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(54) **Eljárás egy összeillesztésre szolgáló gyártórendszer üzemeltetésére és gyártórendszer előszerelt struktúrák összeillesztésére**

Assembly line and corresponding process for joining the elements of a structure

Description

The invention relates to a method for operating a manufacturing system for joining processes and a manufacturing system for joining processes according to the preamble of claim 1 or claim 5. From DE 690 08 839 T2 a device is known for welding motor vehicle chassis assemblies made of pressed sheet metal. Due to having a plurality of stations arranged in series that a component carrier fitted with the metal sheets passes through, this device takes up a lot of space and uses a large number of conveying devices and a large number of component carriers, as the latter are required for each part in each of the plurality of stations.

Furthermore, from US 2002/0056189 A1 a method of production is known in which a manipulating robot removes an only partly finished structure from a clamping device, and a manufacturing system according to the preamble of claim 5.

The objective of the invention is to propose a method for operating a manufacturing system for joining processes and a manufacturing system for joining processes, which uses fewer component carriers because of the short requirement period of the component carrier or component carriers for the production of a finished part or assembly and which takes up less space despite being highly flexible.

Said objective is achieved on the basis of the features of the preamble of claim 1 or claim 5 by the characterising features of claim 1 or claim 5. Advantageous and expedient developments are described in the subclaims.

In the method according to the invention for operating a manufacturing system for joining, transporting and manipulating preassembled structures, the preassembled structure after joining the geo-connections is lifted by the joining robot or robots, which give the structure to be assembled a basic stability, by a second manipulator assigned to the joining unit of the component carrier, wherein the transport unit conveys the component carrier back into the loading unit whilst the joining robot or robots in the lifted position produces or produce joining connections on the structure stabilised by geo-points, wherein at a parallel time the component carrier in the loading unit is fitted by a first manipulator with a second preassembled structure and wherein the finally joined structure is unloaded by the second manipulator from the manufacturing system before the newly fitted workpiece carrier with the second preassembled structure is moved into the joining unit. By finally joining the structure in a suspended position it is possible to remove the component carrier before the end of the joining operations from the joining unit and to fit it again into the loading unit. In this way the time period in which the component carrier is connected to the structure is shortened so that with a spatially compact manufacturing system with minimum equipment it is possible to achieve a high throughput of joining robots and workpiece carriers. The basic concept of the invention is a method in which the workpiece carrier is separated prior to the completion of the structure or before the completion of all of the joining processes from the structure to be produced and is removed from the joining unit.

According to the invention it is also possible either to park one of the component carriers in a lifting unit whilst the manufacturing system is operated by another component carrier or to move one of the component carriers out of a working plane, in which the geo-connections are formed, and to convey it under or over the working plane in a return plane, in particular through a tunnel under the joining unit, from the lifting unit to the loading unit and to lift or lower the loading unit to take over the returned component carrier into the return plane or working

plane, wherein for this the joining unit is arranged between the loading unit and the lifting unit and the manufacturing system comprises at least one second component carrier for mounting a second type or additional types of preassembled structures. By means of such a process it is possible to create a manufacturing system by slightly extending a basic system consisting of the loading unit and the joining unit, which makes it possible to use two different workpiece carriers for the production.

According to the invention the lifting unit is assigned at least one parking unit, in which one of the component carriers is discharged when not required on the working plane and/or on the return plane from a component carrier cycle and/or from which one of the component carriers when required on the working plane and/or on the return plane is introduced into a component carrier cycle. By means of one method, which also comprises the introduction and discharge of workpiece carriers into one or more parking units, the number of different component carriers which can be operated in the manufacturing system is increased further.

According to the invention it is also possible to discharge one of the component carrier when not required on the return plane from a component carrier cycle into a parking unit configured as a low-parking unit and/or to introduce one of the component carriers when required on the return plane from the low-parking unit into the component carrier cycle., wherein for this purpose corresponding low-parking units are arranged in particular under the first manipulator and/or in particular under the second manipulator and/or in particular under one or more of the joining robots. By integrating into the process additional parking options it is possible to expand the manufacturing system by taking up the least possible space.

The manufacturing system according to the invention for joining, transporting and handling preassembled structures, in particular motor vehicle body subassemblies, which are formed by components which are mounted loosely beforehand, comprises a joining unit which comprises a manipulator, by means of which the structure stabilised by geo-points can be lifted from the component carrier into a finally joined position, in which the joining robots perform the joins still be executed, wherein the component carrier can be moved back out of the joining unit into the loading unit whilst the joining robot or robots produces or produce the joining connections. By using a manipulator which holds the not yet completely joined but stabilised structure in a suspended position which can be reached by the joining robot so that the component carrier can be moved back into the loading unit, the component carrier with a simultaneously compact structure of the manufacturing systems is used intensively. In particular, it is not necessary to have a second joining unit, which takes up space and additional joining robots.

According to the invention it is also possible to position the joining unit between the loading unit and a lifting unit and to equip the manufacturing system with at least a second component carrier for mounting a second type or other types of preassembled structures, wherein one of the component carriers can be parked in the lifting unit or wherein one of the component carriers can be moved out of a working plane, in which the geo-connections are created and can be conveyed under or over working plane in a return plane from the lifting unit to the loading unit and wherein the loading unit can be lifted or lowered for transferring the returned component carrier into the return plane. In this way it is possible with minimal structural effort to drive a circular operation, in which the first component carrier is discharged from the joining unit into the lifting unit, the second component carrier is introduced from the loading unit into the joining unit and the first component carrier is returned via the return plane to the loading unit.

