a carrier driven onto the pallet.

[0051] Pallet 5 can be provided with selectively controllable arresting members, such as upward tiltable and lockable brackets or extendable and lockable brackets, for arresting a carrier in the carrying position on a carrier support. It is possible by means of such arresting members to additionally avoid a carrier positioned on the pallet displacing relative thereto when the pallet is lifted.

[0052] The underside of lower deck 15 can be provided with anti-slip material in order to prevent the pallet displacing over the ground surface on which the pallet is placed when a carrier is driven onto the pallet.

[0053] In addition to being provided with carrier supports 17a and 17b, pallet 5 as shown in figures 2 to 6 is also provided with two additional carrier supports 17c and 17d which extend mutually in line and extend parallel to carrier supports 17a and 17b. In the same manner as shown in figures 7 to 14, two additional carriers can be driven onto pallet 5 which can be brought into a carrying position in which the additional carriers are carried respectively by carrier supports 17c and 17d.

[0054] Pallet 5 hereby provides space for four carriers. It is alternatively possible that pallet 5 has more or fewer carrier supports in the direction B in which drive-on paths 21 extend and/or that pallet 5 has more or fewer carrier supports in the direction A transversely of the direction B. Thus shown in figure 16 is an example of pallet 5 with only one carrier support 17a, which pallet provides space for only one carrier 3. Such a pallet can for instance be applied when a carrier 3 has to be displaced by means of a conveyor belt.

[0055] Shown in figures 1 to 16 is that pallet 5 is provided with handgrips 99 for easy lifting of

the pallet 5 by hand.

[0056] Although embodiments of the transport assembly according to the invention are shown in figures 1 to 16 wherein the pallet has a lower deck 15 formed from a plurality of lower deck parts, it is also possible for the lower deck to be formed integrally. Such an embodiment is shown for instance in figure 17. Figure 17 shows an alternative example of pallet 5 as shown in figure 16. Pallet 5 of figure 17 comprises an integrally formed lower deck 15 from which extends a carrier support 17 which defines a support surface for supporting the carrier base of the carrier when the carrier is positioned in a carrying position relative to the carrier support. Lower deck 15 forms on either side of carrier support 17 a drive-on path 21 for driving the carrier onto the lower deck. Lower deck 15 is provided with recesses 23 in which the wheels of the carrier extend in the carrying position thereof. Carrier support 17 comprises two side walls 101, 103 in the form of two parallel beams arranged on lower deck 15. An upper deck part 55 extending parallel to lower deck 15 is arranged on side walls 101, 103. Upper deck part 55 defines support surface 19.

[0057] Figures 18 to 20 show an alternative example of pallet 5 as shown in figures 2 to 6.

[0058] Pallet 5 of figures 18 to 20 has a lower deck 15. The lower deck is embodied by means of three lower deck parts 15a, 15b and 15c. Four carrier supports 17a, 17b, 17c, 17d protrude upward from lower deck 15. Each of the carrier supports 17 defines a support surface 19a, 19b, 19c, 19d for supporting carrier base 7 of a carrier 3 when carrier 3 is positioned in a carrying position relative to the carrier support. This latter will be elucidated hereinbelow in the description of figures 21 to 24.

[0059] Lower deck 15 forms on either side of carrier supports 17 drive-on paths 21a, 21b, 21c, 21d for driving carrier 3 onto lower deck 15. Along each drive-on path 21a, 21b, 21c, 21d the lower deck 15 comprises an elevated part 121a, 121b, 121c, 121d in which a recess 23a, 23b, 23c, 23d is arranged. Each of the recesses 23a, 23b, 23c, 23d defines an end of a drive-on path 21. Pallet 5 differs here from the alternative pallet 5 as shown in figures 2 to 6. Instead of a recess being provided at two ends of each drive-on path 21, a recess is provided at only one end of each drive-on path 21. As will be described in more detail with reference to figures 21 to 24, in the pallet 5 of figures 18 to 20 two wheels of a carrier 3 extend in the carrying position in recesses and two wheels do not. In addition, a difference from pallet 5 as shown in figures 2 to 6 is that recesses 23 of pallet 5 of figures 18 to 20 are not through-holes but blind recesses. The recesses can alternatively be through-holes.

[0060] Along drive-on paths 21 of pallet 5 as shown in figures 18 to 20 strips 25, 27, 29 are arranged on lower deck 15 which serve as a guiding for wheels 9 of carrier 3 during driving onto drive-on path 21.

[0061] Side wall parts 31,33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55 protrude upward from lower deck 15 along drive-on paths 21. Side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55 extend along drive-on paths 21. Side wall parts 31, 35 and 39 are offset through a

distance a relative to side wall parts 33, 37 and 41 in direction A transversely of the direction B in which drive-on paths 21 extend.

[0062] Side wall parts 31, 33, 43 and 45 are offset relative to side wall parts 35, 37, 47 and 49 through a distance b in the direction B in which drive on-paths 21 extend. Side wall parts 31, 33, 35 form two side walls of carrier support 17a which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open over the distance b. Side wall parts 35, 37, 39, 41 form two side walls of carrier support 17b which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open over the distance b.

[0063] Side wall parts 43, 47 and 51 are offset through a distance a relative to side wall parts 45, 49 and 53 in the direction A transversely of the direction B in which drive-on paths 21 extend. Side wall parts 39, 41, 51 and 53 are offset through a distance b relative to side wall parts 35, 37, 47 and 49 in the direction B in which drive-on paths 21 extend. Side wall parts 43-49 form two side walls of carrier support 17c which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open through the distance b. Side wall parts 47, 49, 51, 53 form two side walls of carrier support 17d which extend in the direction B in which drive-on paths 21 extend and which in the direction A transversely of the direction B in which the drive-on paths extend are offset through a distance a and which are open through the distance b.

[0064] Close to the ends of side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53 remote from lower deck 15 the pallet 5 has an upper deck 55 running parallel to lower deck 15. Upper deck 55 is embodied by means of six upper deck parts 55a, 55b, 55c, 55d, 55e, 55f. Upper deck parts 55a, 55b, 55c and 55d define the support surfaces 19a, 19b, 19c, 19d. Upper deck parts 55a, 55b, 55c and 55d are connected to upper deck parts 55e and 55f which are in turn connected to the respective pairs of side wall parts 31 and 33, 35 and 37, 39 and 41, 43 and 45, 47 and 49, 51 and 53. Lower deck part 15a is connected to the respective side wall parts 31, 35 and 39. Lower deck part 15b is connected to the respective pairs of side wall parts 33 and 43, 37 and 47, 41 and 51. Lower deck part 15c is connected to the respective side wall parts 45, 49 and 53.

[0065] Compared to pallet 5 as shown in figures 2 to 6, the connecting wall parts 57, 59, 61, 63, 65, 67 and connecting wall parts 75, 77, 79 are omitted in pallet 5 as shown in figures 18 to 20. Each side wall part 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53 is connected by means of its own connecting wall part to the respective upper deck parts 55e and 55f and lower deck parts 15a, 15b, 15c. Alternatively however, connecting wall parts 57, 59, 61, 63, 65, 67 and 75, 77, 79 can be provided in pallet 5 as shown in figures 18 to 20.

[0066] Forks of a forklift truck can be inserted, in the direction B in which drive-on paths 21

extend, into the space 87 between side wall parts 31, 33, 35, 37, 39, 41 and below upper deck part 55f and into the space 89 between side wall parts 43, 45, 47, 49, 51, 53 and below upper deck part 55e. Since lower deck 15 is open between side wall parts 31-41 and below upper deck part 55f and between side wall parts 43, 45, 47, 49, 51, 53 and below upper deck part 55e, the forks of a pallet truck can also be inserted into the spaces 87 and 89 in the direction B in which drive-on paths 21 extend.

[0067] A fork of a forklift truck can be inserted, in the direction A transversely of the direction B in which drive-on paths 21 extend, into passage 91 between lower deck 15 and upper deck 55 and the respective side wall part pairs 31 and 33, 33 and 37, 43 and 47, 45 and 49. A fork of a forklift truck can be inserted, in the direction A transversely of the direction B in which drive-on paths 21 extend, into passage 93 between lower deck 15 and upper deck 55 and the respective side wall part pairs 35 and 39, 37 and 41, 47 and 54, 49 and 53. The side wall parts extending mutually in line can alternatively be formed integrally and thus form a side wall without openings for the insertion of forks of a forklift truck. Passages 91 and 93 will then be omitted. The stiffness of pallet 5 in the direction B in which drive-on paths 21 extend is greater with such continuous side walls.

[0068] Side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53 are of metal. Lower deck parts 15a-15c and upper deck parts 55a-55f are of wood. The side wall parts can alternatively be of wood, or a number of the side wall parts can be of wood, for instance side wall parts 31, 35, 39, 45, 49 and 53 and the other side wall parts of metal, for instance side wall parts 33, 37, 41, 43, 47 and 51. It is also possible for the pallet to be wholly or partially of plastic, in particular reinforced plastic.

[0069] A partition 107 extending transversely of the direction B in which drive-on paths 21 extend is arranged between the side wall parts pair 37 and 47. This partition imparts stiffness to pallet 5 in the direction A transversely of the direction B in which drive-on paths 21 extend. Two carriers can then not be driven onto the pallet in the manner as shown in figures 7 to 15. The carriers must then be driven onto the pallet from opposite sides thereof. Partition 107 also forms a stop for a carrier driven onto the pallet.

[0070] Figures 21 to 24 show that a carrier 3 is driven in the direction of arrow C to a carrying position on pallet 5, wherein in figure 21 the front wheels 9a of carrier 3 are about to drive onto drive-on path 21a and wherein in figure 24 carrier 3 is located in the carrying position on pallet 5. As illustrated by means of the intervening figures 22 and 23, carrier 3 and pallet 5 are configured such that when carrier 3 travels over drive-on path 21a in the direction of the carrying position the carrier base 7 is clear of support surface 19a.

[0071] As soon as the carrier is driven from the situation as shown in figure 23 in the direction of arrow C, the rear wheel 9b moves onto the one end of drive-on path 21a and the front wheel 9a comes to lie in recess 23a at the other end of drive-on path 21a. The underside of carrier base 7 comes into contact here with support surface 19a of carrier support 17a, wherein carrier 3 moves into the carrying position as shown in figure 24. Carrier 3 and pallet 5 are

configured such that in the carrying position the front wheels 9a of carrier 3 extend in recesses 23a, while rear wheels 9b support on lower deck 15. Carrier support 17a carries a first part of the weight of carrier base 7 and the goods placed thereon. In the carrying position front wheels 9a no longer carry the weight of carrier base 7 and the goods positioned thereon, while rear wheels 9b carry a second part of the weight of carrier base 7 and the goods placed thereon.

[0072] By sliding the carrier 3 from the situation as shown in figure 24 over support surface 19a in the direction of arrow D, the front wheel 9a comes into contact with the chamfered edge 95 and, when further displaced in the direction of arrow D, moves onto drive-on path 21a so that the situation as shown in figure 23 results. Carrier base 7 here moves clear of support surface 19a. With still further displacement in the direction of arrow D the carrier 3 is driven off pallet 5.

[0073] Figure 25 shows the situation after a second carrier 3 has been driven from the situation shown in figure 24 from the opposite side of pallet 5 in the direction of arrow D onto pallet 5. As shown, the respective support surfaces 19a and 19b are embodied such that in the carrying position the two carriers 3 are positioned inclining away from each other, in the shown example at an angle α of about 1 degree relative to each other.

[0074] Figure 26 shows that the height h1 of upper deck parts 55b and 55c is greater than the height h2 of upper deck parts 55a and 55d. The height h3 of the non-elevated part of drive-on paths 21 on lower deck part 15b is also greater than the height h4 of the non-elevated part of drive-on paths 21 on lower deck parts 15a and 15c. As shown in figure 27, the result hereof is that two carriers 3 positioned adjacently of each other on pallet 5 transversely of the direction B in which the drive-on path extends are positioned inclining away from each other, in the shown example at an angle β of about 1 degree relative to each other.

[0075] Figure 28 shows that in the pallet 5 as shown in figures 18 to 20 the position of upper deck parts 55a, 55b, 55c and 55d and the position of lower deck parts 15a, 15b and 15c are adapted to each other such that, when two pallets 5 are stacked onto each other, upper deck parts 19a, 19b, 19c and 19d prevent pallets 5 displacing relative to each other in the direction of arrows A. This results in a firm stack of pallets 5.

[0076] Figures 29 and 30 show an alternative embodiment of the transport assembly as shown in figures 1 to 15.

[0077] The embodiment as shown in figures 29 and 30 differs from the embodiment as shown in figures 1 to 15 in that lower deck parts 15a, 15b and 15c of pallet 5 are embodied by U-profile beams 116a, 116b, 116c, 116d.

[0078] The U-profile beams are of metal and are connected via plastic profile beams 118a-g of rectangular section to side wall parts 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53,55, preferably by means of bolt/nut combinations (not shown. The two U-profile beams 116b and 116c are mutually connected via plastic profile beam 118d. The two outer U-profile beams

116a and 116d are connected via plastic profile beams 118a and 118g to a pallet guide wall 120. This pallet guide wall 120 serves to guide the pallet during placing thereof in for instance a rack or during transport thereof on a conveyor belt. The guide wall preferably extends from the corners of the pallet along only a part of the length of the pallet.

[0079] As shown, the plastic profile beams 118a-g protrude downward beyond the U-profile beams 116a-d so that in use the pallet rests with the plastic profile beams 118a-g on a ground surface on which it is positioned. Recesses 23a and 23b are arranged in U-profile beams 116a and 116b, recesses 23c and 23d in U-profile beams 116c and 116d. In the embodiment of figures 1 to 15 the recesses 23 on the corners of the pallet are only bounded on two sides. In the embodiment of figures 29 and 30 the recesses 23 on the corners of the pallet are bounded on four sides, i.e. enclosed by the relevant U-profile beam.

[0080] From the situation as shown in figure 30 carriers 3 can be driven onto the pallet in the same way as shown in figures 9 to 15.

[0081] In addition, two guide walls extending toward each other can be provided on the free ends of the legs of the U of the U-profile beam. The profile beam then acquires the cross-sectional form of a C. Such a profile beam is therefore also referred to as a C-profile beam. The guide beams extending toward each other guide the wheels of the carrier during driving of carrier 3 onto the pallet so that the wheels remain clear of for instance bolts and nuts with which the profile beams are attached to the side walls and the pallet guide wall.

[0082] In figures 31 and 32 the transport assembly of figures 29 and 30 is shown in combination with an auxiliary device 120. Auxiliary device 120 comprises four strips 122a-d arranged on ground surface 11. Strips 122 are each provided with upward protruding members 124, each extending in one of the recesses 23. These members 124 help to bridge the recesses during driving of carrier 3 onto the pallet. The members preferably extend partially into the recesses so that the recesses are not wholly filled in vertical direction by the members. When the carrier is driven onto the pallet, the person driving the carrier onto the pallet will then notice that a recess is being passed over. As shown, strips 122 fit into the spaces between the plastic profile beams 118 so that the pallet supports stably on strips 122 and plastic profile beams 188.

[0083] Embodiments are shown in the foregoing wherein in the carrying position of the carrier four wheels extend in recesses and an embodiment wherein two wheels extend in recesses. It is also possible for only one wheel to extend in a recess or for three wheels to extend in recesses.

[0084] The present invention is not limited to the above described preferred embodiments. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

Patentkrav

1. Transportanlæg (1), som omfatter mindst en transportindretning (3) og en hertil hørende palle (5), hvilken transportindretning (3) omfatter en transportindretningsbasisdel (7) og et antal herpå anbragte hjul (9), og hvor pallen (5) omfatter:

- et nedre dæk (15); og
- mindst en transportindretningsunderstøtning (17), som rager op fra det nedre dæk (15), og som fastlægger en bæreflade (19) til bæring af transportindretningen (3), når sidstnævnte er anbragt i en transportstilling i forhold til transportindretningsunderstøtningen (17), og hvor transportindretningen, når denne befinder sig i transportstilling, kan løftes ved hjælp af pallen (5);

og hvor

- det nedre dæk (15) har mindst en udtagning (23), hvori et hjul (9) i transportindretningen (3) strækker sig i transportindretningens (3) transportstilling;

kendetegnet ved,

- at det på hver side af transportindretningsunderstøtningen (17) gælder, at det nedre dæk (15) danner en kørebane (21), der tjener til at tillade, at transportindretningen (3) kan køres hen over det nedre dæk (15) og hen i transportstilling; og

hvor

- transportanlægget (1) er således udformet, at for at transportindretningen (3) kan bevæges hen i transportstilling, transportindretningen (3) kan drives hen over kørebanen (21), idet transportindretningsbasisdelen (7) går fri af bærefladen (19), og at hjulet (9) - når det befinder sig i bærestilling - er løbet

ind i en udtagning (23), så at transportindretningsbasisdelen (7) på transportindretningen (3) er bragt i berøring med bærefladen (19).

2. Transportanlæg (1) ifølge krav 1, hvor det nedre dæk (15) er forsynet med udtagninger (23), så at hvert hjul (9) på transportindretningen (3) kan strække sig ind i den respektive udtagning (23) i transportindretningens transportstilling.

3. Transportanlæg (1) ifølge krav 2, hvor transportindretningsunderstøtningen (17) i den bærende stilling bærer transportindretningen.

4. Transportanlæg (1) ifølge krav 1, hvor det nedre dæk (15) er forsynet med udtagningen, så at det i transportindretningens (3) transportstilling gælder, at kun hjulene (9) på den ene side af transportindretningsbasisdelen (7) befinder sig i en respektiv udtagning (23), og at det fortrinsvis i hjulenes (9) transportstilling gælder, at hjulene (9) - på hver side af transportindretningsunderstøtningen (17) på den side af transportindretningsbasisdelen (7), som set i køreretningen befinder sig længst væk fra palettens (5) rand - strækker sig i en respektiv udtagning (23).

5. Transportanlæg (1) ifølge ethvert af de foregående krav, hvor udtagningen (23) er et gennemgående hul, hvor fortrinsvis transportanlægget (1) også omfatter en hjælpeindretning (120), hvorpå pallen (5) kan positioneres, og hvor hjælpeindretningen (120) omfatter en opad ragende del (124), som i det mindste strækker sig ind i det gennemgående hul (23), når pallen (5) er anbragt på hjælpeindretningen (120).

6. Transportanlæg (1) ifølge ethvert af de foregående krav, hvor det, når transportindretningen er anbragt i transportstilling, gælder, at et hjul (9), som strækker sig i en udtagning (23), befinder sig ved en kant (95) af udtagningen (23), set i den retning (B), hvori køresporet strækker sig, og fortrinsvis er i berøring med den relevante kant (95), som fortrinsvis er affaset.

7. Transportanlæg (1) ifølge ethvert af de foregående krav, hvor køresporet strækker sig langs kanten af pallen i den retning (B), hvori køresporet strækker sig og hinsides bærefladen (19).

8. Transportanlæg (1) ifølge ethvert af de foregående krav, hvor pallen (5) i det retning (B), hvori køresporet forløber, omfatter et antal transportindretningsunderstøtninger (17a, 17b; 17c, 17d), som rager opad fra det nedre dæk (15), og som fastlægger en bæreflade (19a, 19b; 19c, 19d) til understøtning af transportindretningsbasisdelen (7) på en respektiv transportindretning (3), og hvor det nedre dæk (15) på hver side af hver transportindretningsunderstøtning (17a, 17b; 17c, 17d) fastlægger en kørespor-bane (21a, 12b; 21c, 21d), og hvor de respektive transportindretningsunderstøtninger (17) og kørespor-baner indbyrdes strækker sig på linje, og at fortrinsvis de respektive bæreflader (19a, 19b; 19c, 19d) er således udformet, at det i bærestillingen gælder, at to transportindretninger (3, 3b), som er anbragt ved siden af hinanden - i retningen (B), hvor køresporet (21) forløber - er således anbragt, at de hælder (α) bort fra hinanden.

9. Transportanlæg (1) ifølge ethvert af de foregående krav, hvor pallen (5) omfatter et antal tvangsindretningsunderstøtninger (17a, 17c; 17b, 17d), som strækker sig på tværs (A) af den retning (B), i hvilken køresporet (21) strækker sig, og rager opad fra det nedre dæk (15), og hver fastlægger en bæreflade (19a, 10c; 19b, 19d) til understøtning af transportindretningsbasisdelen (7) hørende til den respektive transportindretning (3), og hvor det nedre dæk (15) fastlægger et kørespor (21a, 21c; 21b, 21c) på hver side af hver transportindretningsunderstøtning (17a, 17c; 17b, 17d), og hvor de respektive transportindretningsunderstøtninger og kørespor strækker sig parallelt med hinanden, og hvor fortrinsvis de respektive kørespor (21a, 21c; 21b, 21d) og bæreflader (19a, 19c; 19b, 19d) er således udformet, at to transportindretninger (3), som er anbragt ved siden af hinanden på tværs (A) af den retning (B), hvori køresporet (21a, 21c; 21b, 21d) forløber - er anbragt, så at de hælder (β) bort fra hinanden.

10. Transportanlæg (1) ifølge ethvert af de foregående krav, hvor transportindretningsunderstøtningen (17a, 17b; 17c, 17d) omfatter:

- to sidevægge (31, 35, 39; 33, 37, 41; 43, 47, 51; 45, 49, 53), som rager opad fra det nedre dæk (15), hvilke sidevægge er forskudt (a) i forhold til hinanden i retningen (A) på tværs af den retning (B), hvori køresporet strækker sig langs køresporet; og
- en øvre dækdel (55), som forløber parallelt med det nedre dæk (15) nær ved enderne af sidevæggene og fjernt fra det nedre dæk (15),

og hvor fortrinsvis det nedre dæk (15) er åbent mellem sidevæggene i transportindretningsunderstøtningen (17).

11. Transportanlæg ifølge krav 10, hvor sidevæggene i transportindretningsunderstøtningen (17) er delvis åbne.

12. Transportanlæg ifølge krav 10 eller 11, hvor den øvre dækdel (55) fastlægger bærefladen (19).

13. Transportanlæg ifølge ethvert af kravene 10 til 12, hvor sidevæggene (31, 35, 39; 33, 37, 41; 43, 47, 51; 45, 49, 53) er af metal.

14. Transportanlæg ifølge ethvert af kravene 10 til 13, hvor det nedre dæk (15) er tildannet ved hjælp af U-profilbjælker (116) eller C-profilbjælker, fortrinsvis af metal, forbundet med sidevæggene (31, 35, 39; 33, 37, 41; 43, 47, 51; 45, 49, 53), og hvor fortrinsvis U-profilbjælkerne (116) eller C-profilbjælkerne er forbundet med sidevæggene ved hjælp af plastbjælker, og hvor plastbjælkerne (118) strækker sig hinsides U-profilbjælkerne (116) eller C-profilbjælkerne i retning bort fra den øvre dækdel (55).