Furthermore, according to the invention it is possible to add at least one parking unit to the manufacturing system which parking unit is arranged adjacent to the lifting unit and on the working plane and/or on the return plane has a parking space for one of the component carriers, wherein one of the component carriers can be ejected when not in use from a component carrier cycle on one of the parking spaces and/or wherein one of the component carriers if necessary can be introduced into a component carrier cycle. In this way it is possible to increase the number of different component carriers which can be operated in the manufacturing system by inexpensively produced parking units.

Lastly, according to the invention at least one parking unit is added to the manufacturing system which is in the form of a low-parking unit, which is arranged in particular underneath the first manipulator and/or in particular underneath the second manipulator and/or in particular underneath one of the joining robots, wherein one of the component carriers when not in use can be ejected on the return plane from a component carrier cycle into the low-parking unit and/or wherein one of the component carriers if necessary can be introduced on the return plane from the low-parking unit into the component carrier cycle. By means of such low-parking units the manufacturing system, without additional space being required, can be extended to an even greater number of different types of component carriers, as the area required for the manipulators and the joining robot or robots is also used.

The more complex manufacturing systems described in the subclaims have the advantage of optimising the handling of the component carriers, by means of which it is possible to provide the loading station according to the manufacturing program with the respectively required component carriers, without a longer logistical pre-run being required for this. Thus it is possible with the manufacturing system to also react swiftly to changes in the manufacturing program or to provide the component carriers according to the upcoming requirement in the loading station. By means of such a flexible manufacturing system expensive downtimes can be avoided. In principle, it is sufficient for the manufacturing system that a decision is made about the next component carrier to be fitted only when the preceding component carrier is conveyed completely fitted with components into the joining unit. The latter can be made available to the loading unit from each parking unit provided in the manufacturing system.

Within the meaning of the invention geo-connections, which are designed as geo-points or geo-seams, are defined as the joined connections which ensure the inherent stability of the assembly to be made from the individual components, so that the assembly to be produced or the structure to be produced can be removed without changing its geometry disadvantageously from the component carrier. Accordingly, joining connections which are in the form of welding points or welding seams are defined as joined connections which are not required for producing the inherent stability of the assembly or the structure of the workpiece to be produced, but increase its stability for example.

The term "joining" is defined within the meaning of the invention as the permanent connection of at least two components in particular welding and/or adhering and/or clinching and/or self-piercing riveting.

According to the invention the components used to produce the assembly or the finished article are in particular sheet metal components and/or plastic components and/or sandwich components, which are joined by one or more of the said joining methods to form the assembly or the finished article.

Further details of the invention are described in the drawings with reference to schematically illustrated embodiments.

In the latter:

Figure 1a: shows a plan view of a first embodiment variant of a manufacturing system according to the invention which is configured for operation with a component carrier type;

Figure 1b: shows a simplified, partially perspective view of the manufacturing system shown in figure 1 in a view that is closer to reality;

Figure 2a - 2f: show a processing sequence in a manufacturing system, which corresponds in its basic structure to the manufacturing system shown in figure 1a;

Figure 3a, 3b: show a second embodiment variant of a manufacturing system according to the invention in a plan view and side view, which is configured for operation using up to 2 component carrier types;

Figure 4: shows a third embodiment variant of a manufacturing system according to the invention in plan view, which is configured for operation using up to 3 component carrier types;

Figure 5: shows a fourth embodiment variant of a manufacturing system according to the invention in plan view, which is configured for operation using up to 4 component carrier types;

Figure 6: shows a fifth embodiment variant of a manufacturing system according to the invention in plan view, which is configured for operation using up to 6 component carrier types;

Figure 7: shows a sixth embodiment variant of a manufacturing system according to the invention in plan view, which is also configured for operation using up to 6 component carrier types and

Figure 8: shows a seventh embodiment variant of a manufacturing system according to the invention in plan view, which is configured for operation using up to 11 component carrier types.

Figure 1a shows a plan view of a first embodiment variant of a manufacturing system 1 according to the invention, which is set up for operation with a component carrier 2 of a first type 2a. The manufacturing system 1 comprises essentially a loading unit 3, a joining unit 4 and a transport unit 5, which is symbolised in figure 1 simply by a double arrow. By means of the transport unit 4 the component carrier 2 can be conveyed in the direction of arrow x' out of the loading unit 3 into the joining unit 5 and in a direction of arrow x out of the joining unit 5 into the loading unit 3. The loading unit 3 comprises a table 3a and a first manipulator 3b. By means of the first manipulator 3a a structure 7 consisting of at least two components 6a, 6b of a first type is fitted onto the component carrier 2 of the first type 2a. The component carrier 2 is used as a clamping device or geometry device for the components 6a and 6b, in which the latter are positioned relative to one another according to the requirements. Further structures 7 are available next to the loading unit 3. The joining unit 4 comprises a table 4a, a second manipulator 4b and four joining robots 4c, 4d, 4e and 4f. The preassembled structure 7 is moved by means of the transport unit 5 with the component carrier 2 into the joining unit 4 in order to be joined there into a finished structure. A corresponding sequence is shown in figures 2a to 2f.

Firstly, reference is also made to figure 1b, which in a simplified, partially perspective view shows a realistic representation of the manufacturing system 1 shown in figure 1 according to a cross section 1b-1b shown in figure 1a. In this view the joining robots 4f and 4d are shown, wherein the component carrier 2 with the structure to be joined is already on the table 4a of the joining unit 4 and the joining robots 4d, 4f are already forming geo-connections 8.

In figures 2a - 2f a method sequence of a manufacturing system is shown which corresponds in its principle structure to the manufacturing system shown in figure 1a. Reference is made here to the description of figure 1a. Figure 1a shows the manufacturing system 1 with the already mentioned components loading unit 3, joining unit 4 and transport unit 5. The manipulator 3b of the loading unit 3 is gripping the preassembled structure 7, in order to place the latter onto the component carrier 2, which lies on the table 3a of the loading station 3. Figure 2b shows how the preassembled structure 7 lies on the component carrier 2. Figure 2c shows how the component carrier 2 has been transported by the preassembled structure 7 from the transport unit 5 onto the table 4a of the joining unit 4 and the joining robots 4c, 4d, 4e and 4f join the geo-connections 8. Figure 2d shows how the second manipulator 4b of the joining unit 4 has lifted the structure 7 stabilised by making the geo-connections 8 from the component carrier 2, and the component carrier 2 is being moved back from the transport unit 5 into the loading station 3 in the direction of arrow x. In parallel to this by means of the manipulator 3b of the loading unit 3 a further structure 7' is gripped in order to place the latter in a further step onto the component carrier 2, when the latter has come back to the loading unit 3. The situation shown in plan view in figure 2d is shown according to the sectional line IIe-II1 shown in figure 2d in cross-sectional or side view. It is shown here how the structure 7 stabilised by the geo-connections is lifted by the manipulator 4b in the direction of arrow z from the table 4a of the joining station from geo-level I to joining-level II by a height H1 into a final joining position III. In this case the height H1 is measured such that the component carrier 2 can be moved in the direction of arrow x under the lifted structure 7 without collision from the transport unit 5 into the loading unit 3. The transport unit is only shown schematically in figures 2a to 2f. In its practical configuration the transport unit comprises at least one conveying means, associated sensors and a control unit. For the additional preassembled structure 7' it is indicated in figure 2e by arrows how the latter is moved in the direction of arrows x' and z', in order to be placed later – as shown in figure 2f – onto the component carrier 2. At the time at which the structure 7' is placed on the component carrier 2 or shortly before this time point or shortly after this time point the second manipulator 4b has meanwhile placed down the completely joined first structure 7 and moves its gripper 9 back into the position shown in figure 2a, in order after establishing geo-connections on the second structure 7' to lift the latter to the joining-level II.

In figures 3a and 3b a second embodiment variant of a manufacturing systems 10 according to the invention is shown in plan view and side view, wherein said manufacturing system is configured for operation with up to two component carrier types 2 and/or 2a, 2b. The manufacturing system 10 builds on the manufacturing system shown in figures 1a to 2f and also comprises a loading unit 3, a joining unit 4 and a first transport unit 5. In addition, the manufacturing system 10 comprises a lifting unit 11 and a second transport unit 12. The loading unit 3 comprises in a known manner a table 3a and a manipulator 3b. Unlike the first embodiment variant the table 3a is designed as a lifting table 3c. The joining unit 4 comprises in a known manner a table 4a, a manipulator 4b and joining robots 4c, 4d, 4e and 4f. Unlike the first embodiment variant the table 4a comprises a tunnel 4g. In figure 3a a component carrier 2 is also shown which is located in the loading unit 3. The component

carrier 2 is also denoted as a "skid" or loading frame or loading skid. In figure 3b the manufacturing system 10 is shown in a simplified side view. Both the independent lifting unit 11 and the lifting table 3c of the loading unit can be moved from a working plane E1, which corresponds to geo-level I, into a return plane E2 and back. The tunnel 4g of the joining station 4 also lies with its base 13 on the return plane E1. Accordingly, the component carriers 2 and/or 2a, 2b are moved by the transport units 5 and 12 in directions x and x' and by the lifting unit 11 and the lifting table 4g of the loading unit 3 in directions z and z'. A joining level II, in which a not shown structure is lifted after joining the geo-connections by the manipulator 4b, lies on a plane E3 above plane E2. For the operation of the manufacturing system 10 in principle two sequences are provided. With a circular operation the component carrier 2b, after lifting the not shown structure, is moved into position 14.3 and the fitted component carrier 2a is moved out of position 14.1 into position 14.2. Whereas on the not shown structure the joining connections are produced and whereas afterwards on the additional structure delivered with the component carrier 2a the geo-connections are produced, the empty component carrier is lowered by the lifting unit 11 to plane E2 into position 14.4 and then moved through the tunnel 4g via position 14.5 onto the lowered lifting tables 3c of the loading unit 3 into position 14.6 and then lifted by the latter into position 14.1 onto plane E1 in order to be fitted with a preassembled structure and then moved by the transport unit 12 back to the position 14.2 if the component carrier 2b has left the latter. The transport units 5 and 12 ensure both transport on plane E1 and also transport on plane E2. Alternatively to circular operation a shuttle operation is also possible in which production is only performed by one of the two component carriers 2a, 2b and the other component carrier is parked until it is required again. For this purpose for example the component carrier 2b is moved from position 14.2 to position 14.3 and parked in the lifting unit 11, whereas the component carrier 2a shuttles continually, as shown in the embodiment described in figures 1a to 2f between the positions 14.1 and 14.2. The parking positions available for the component carrier 2b are positions 14.3, 14.4 and 14.5. As long as the component carrier 2b is parked in position 14.5 it is possible during the operation of the system to undertake the maintenance of the lifting table 11. Furthermore, it is also possible during the shuttle operation to replace the component carrier 2b with another component carrier without interrupting the manufacturing. By planning the production sequence accordingly downtimes of the manufacturing system 10 can be avoided in this way.