DRAWINGS

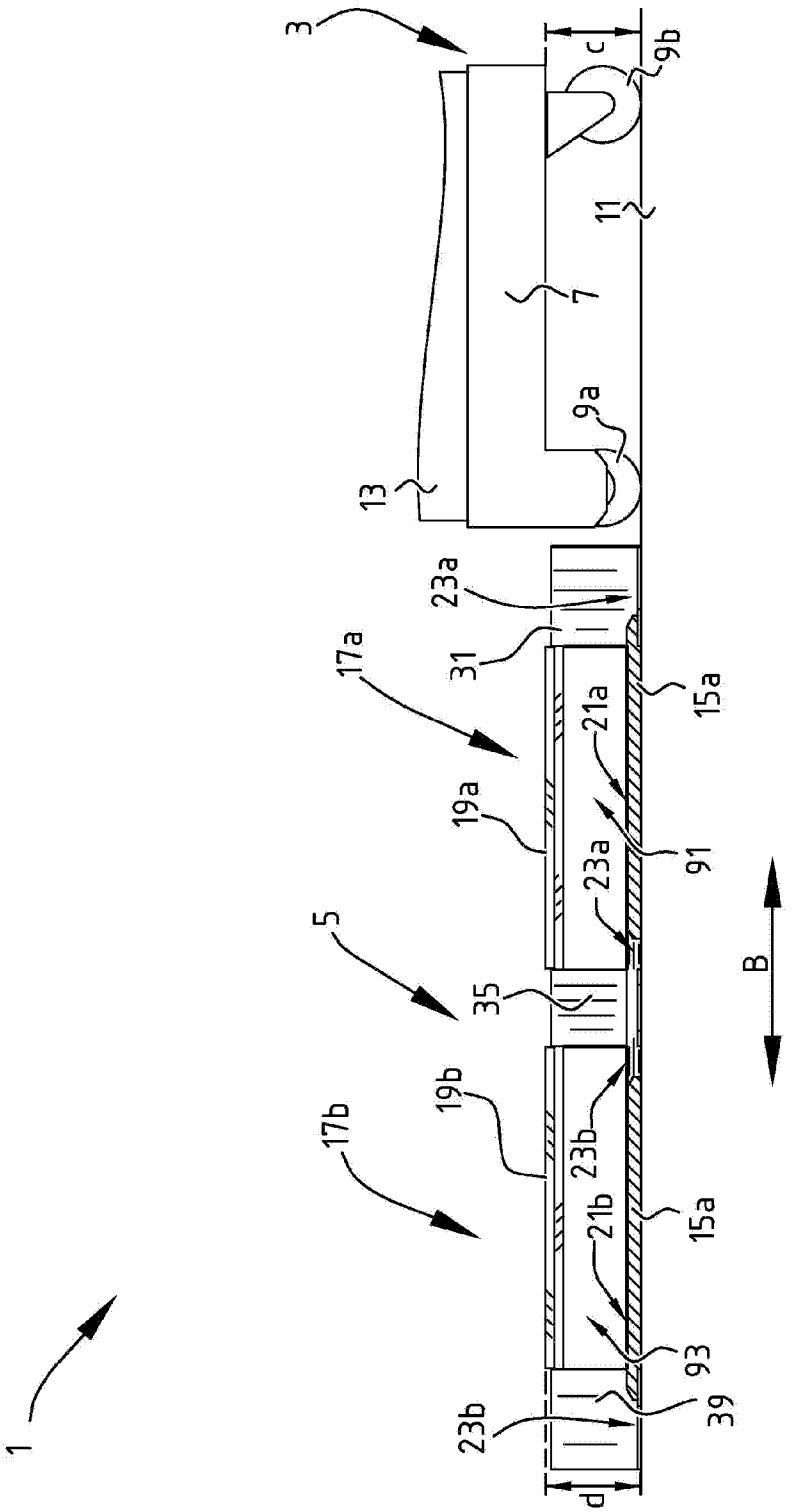


FIG. 1

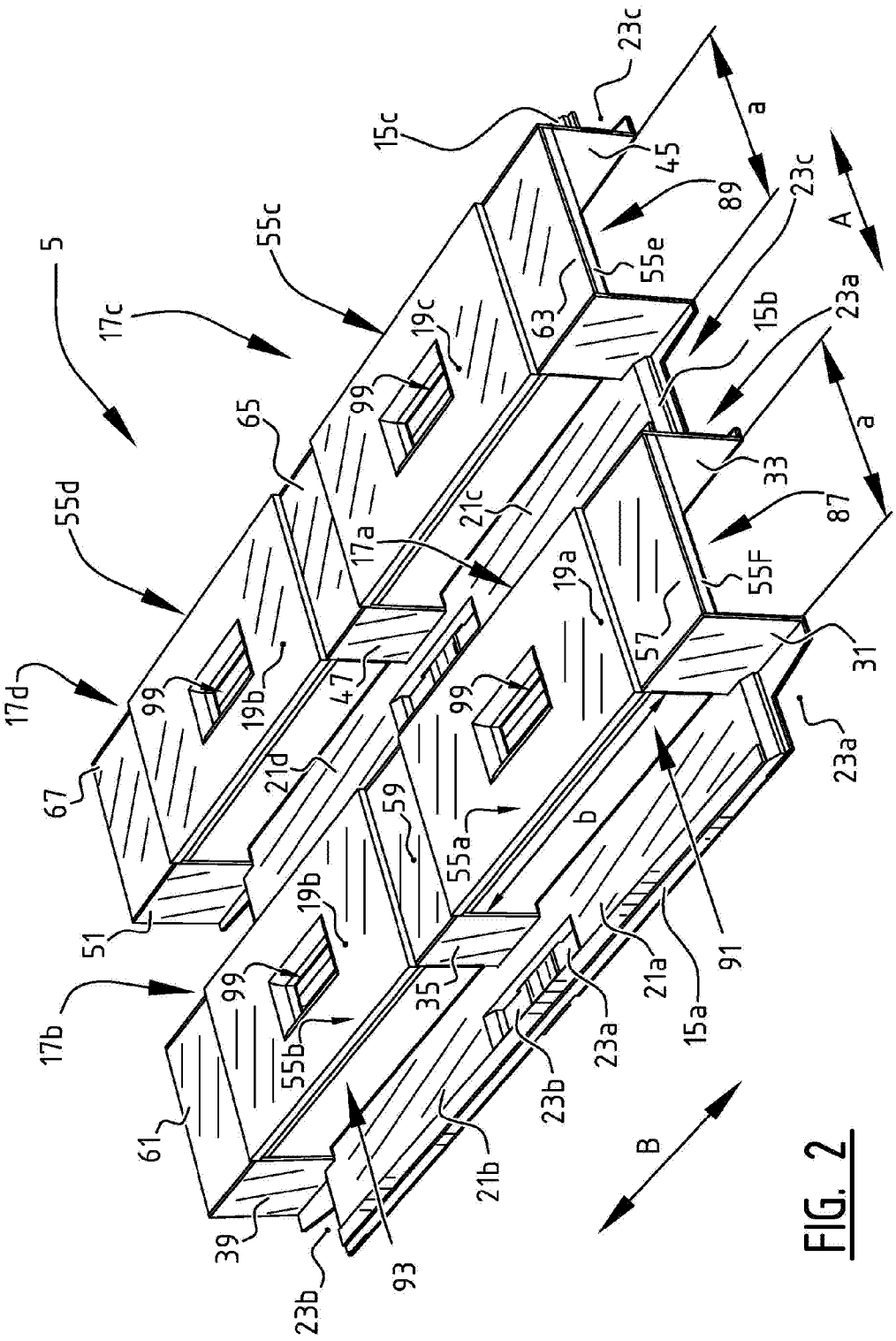

5
17c
55c
15c
23c
45
89
a
A
55e
63
19c
99
65
15b
23a
55d
17a
21c
33
87
55F
19a
57
31
17d
67
99
19b
47
21d
59
55a
b
23a
51
19b
99
35
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55b
61
39
23b
93
21b
23b
23a
21a
15a
91
B

FIG. 2

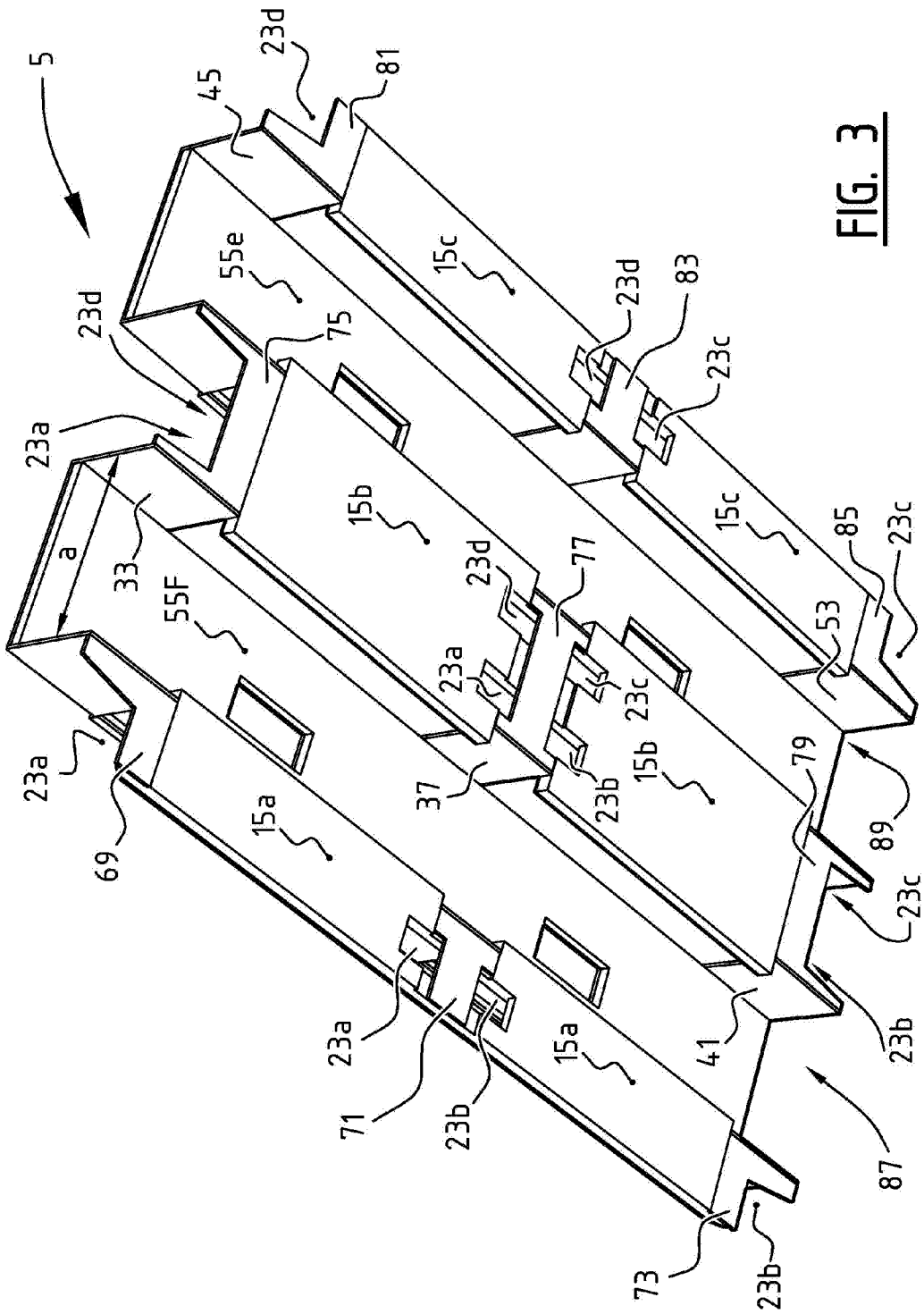

5
45
23d
81
55e
75
23d
15c
83
23c
23a
a
33
55F
15b
23d
77
15c
85
23c
53
23a
23a
23c
15b
79
69
15a
37
23b
89
23c
23a
15a
41
23b
71
23b
87
73
23b

FIG. 3

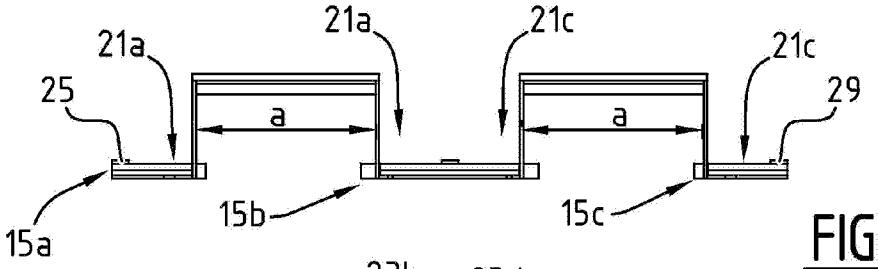

21a
21a
21c
21c
25
29
a
a
15a
15b
15c

FIG. 5

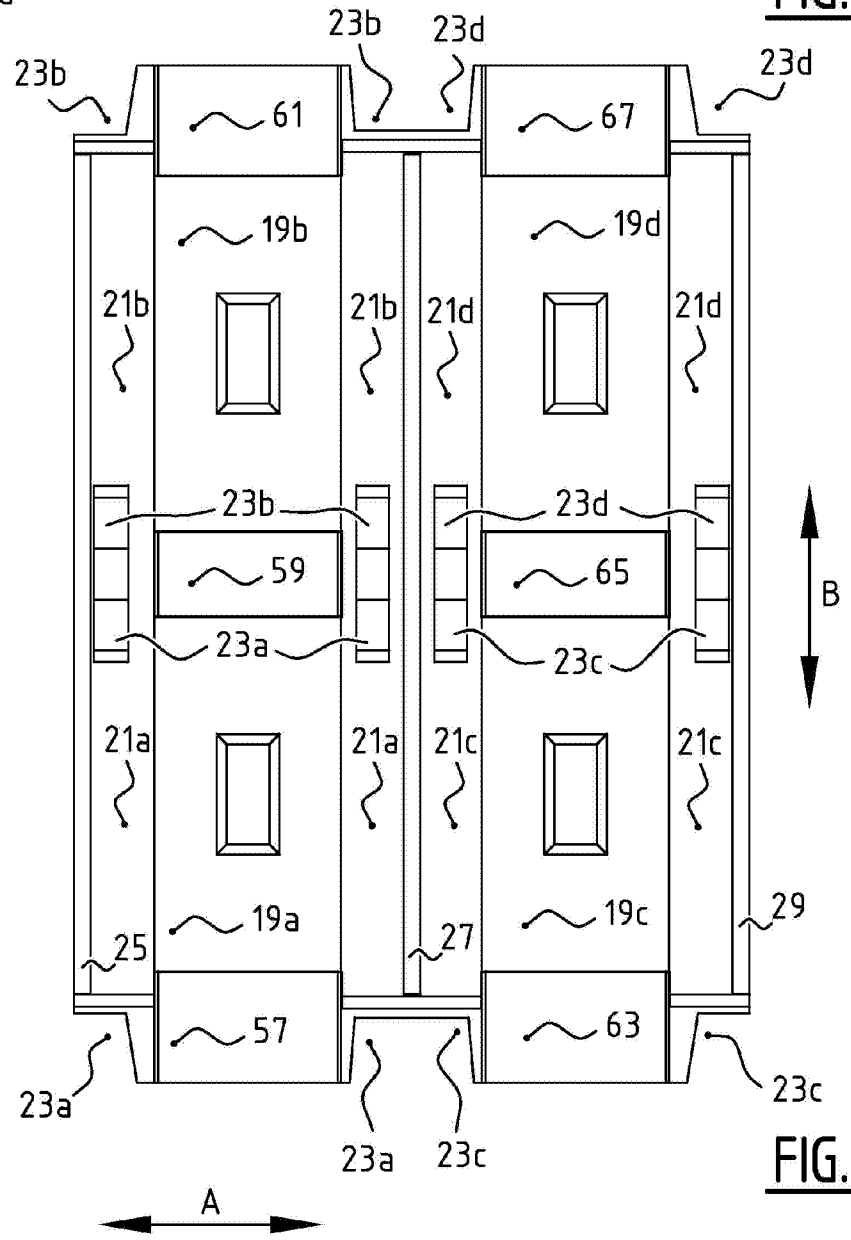

23b
23d
23b
23d
61
67
19b
19d
21b
21b
21d
21d
23b
23d
59
65
23a
23c
B
21a
21a
21c
21c
19a
19c
29
25
27
57
63
23a
23c
23a
23c
A