Figure 4 shows in plan view a third embodiment variant of a manufacturing system 15 according to the invention which is configured for operation with up to three different component carriers 2 and/or 2a, 2b and 2c. With regard to the components loading unit 3, joining unit 4, transport unit 5, lifting unit 11 and transport unit 12 and a circular operation or shuttle operation over the stations 14.1 to 14.6 reference is made to the explanations of figures 3a and 3b. In addition to said components, the manufacturing system 15 comprises a parking unit 16 and a third transport unit 17. By means of the third transport unit 17, which is designed as a transverse conveyor, it is possible on the working plane E1 to eject one the component carriers 2 by the lifting unit 11 in the direction of arrow y into the parking unit 16 or – as shown in the drawing – to eject the component carrier 2b out of the parking unit 16 onto the lifting unit 11 in the direction of arrow y'. If necessary in the shown situation the component carrier 2b can be removed from the parking unit 16 and by means of the subsequent lowering of the lifting unit 11 can be moved through the tunnel 4g of the joining unit 4 to the loading unit 3. As soon as the lifting unit 11 is back on plane E1 the component carrier 2c can be ejected into the parking unit 16 or into a position 14.7. As long as a circular mode of operation is not used, in which all three component carriers 2a, 2b and 2c are used in series, it is possible by means of the parking unit 16 to use the position 14.7 to take one of the

three component carriers 2a, 2b or 2c out of circular operation and to move the latter only with two of the component carriers 2. A shuttle operation of one of the component carriers 2 between positions 14.2 and 14.1 is then also possible – as described in figures 3a and 3b.

In figure 5 a fourth embodiment variant of a manufacturing system 18 according to the invention is shown in plan view, which is configured for operation using up to four different component carriers 2 or 2a, 2b, 2c, 2d. Here reference is made first of all to the descriptions of figures 1a to 2f and 3a, 3b and 4. With regard to the components loading unit 3, joining unit 4, transport unit 5, lifting unit 11, transport unit 12, parking unit 16 and transport unit 17 and a circular operation or shuttle operation over the stations 14.1 to 14.7 reference is made in particular to the explanations regarding figure 4. In addition to said components, the manufacturing system 18 comprises a second parking unit 19 and a fourth transport unit 20. By means of the fourth transport unit 20, which is designed as a cross conveyor, it is possible on the working plane E1 to eject one of the component carriers 2 from the lifting unit 11 into the parking unit 19. In this way a further parking option is provided with a position 14.8 compared to the manufacturing system shown in figure 4.

In figure 6 a fifth embodiment variant of a manufacturing system 21 according to the invention is shown in plan view which is designed for operation with up to six different component carriers 2 or 2a to 2f. Here reference is made firstly to the descriptions of figures 1a to 2f and 3a, 3b, 4 and 5. With regard to the components loading unit 3, joining unit 4, transport unit 5, lifting unit 11, transport unit 12, parking unit 16, transport unit 17, second parking unit 19 and fourth transport unit 20 and the option of a circular operation or shuttle operations, reference is made in particular to the embodiments in figure 4 and 5. Unlike the manufacturing system shown in figure 5, the parking units 16 and 19 are designed as parking areas 16a and 19a and each have a parking space on plane E1 and plane E2, wherein the parking spaces on plane E2 are denoted by the positions 14.9 and 14.10. Accordingly the transport units 17 and 20 are designed such that component carriers 2 on plane E1 or plane E2 can be introduced into the parking units 16 and 19 or ejected therefrom.

Figure 7 shows in plan view a sixth embodiment variant of a manufacturing system 22 according to the invention which, as in the manufacturing system shown in figure 6, is designed for operation using up to six different component carriers 2 or 2a to 2f. Instead of creating two additional parking spaces by designing the parking units as double parking areas – as shown in figure 5 – in the embodiment variant of figure 6 additional parking space is created in that one loading unit 3 is assigned two parking units 23, 24, wherein the parking unit 23 provides a parking space 25 as position 14.9 on a working plane E1 and wherein the parking unit 24 provides a parking space 26 as a position 14.10 on a return plane E2. In this case the parking unit 24 is designed as a low-parking unit 24a which is arranged below a manipulator 3b of the loading unit 3. A fifth and a sixth transport unit 27 and 28 undertake the transport of the respective component carriers 2 into and out of the parking units 23 and 24. With regard to the components of the manufacturing system 22, which is not described in more detail, reference is made in particular to the description of figure 5.

Figure 8 shows a seventh embodiment variant of a manufacturing system 29 according to the invention in plan view, which is configured to operate using up to eleven different component carriers 2, 2a to 2k. The manufacturing system 29 represents a combination of the manufacturing systems shown in figures 6 and 7 and comprises the following components, which are already known from the said figures 6 and 7 and the associated description. In detail the latter include a loading unit 3, a joining unit 4, a first transport unit 5, a lifting unit 11, a

second transport unit 12, a first parking unit 16, which is designed as a parking area 16a, a transport unit 17, a second parking unit 19, which is designed as a parking area 19a, a fourth transport unit 20, a parking unit 23, which is designed as a parking area 23a, a transport system 27, a parking unit 24, which is designed as an low-parking unit 24a, a transport system 28, a parking unit 30, which is designed as a low-parking unit 30a, a seventh transport unit 31, a parking unit 32, which is designed as a low-parking unit 32a and an eighth transport unit 33. The eleven component carriers 2 are distributed in the embodiment in the positions 14.7, 14.9, 14.8, 14.10, 14.14, 14.2, 14.15, 14.13, 14.1, 14.11 and 14.12.

The invention is not restricted to the shown or described embodiments. Rather it comprises any developments of the invention within the scope of the claims. In particular, the joining robots are designed as welding robots.

List of reference numerals:

1	manufacturing system
2	component carrier, clamping or geometry device
3	loading unit
3a	table
3b	manipulator
4	joining unit
4a	table
4b	manipulator
4c - 4f	joining robots
4g	tunnel
5	transport unit
6a, 6b	components
7	structure
7'	additional structure
8	geo-connections
9	gripper
10	manufacturing system
11	lifting unit
12	transport unit
15	manufacturing system
16	parking unit
16a	parking area
17	3rd transport unit
18	manufacturing system
19	parking unit
19a	parking area
20	4th transport unit
21	manufacturing system

22	manufacturing system
23	parking unit
23a	parking area
24	parking unit
24a	low-parking unit
25	parking space
26	parking space
27, 28	5th and 6th transport unit
29	manufacturing system
30	parking unit
30a	low-parking unit
31	7th transport unit
32	parking unit
32a	low-parking unit
33	8th transport unit
E1	working plane
E2	return plane
H1	height
I	geo-level
II	joining level
III	finished joining position
x, x'	direction of arrow
y, y'	direction of arrow
z, z'	direction of arrow
14.1 - 14.15	positions for 2

Eljárás egy összeillesztésre szolgáló gyártórendszer üzemeltetésére és gyártórendszer előszerelt struktúrák összeillesztésére

Szabadalmi igénypontok

1. Eljárás egy gyártórendszer (1, 10, 15, 18, 21, 22, 29) üzemeltetésére előszerelt struktúrák (7, 7'), főként gépjárműkarosszéria-szerkezetcsoportok összeillesztésére, továbbítására és kezelésére, amelyeket előzetesen lazán összeszerelt szerkezetrészek (6a, 6b) képeznek, amely gyártórendszer tartalmaz:

– egy első szerkezetrész-hordozót (2) előszerelt struktúrák (7, 7') egy első típusának a felvételére;

– egy rakodóegységet (3), amely egy első manipulátort (3b) foglal magában, ahol az első előszerelt struktúrát (7) a rakodóegységben (3) az első manipulátor (3b) helyezi rá a szerkezetrész-hordozóra (2),

– egy illesztőegységet (4), amely legalább egy illesztőrobotot (4c-4f) foglal magában, amellyel az első előszerelt struktúrát (7) összeillesztjük, és

– egy továbbító egységet (5), amelynek révén a szerkezetrész-hordozó (2) a rakodóegység (3) és az illesztőegység (4) között mozgatható,

– ahol a továbbító egység (5) az első előszerelt struktúrával (7) megrakott szerkezetrész-hordozót (2) az illesztőegységbe (4) továbbítja, és

– ahol az illesztőegységben (4) az első előszerelt struktúra (7) geo-kötéseit (egy szerelőállomás geometriai rendszerének meghatározott pontjaiban létrehozott kötéseit) (8) az egy vagy több illesztőrobottal (4c-4f) hozzuk létre,

– ahol az illesztőegység (4) egy második manipulátort (4b) foglal magában, amellyel az előszerelt struktúrát (7) a geo-kötések (8) egy vagy több illesztőrobot (4c-4f) általi összeillesztése után a szerkezetrész-hordozóról (2) leemeljük,

– ahol a továbbító egységgel (5) a szerkezetrész-hordozót (2) a rakodóegységbe (3) visszaszállítjuk, mialatt ugyanazon illesztőrobottal vagy -robotokkal (4c-4f) összeillesztő kötéseket hozunk létre,

– ahol ehhez a geo-kötések által stabilizált struktúrát (7) a manipulátorral (4b) nyílirányban (z) az illesztő állomás (4) asztaláról (4a) egy I geo-szintről egy II összeillesztési szintre emeljük H1 magassággal egy III készre illesztési helyzetbe,

– ahol a struktúra (7) készre illesztésével egy lebegő helyzetben lehetővé válik, hogy a szerkezetrész-hordozót (2) az illesztési művelet vége előtt az illesztőegységből (4) kivegyük és a rakodóegységben (3) ismét megrakjuk,

– ahol a szerkezetrész-hordozót (2) a rakodóegységben (3) az első manipulátor (3b) által egy második előszerelt struktúrával (7') rakjuk meg, és

– ahol a második manipulátorral (4b) a készre illesztett struktúrát (7) a gyártórendszerből (1, 10, 15, 18, 21, 22, 29) kirakodjuk, mielőtt az újonnan megrakott szerkezetrész-hordozót (2) a második előszerelt struktúrával (7') bejáratjuk az illesztőegységbe (4).