FIG. 4

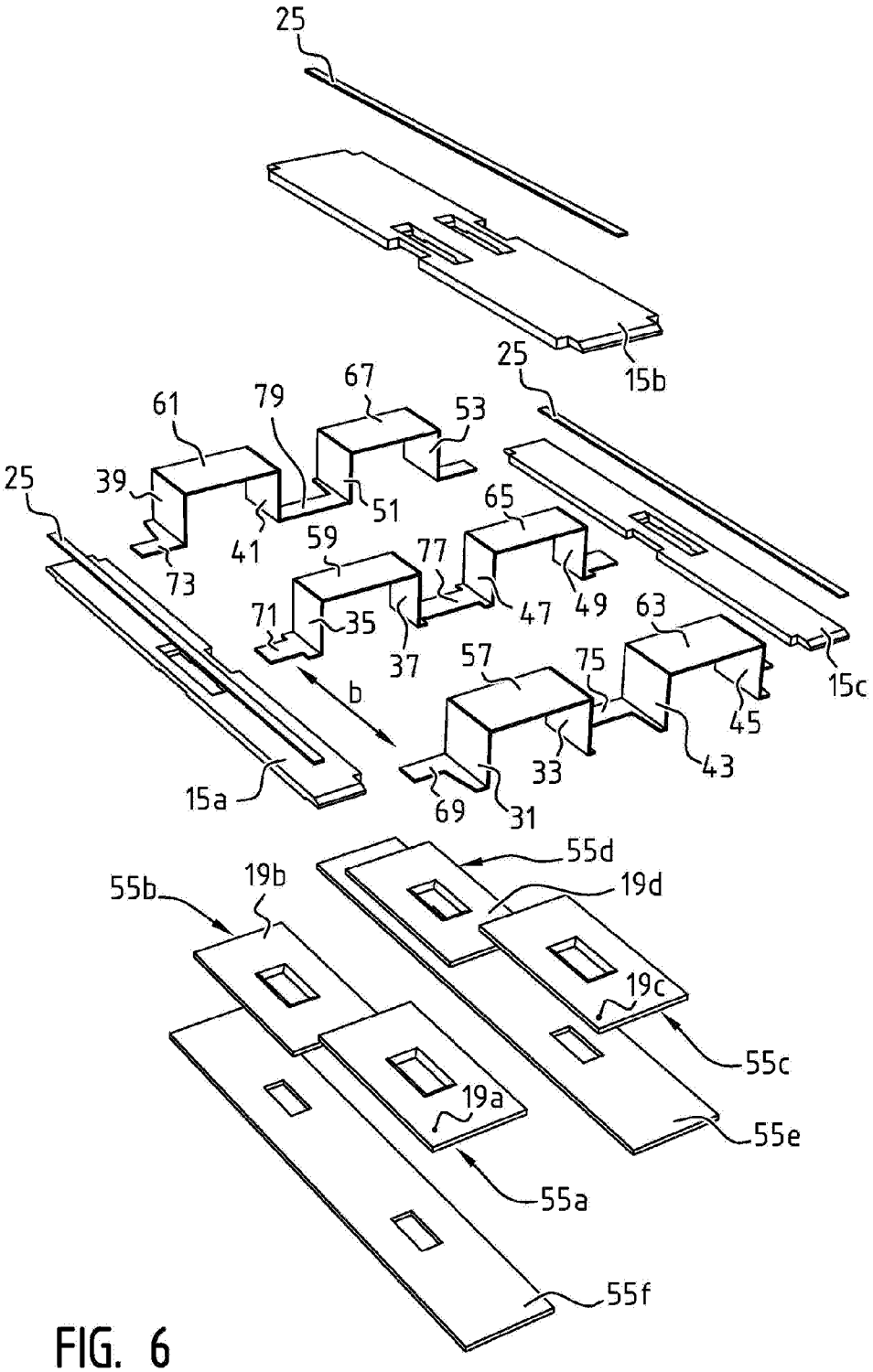

25
15b
25
61
79
67
53
39
51
65
41
59
77
73
47
49
63
71
35
37
57
75
15c
b
45
43
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55b
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19a
55e
55a
55f