2. Az 1. igénypont szerinti eljárás, ***azzal jellemezve***, hogy az illesztőegység (4) a rakodóegység (3) és egy emelőegység (11) között van elrendezve és a gyártóegység (1, 10, 15, 18, 21, 22, 29) legalább egy második szerkezetrész-hordozóval (2) rendelkezik előszerelt struktúrák (7, 7') egy második típusának ill. további típusainak felvételéhez, ahol a szerkezetrész-hordozók (2) egyikét

– vagy az emelőegységben (11) parkoltatjuk, mialatt a gyártórendszert (1, 10, 15, 18, 21, 22, 29) a szerkezetrész-hordozók (2) másikával üzemeltetjük,

– vagy ahol a szerkezetrész-hordozók (2) egyikét egy munkasíkból (E1), amelyben a geo-kötéseket (8) hozzuk létre, kimozgatjuk, és a munkasík (E1) alatt vagy fölött egy visszavezetési síkban (E2), főként az illesztőegység (4) egy alagútján (4g) keresztül az emelőegységtől (11) a rakodóegységhez (3) juttatjuk és ahol a rakodóegységet (3) a visszavezetett szerkezetrész-hordozó (2) átvételéhez a visszavezetési síkba (E2) emeljük vagy oda leállyesztjük.

3. A 2. igénypont szerinti eljárás, ***azzal jellemezve***, hogy az emelőegységhez (11) legalább egy parkolóegység (16, 19) van hozzárendelve, amelybe a szerkezetrész-hordozók (2) egyikét igény hiányában a munkasíkban (E1) és/vagy a visszavezetési síkban (E2) egy szerkezetrészhordozó-körfolyamból kizsilipeljük és/vagy amelyből a

szerkezetrész-hordozók (2) egyikét igény esetén a munkasíkban (E1) és/vagy a visszavezetési síkban (E2) egy szerkezetrészhordozó-körfolyamba bezsilipeljük.

4. A 2. vagy 3. igénypont szerinti eljárás, *azzal jellemezve*, hogy a gyártórendszer (1, 10, 15, 18, 21, 22, 29) legalább egy parkolóegységet (23, 30, 32) foglal magában, amely mélyparkoló-egységként (24a, 30a, 32a) van kialakítva, amely főként az első manipulátor (3b) alatt és/vagy főként a második manipulátor (4b) alatt és/vagy főként az illesztőrobotok (4c-4f) egyike alatt van elrendezve, ahol a szerkezetrész-hordozók (2) egyikét igény hiányában a visszavezetési síkban (E2) egy szerkezetrészhordozó-körfolyamból a mélyparkoló-egységbe (24a, 30a, 32a) kizsilipeljük és/vagy a szerkezetrész-hordozók (2) egyikét igény esetén a visszavezetési síkban (E2) a mélyparkoló-egységből (24a, 30a, 32a) a szerkezetrészhordozó-körfolyamba bezsilipeljük.

5. Gyártórendszer (1, 10, 15, 18, 21, 22, 29) előszerelt struktúrák (7, 7'), főként gépjárműkarosszéria-szerkezetcsoportok összeillesztésére, továbbítására és kezelésére, amelyeket előzetesen lazán összeszerelt szerkezetrészek (6a, 6b) képeznek, amely gyártórendszer tartalmaz

– egy első szerkezetrész-hordozót (2) előszerelt struktúrák (7, 7') egy első típusának a felvételére;

– egy rakodóegységet (3), amely egy első manipulátort (3b) foglal magában, ahol az első előszerelt struktúra (7) a rakodóegységben (3) az első manipulátor (3b) által van a szerkezetrész-hordozóra (2) ráhelyezve,

– egy illesztőegységet (4), amely legalább egy illesztőrobotot (4c-4f) foglal magában, amellyel az első előszerelt struktúra (7) össze van illesztve, és

– egy továbbító egységet (5), amelynek révén a szerkezetrész-hordozó (2) a rakodóegység (3) és az illesztőegység (4) között mozgatható,

– ahol az első előszerelt struktúrával (7) megrakott szerkezetrész-hordozó (2) a továbbító egység (5) által az illesztőegységbe (4) van továbbítva, és

– ahol az illesztőegységben (4) az első előszerelt struktúra (7) geo-összeköttetései (8) az egy vagy több illesztőrobot (4c-4f) által vannak létrehozva, és

– ahol az illesztőegység (4) egy második manipulátort (4b) foglal magában, amely által az előszerelt struktúra (7) a geo-kötések (8) egy vagy több illesztőrobot (4c-4f) általi összeillesztése után a szerkezetrész-hordozóról (2) leemelhető,

azzal jellemezve, hogy

az előszerelt struktúra (7) leemelhető egy készre illesztési helyzetbe (III) és rajta egy vagy több ugyanazon illesztőrobot (4c-4f) összeillesztési kötéseket képes létrehozni, mialatt a szerkezetrész-hordozó (2) az illesztőegységből (4) visszajuttatható a rakodóegységbe (3).