FIG. 6

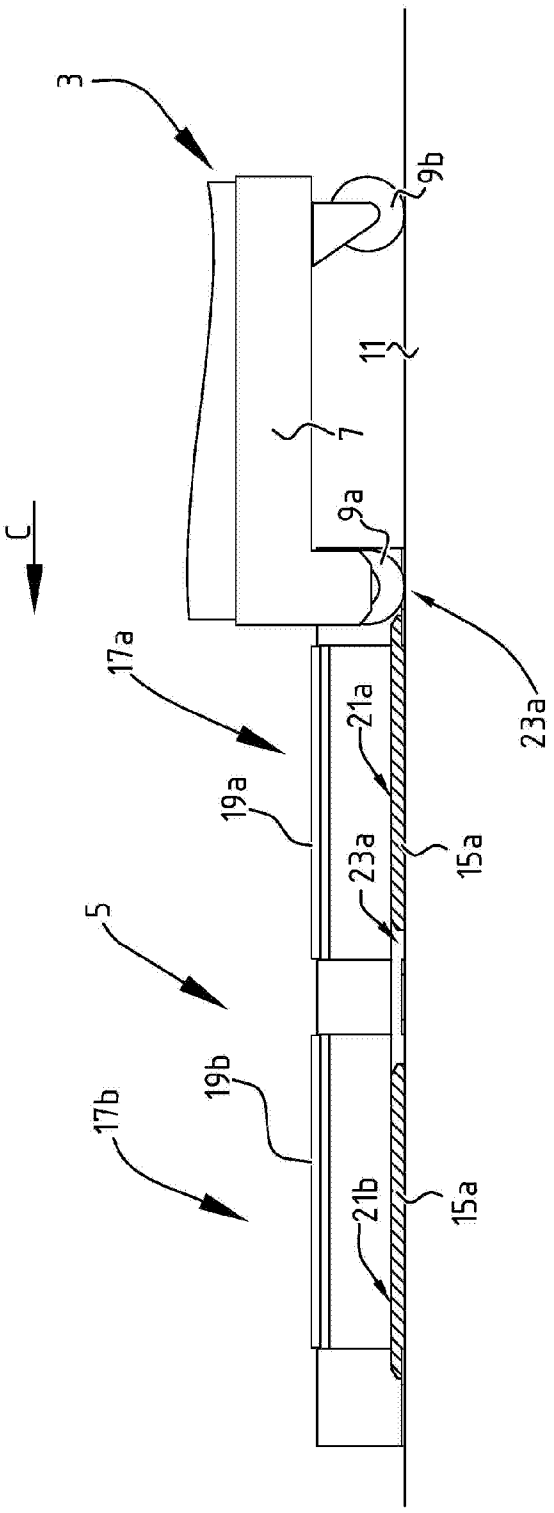


FIG. 7

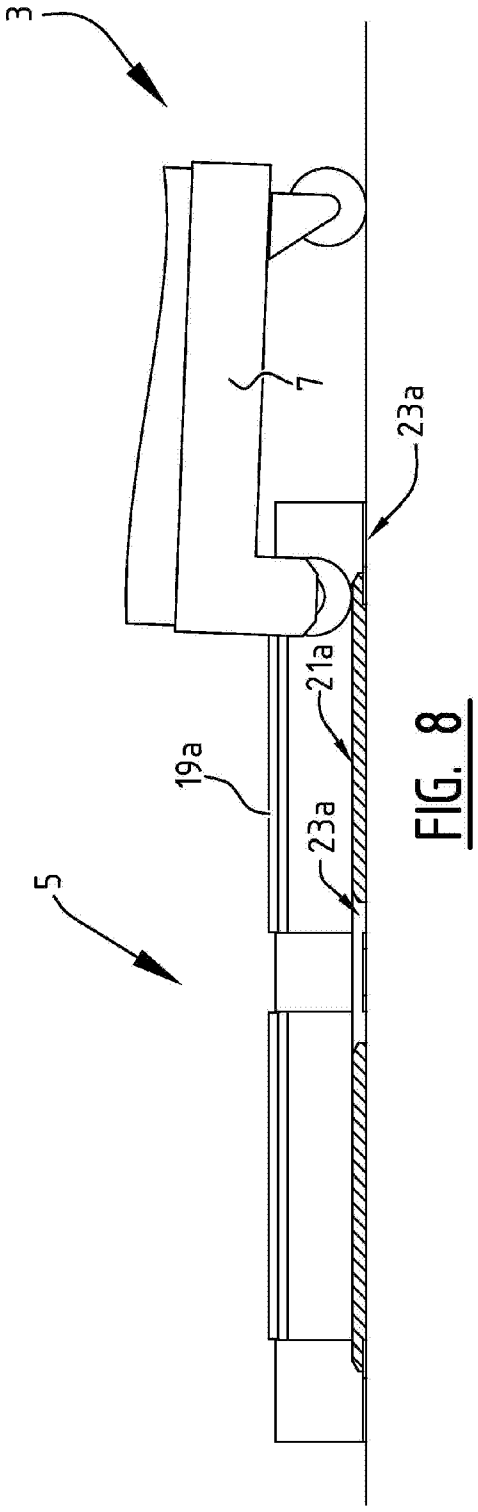


FIG. 8

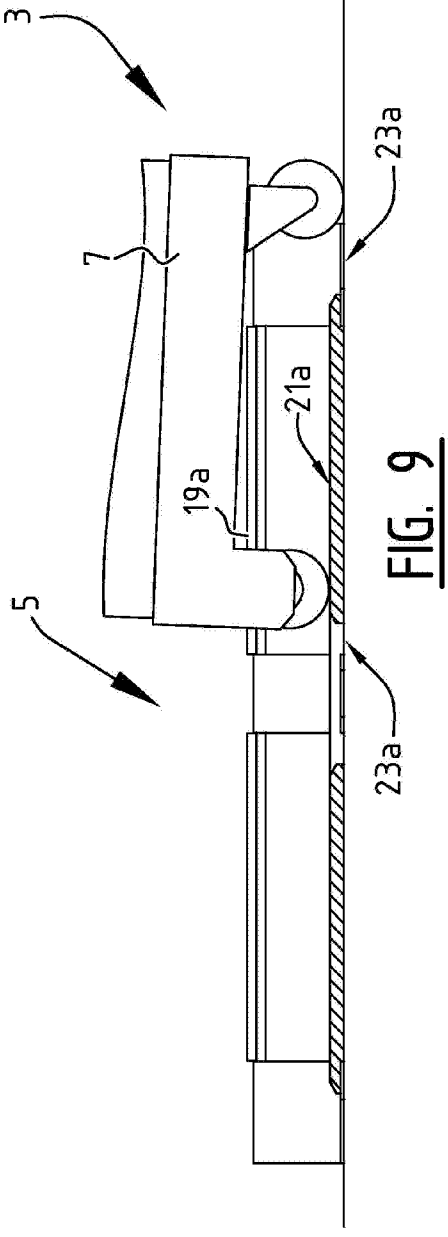


FIG. 9

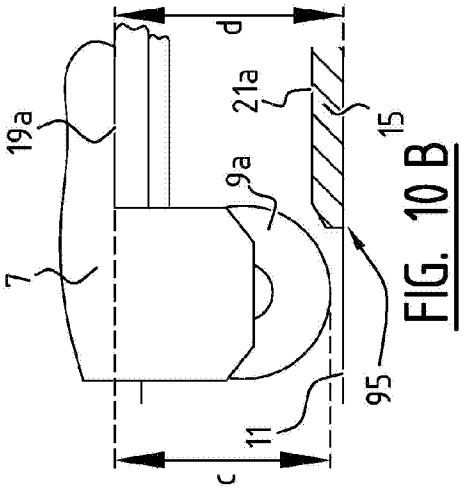


FIG. 10 B

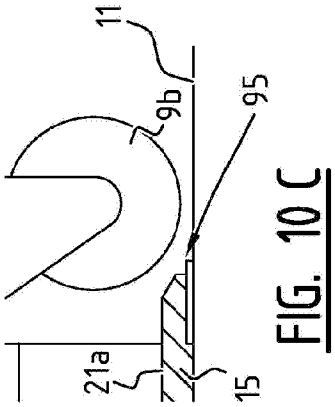


FIG. 10 C

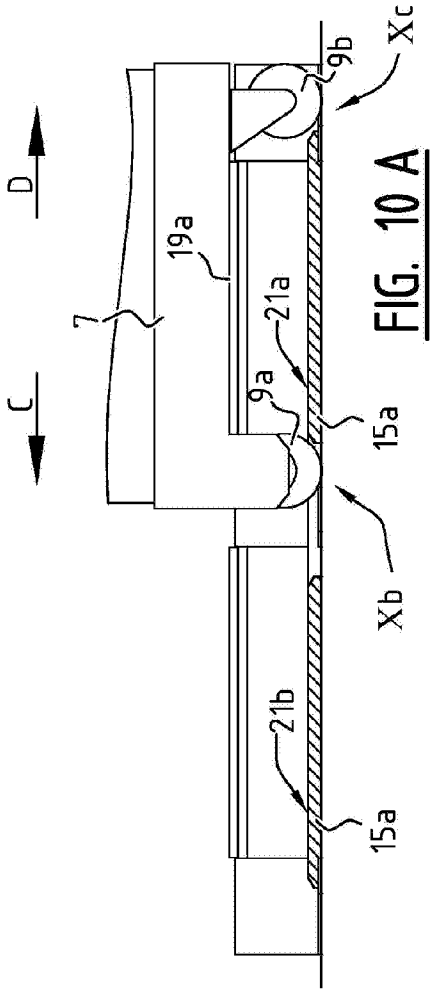


FIG. 10 A

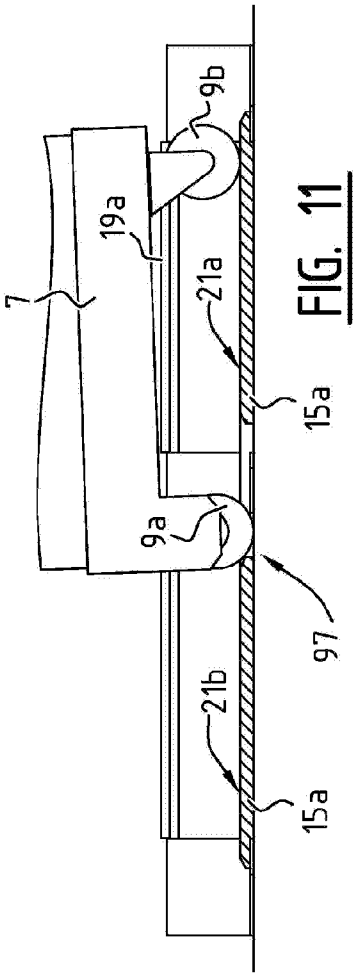


FIG. 11

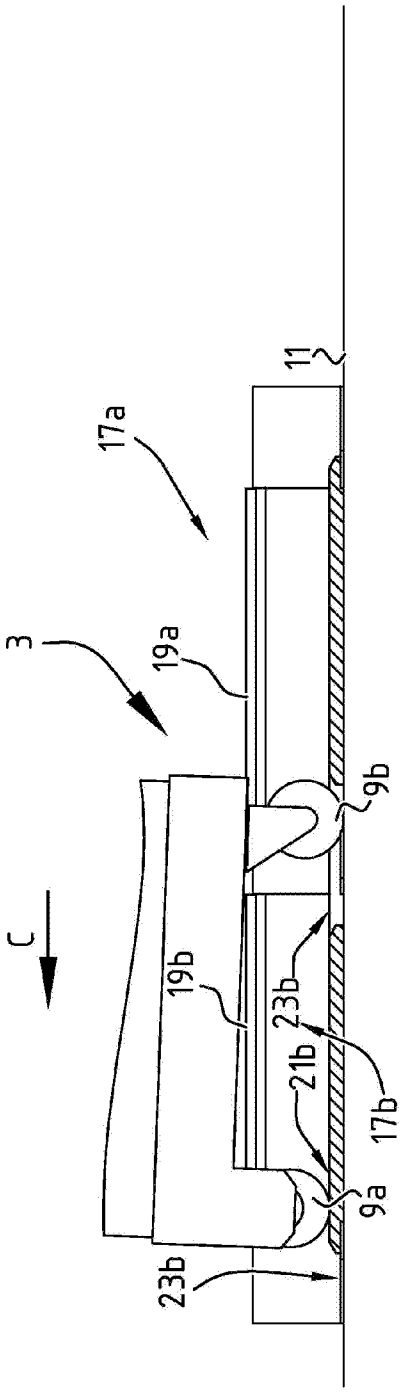


FIG. 12

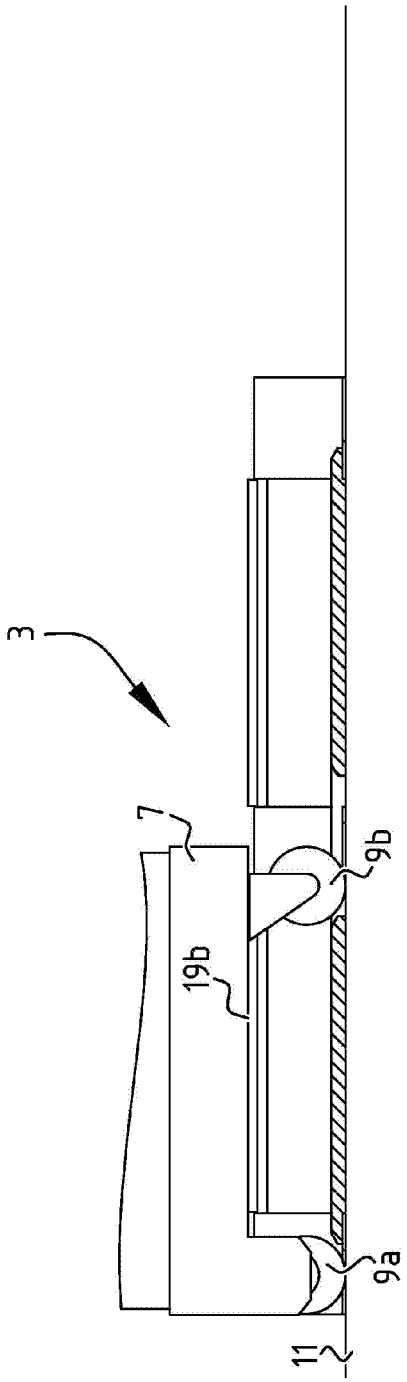


FIG. 13

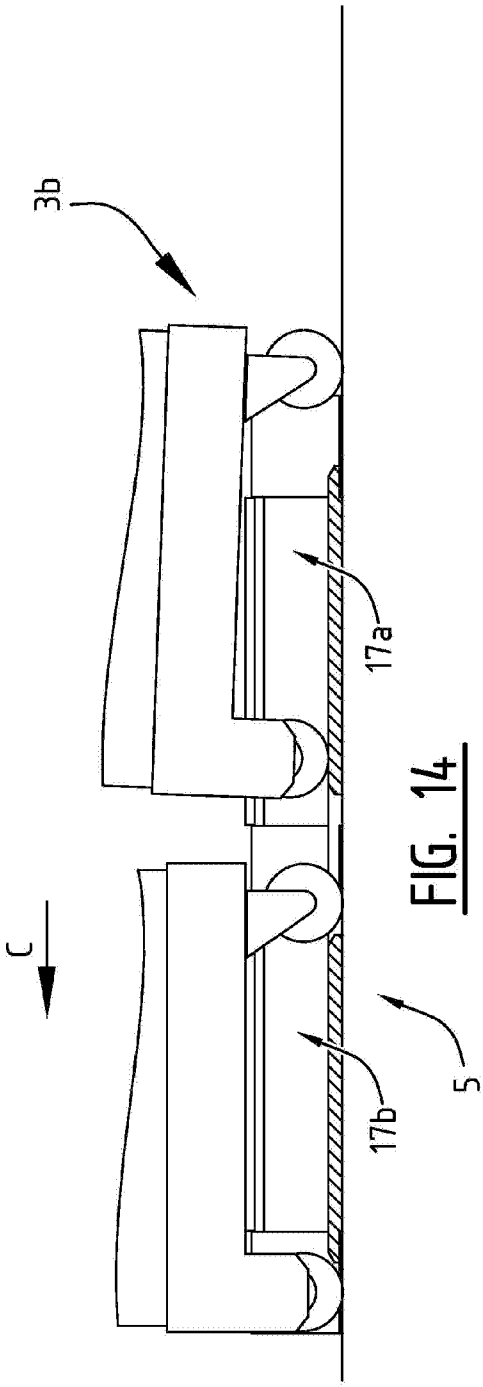


FIG. 14

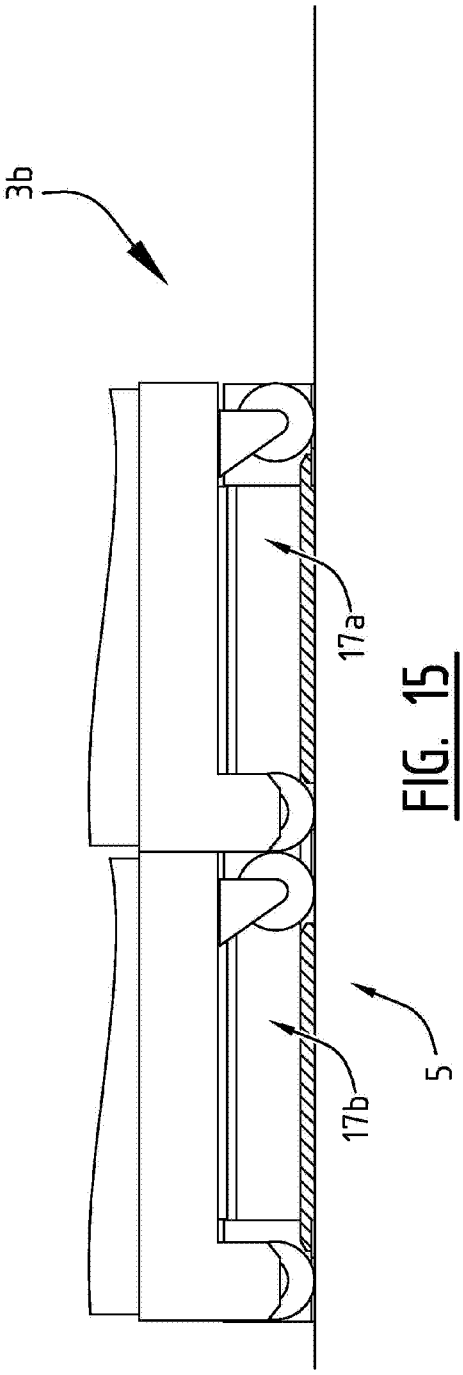


FIG. 15

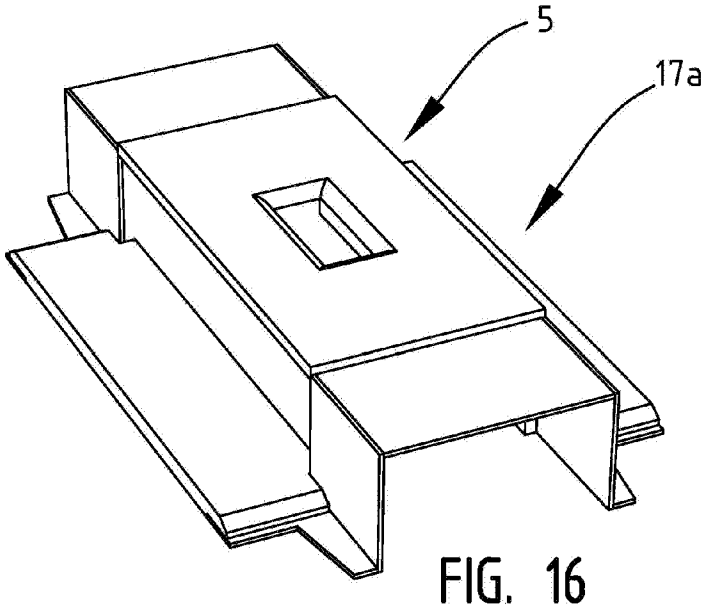


FIG. 16

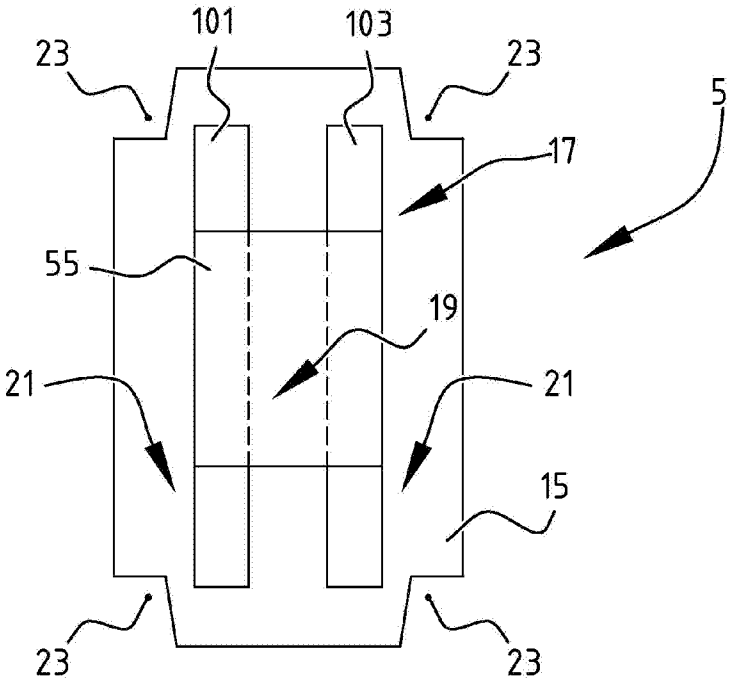


FIG. 17

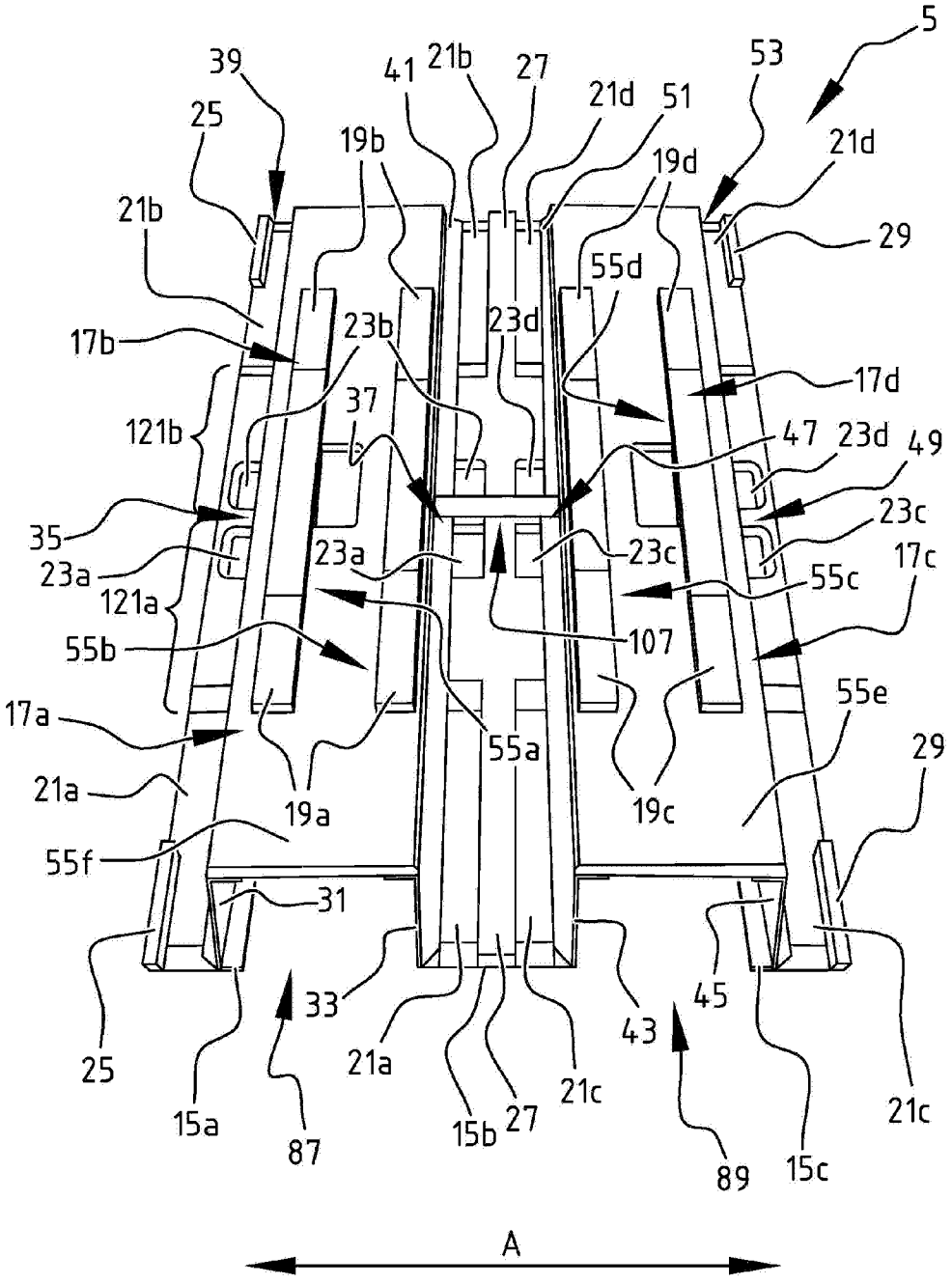

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41
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19b
19d
21d
21b
29
55d
23b
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17d
37
121b
47
23d
49
35
23c
23a
23a
23c
17c
121a
55c
55b
107
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55e
55a
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21a
19a
19c
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21c
21c
15a
87
15b
27
89
15c
A

FIG. 18

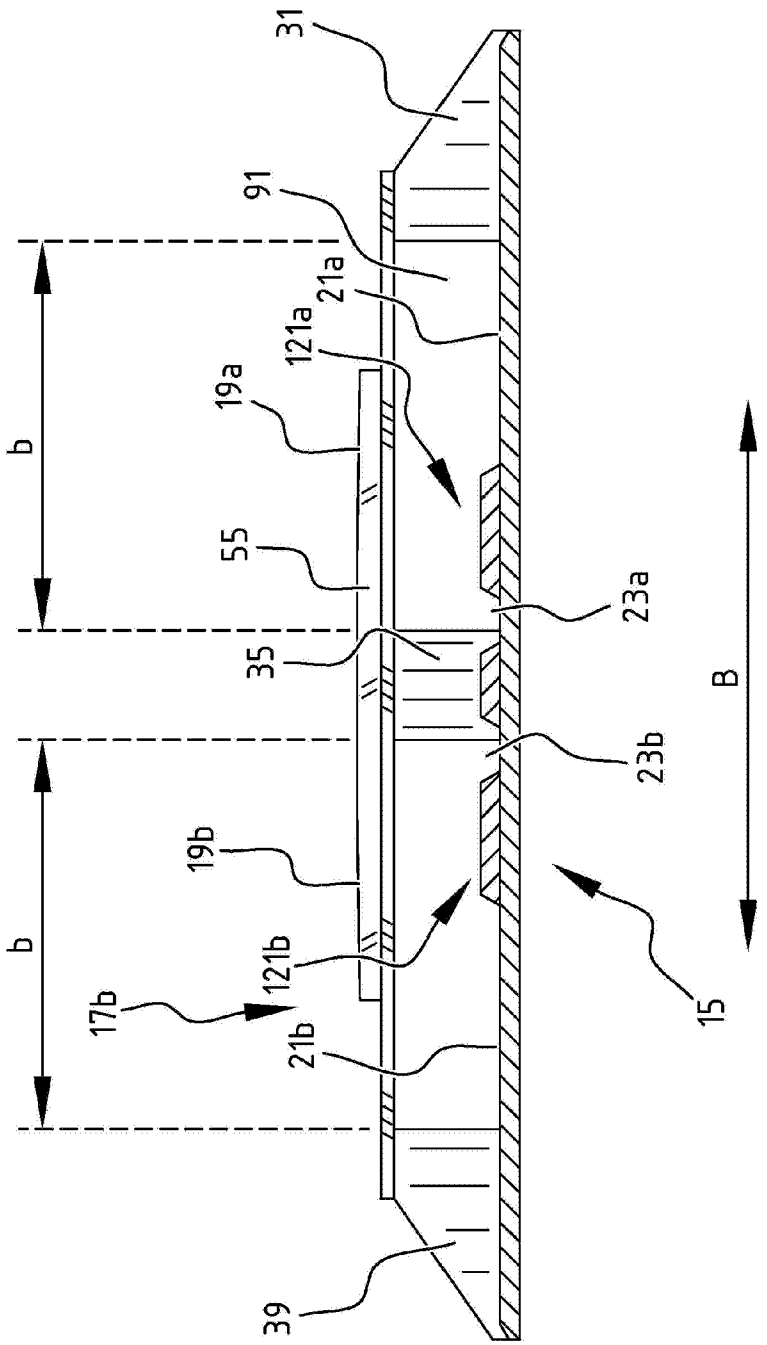


FIG. 19

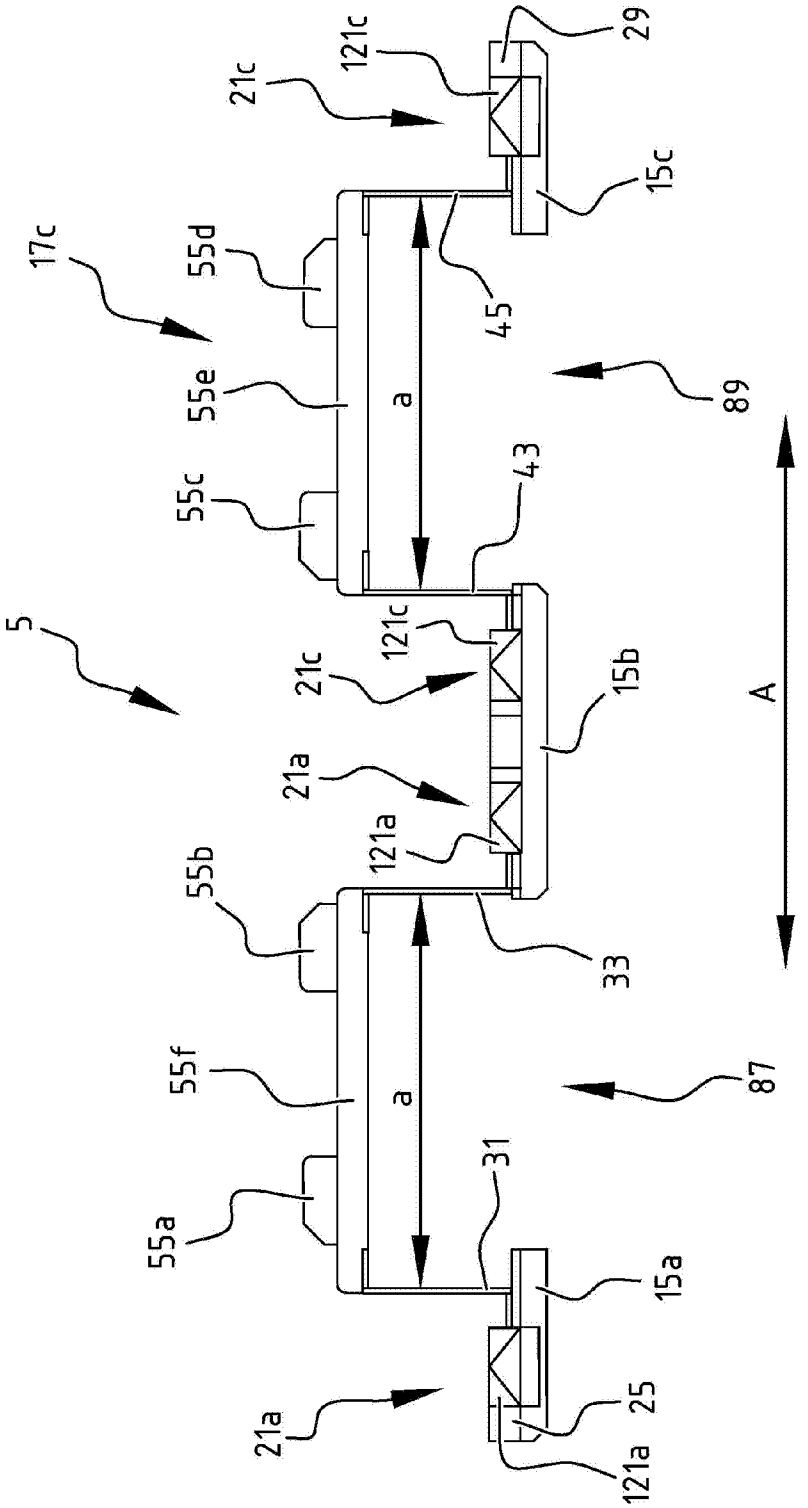

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55c
55b
55f
55a
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121c
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15c
45
89
43
15b
A
21a
121a
33
87
31
15a
25