6. Az 5. igénypont szerinti gyártórendszer (1, 10, 15, 18, 21, 22, 29), ***azzal jellemezve, hogy*** az illesztőegység (4) a rakodóegység (3) és egy emelőegység (11) között van elrendezve és a gyártórendszer (1, 10, 15, 18, 21, 22, 29) legalább egy második szerkezetrész-hordozóval (2) rendelkezik előszerelt struktúrák (7, 7') egy második típusának, ill. további típusainak felvételéhez,

– ahol a szerkezetrész-hordozók (2) egyike az emelőegységben (11) parkoltatható, vagy ahol a szerkezetrész-hordozók (2) egyike egy munkasíkból (E1), amelyben a geo-kötések (8) vannak létrehozva, kimozgatható, és a

munkasík (E1) alatt vagy fölötti egy visszavezetési síkban (E2), az emelőegységtől (11) a rakodóegységhez (3) juttatható és

– ahol a rakodóegység (3) a visszavezetett szerkezetrész-hordozó (2) átvételéhez a visszavezetési síkba (E2) felemelhető vagy oda leállyeszthető.

7. A 6. igénypont szerinti gyártórendszer (1, 10, 15, 18, 21, 22, 29), ***azzal jellemezve***, hogy a gyártórendszer (1, 10, 15, 18, 21, 22, 29) legalább egy parkolóegységet (16, 19) foglal magában, amely az emelőegység (11) szomszédságában van elrendezve és a munkasíkban (E1) és/vagy a visszavezetési síkban (E2) egy parkolóhellyel rendelkezik a szerkezetrész-hordozók (2) egyike számára, ahol a szerkezetrész-hordozók (2) egyike igény hiányában egy szerkezetrészhordozó-körfolyamból a parkolóhelyek egyikére kizsilipelhető és/vagy ahol a szerkezetrész-hordozók (2) egyike igény esetén egy szerkezetrészhordozó-körfolyamba bezsilipelhető.

8. A 6. vagy 7. igénypont szerinti gyártórendszer (1, 10, 15, 18, 21, 22, 29), ***azzal jellemezve***, hogy a gyártórendszer (1, 10, 15, 18, 21, 22, 29) legalább egy parkolóegységet (23, 30, 32) foglal magában, amely mélyparkoló-egységként (24a, 30a, 32a) van kialakítva, amely főként az első manipulátor (3b) alatt és/vagy főként a második manipulátor (4b) alatt és/vagy főként az illesztőrobotok (4c-4f) egyike alatt van elrendezve, ahol a szerkezetrész-hordozók (2) egyike igény hiányában a visszavezetési síkban (E2) egy szerkezetrészhordozó-körfolyamból a mélyparkoló-egységbe (24a, 30a, 32a) kizsilipelhető és/vagy ahol a szerkezetrész-hordozók (2) egyike igény esetén a visszavezetési síkban (E2) a mélyparkoló-egységből (24a, 30a, 32a) a szerkezetrészhordozó-körfolyamba bezsilipelhető.