FIG. 20

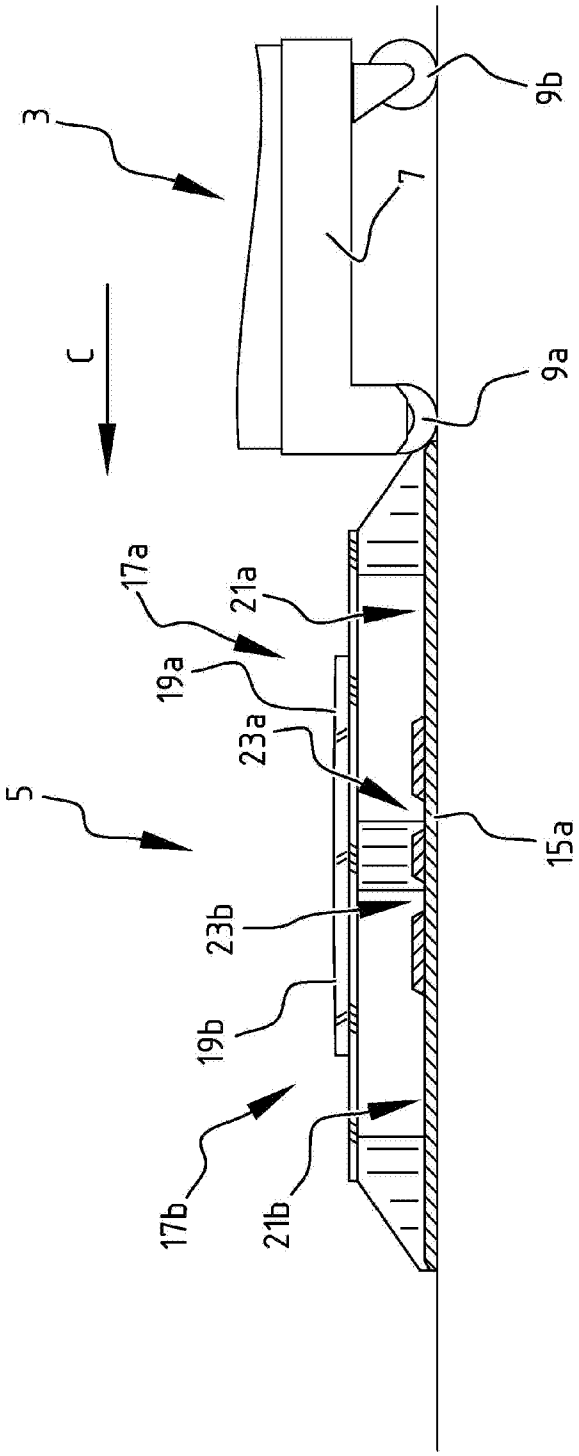


FIG. 21

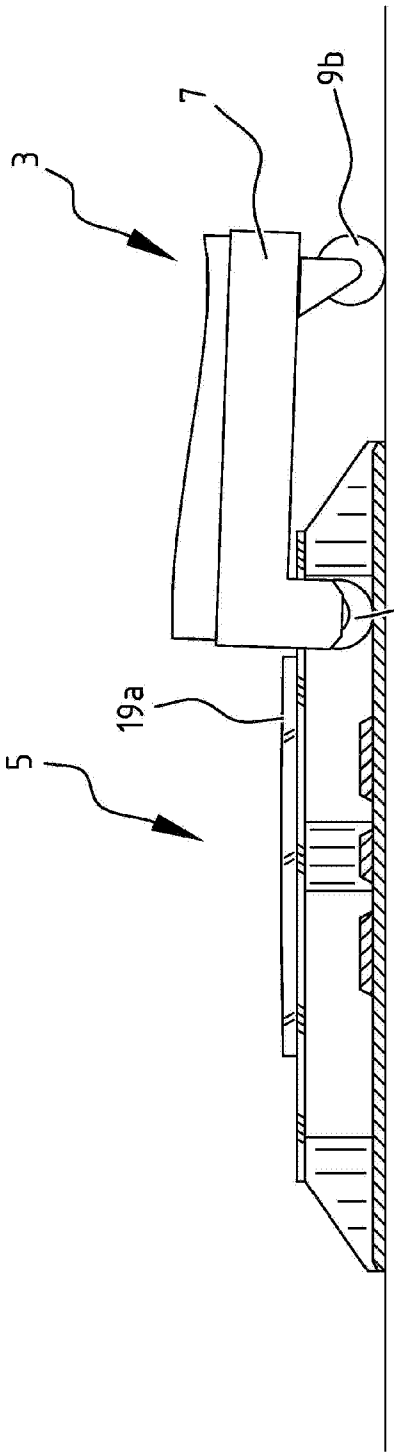


FIG. 22

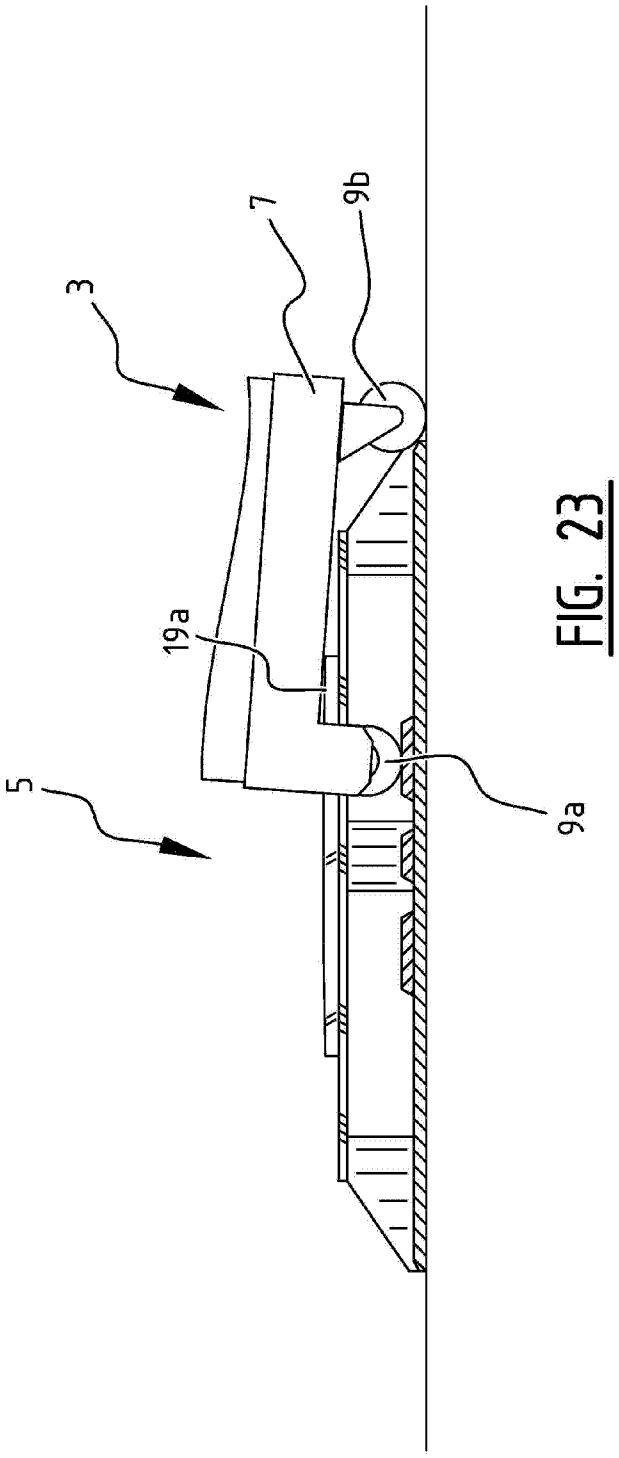


FIG. 23

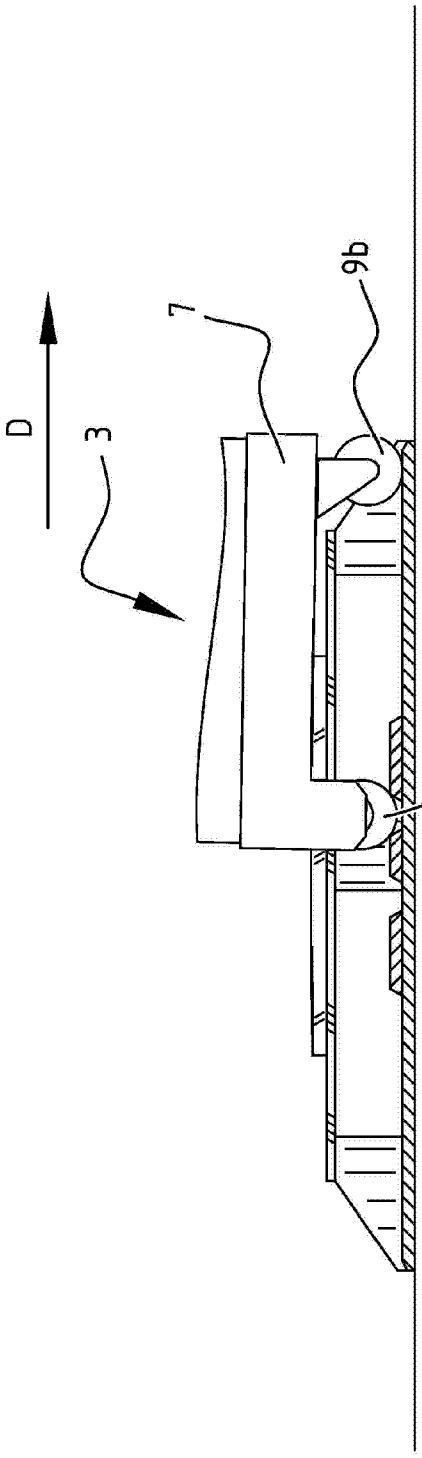


FIG. 24

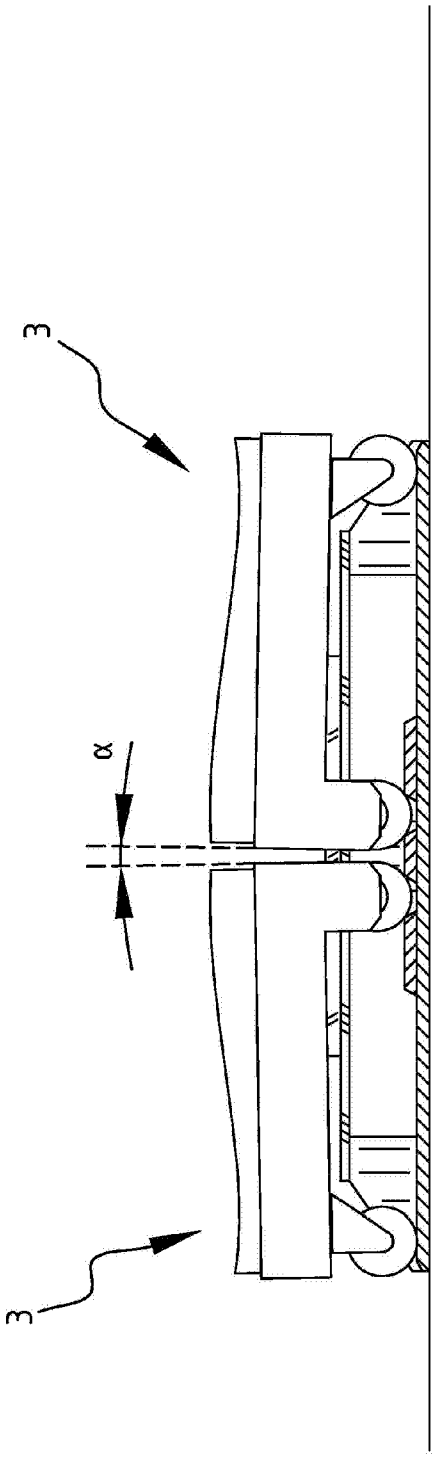


FIG. 25

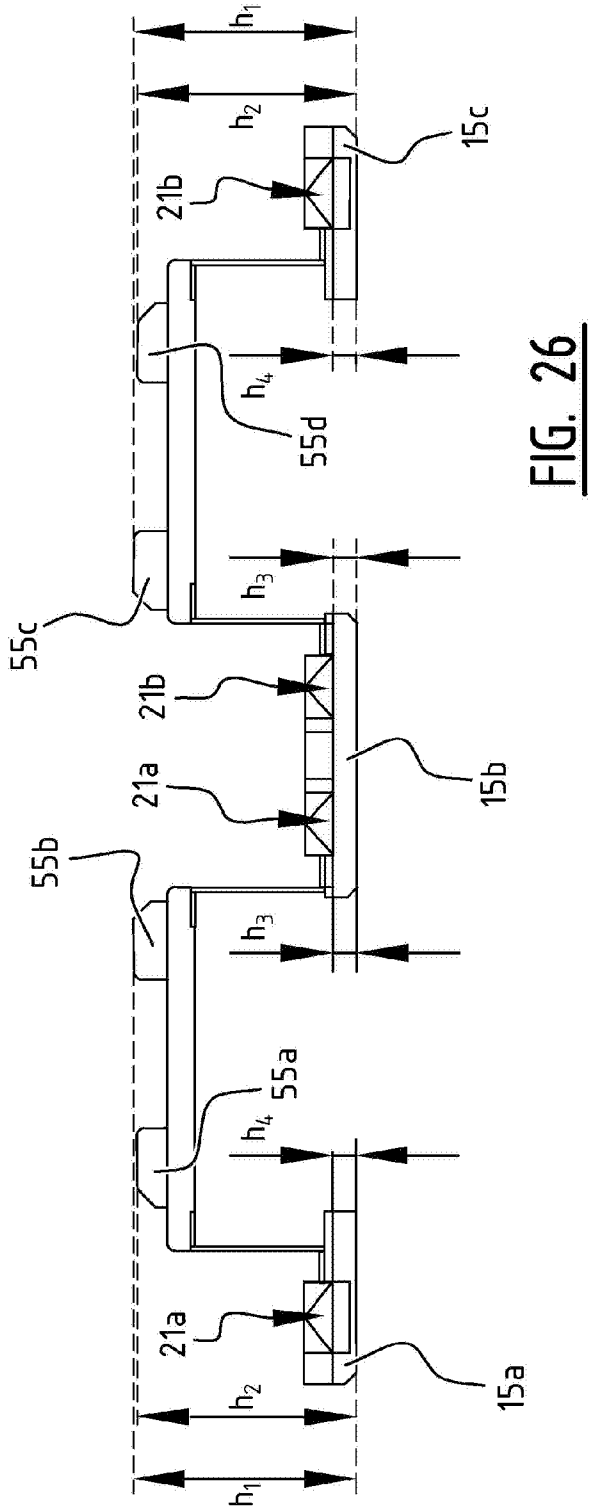


FIG. 26

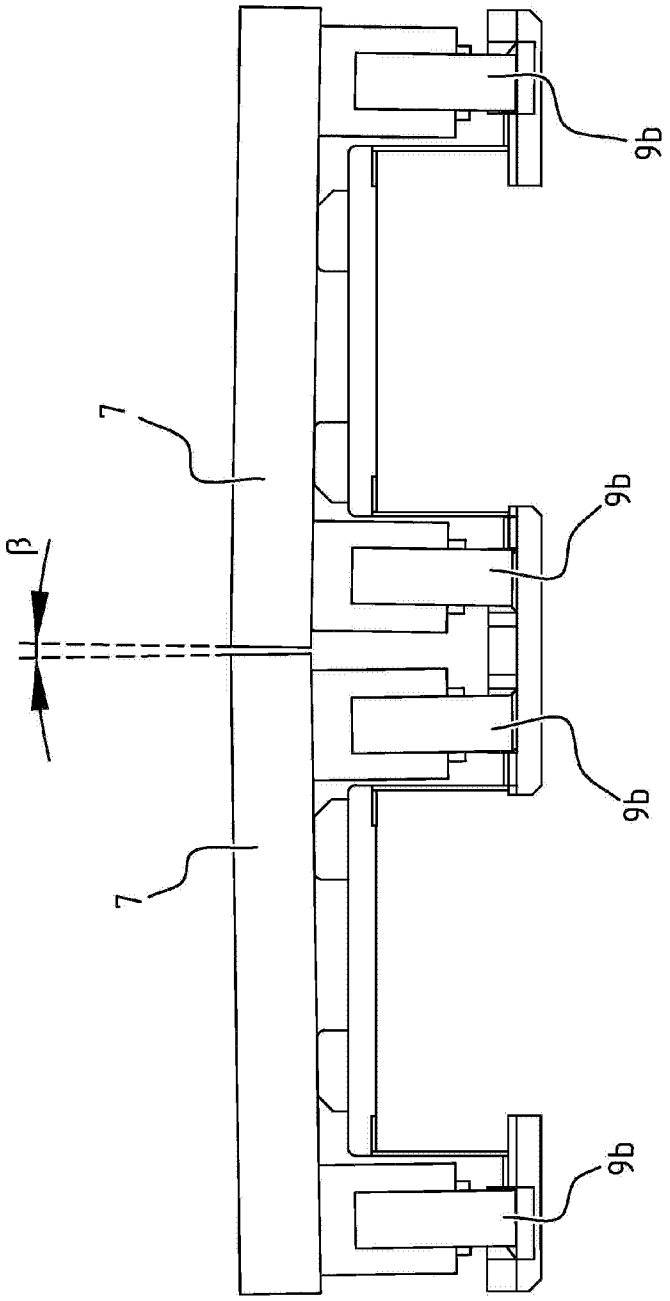


FIG. 27

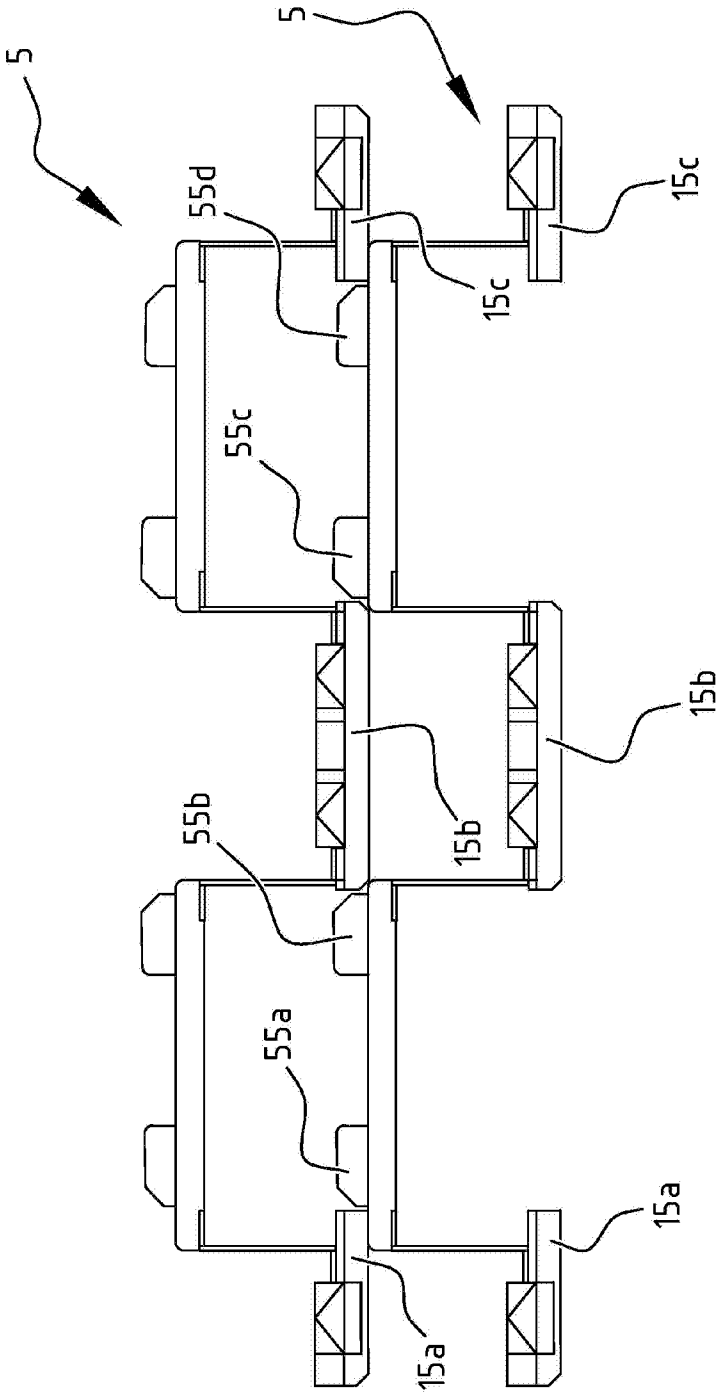


FIG. 28

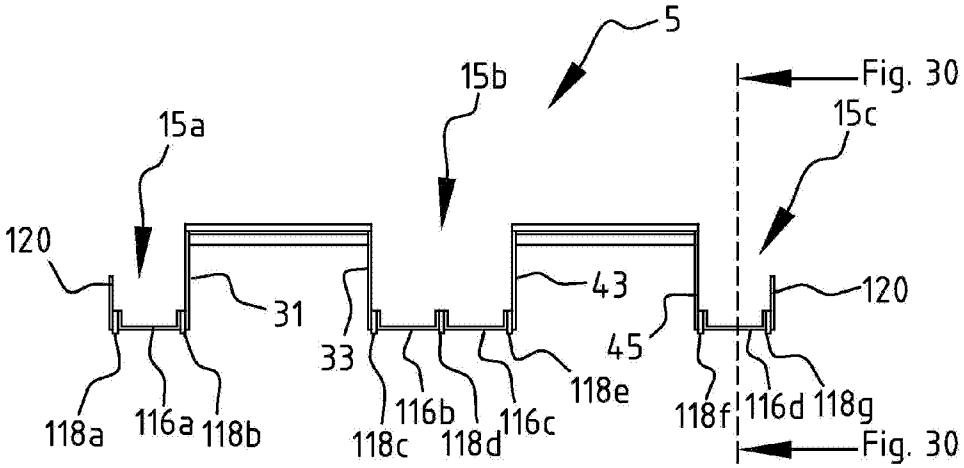

5
15b
Fig. 30
15a
15c
120
43
120
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118e
118a
116a
118b
118c
116b
118d
116c
118f
116d
118g
Fig. 30

FIG. 29

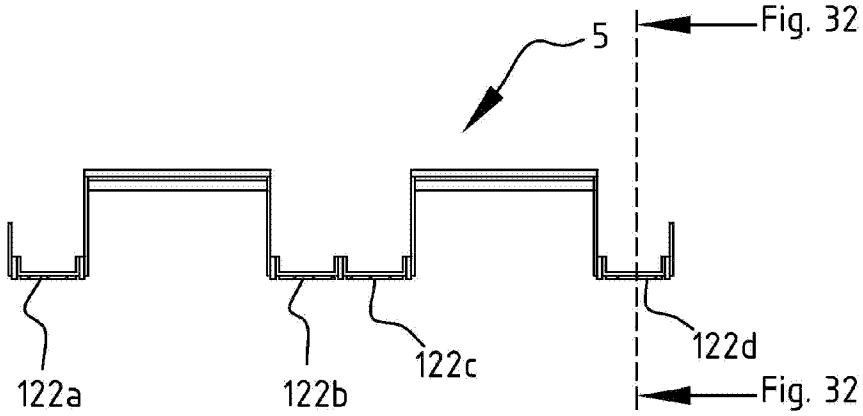

Fig. 32
5
122d
122a
122b
122c
Fig. 32

FIG. 31

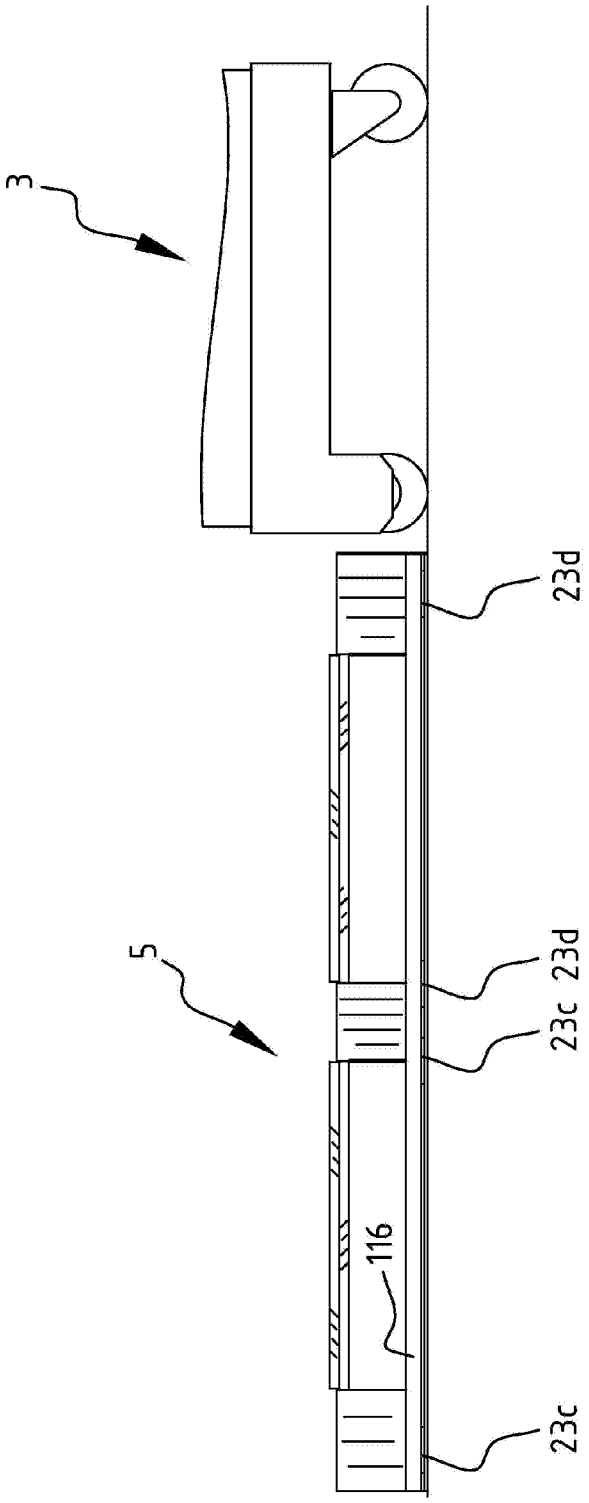


FIG. 30

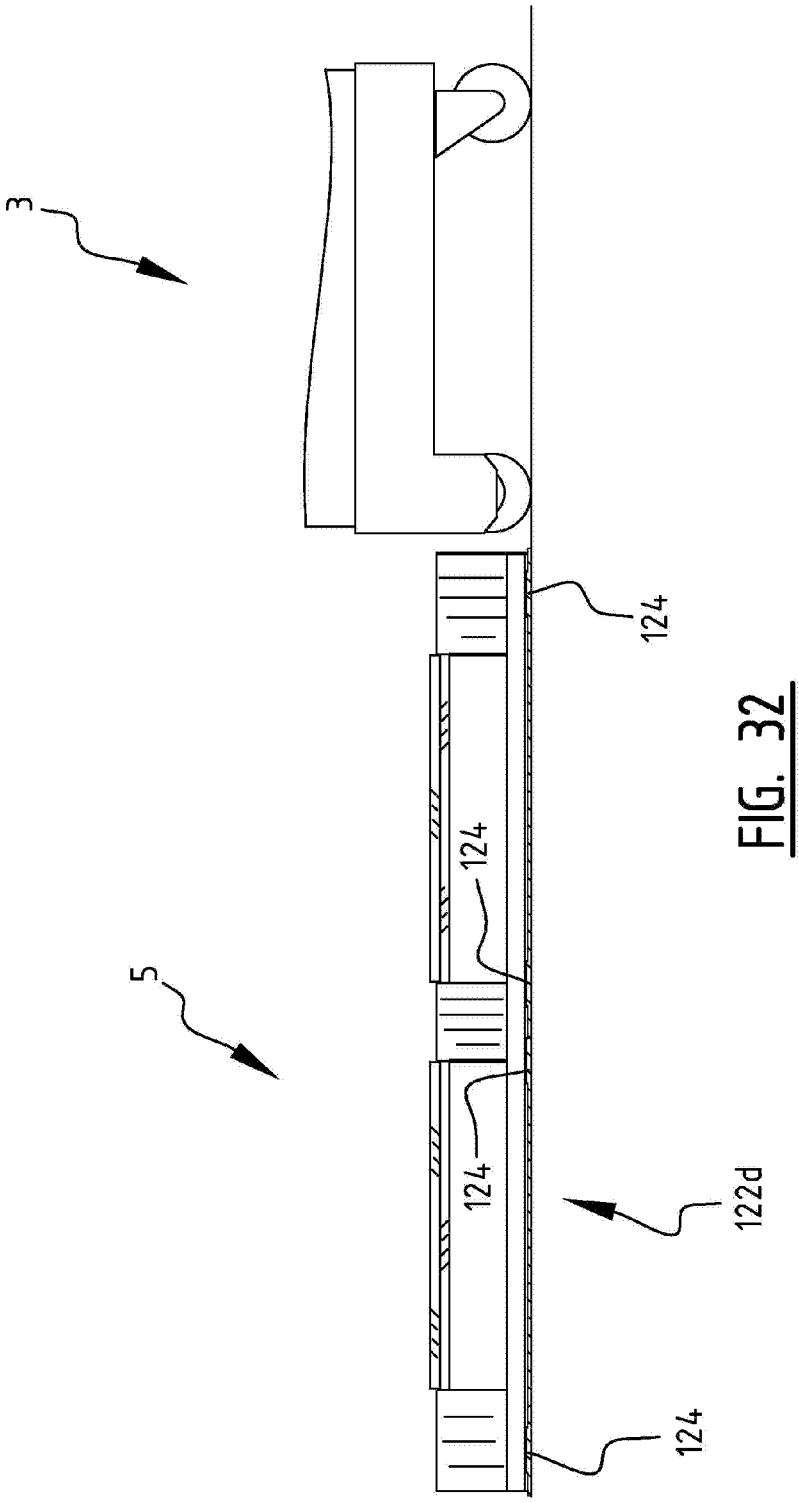


FIG. 32