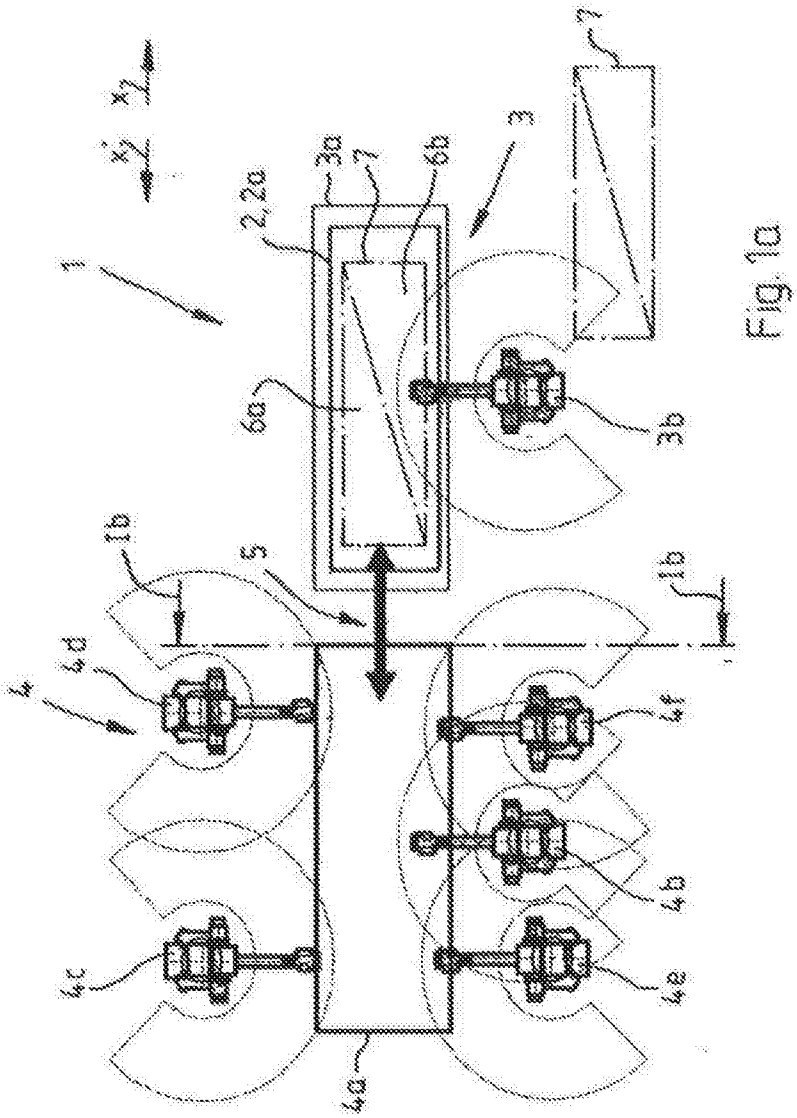


Fig. 1a

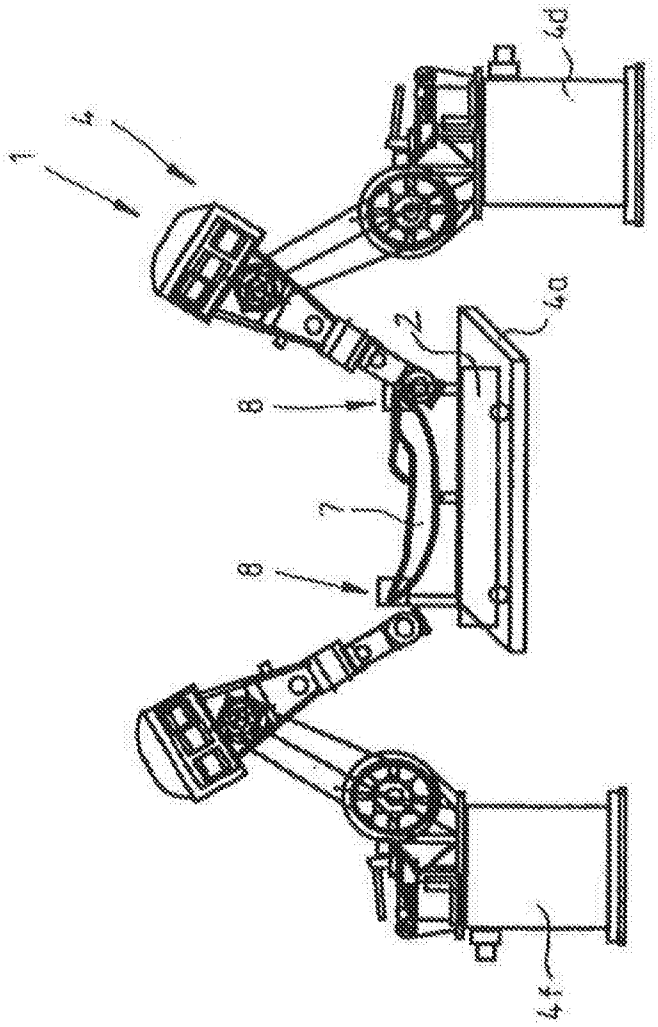


Fig.1b

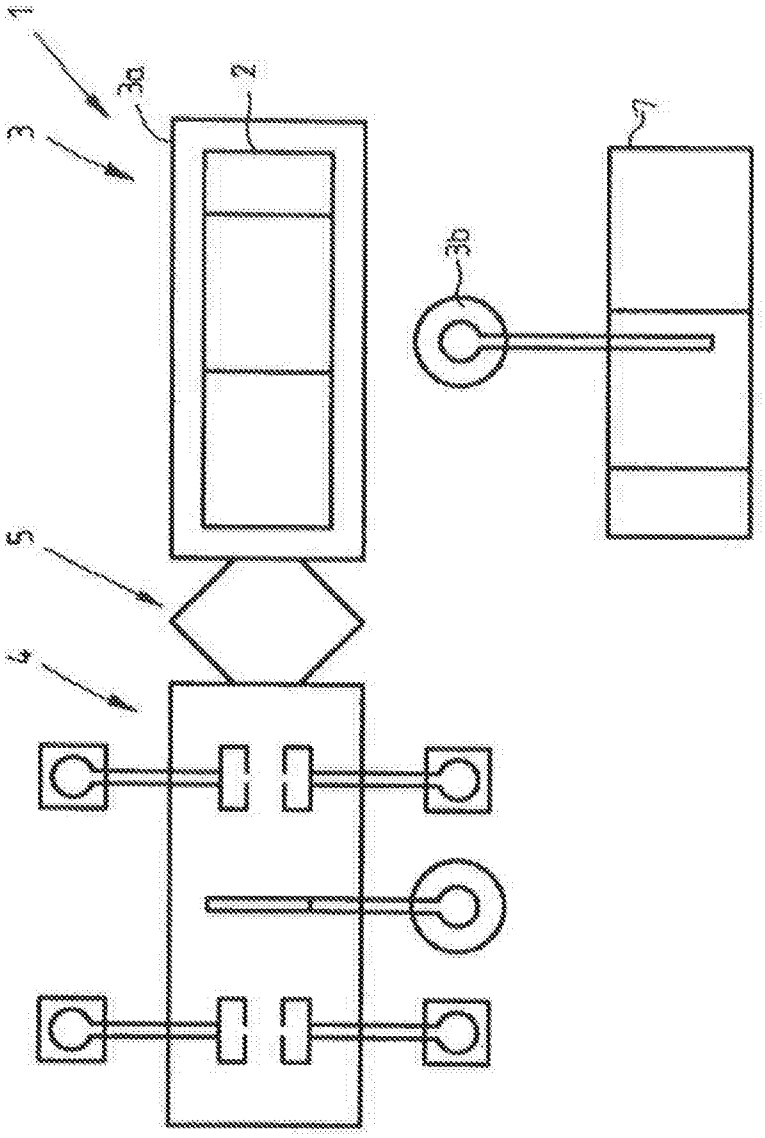


Fig. 2a

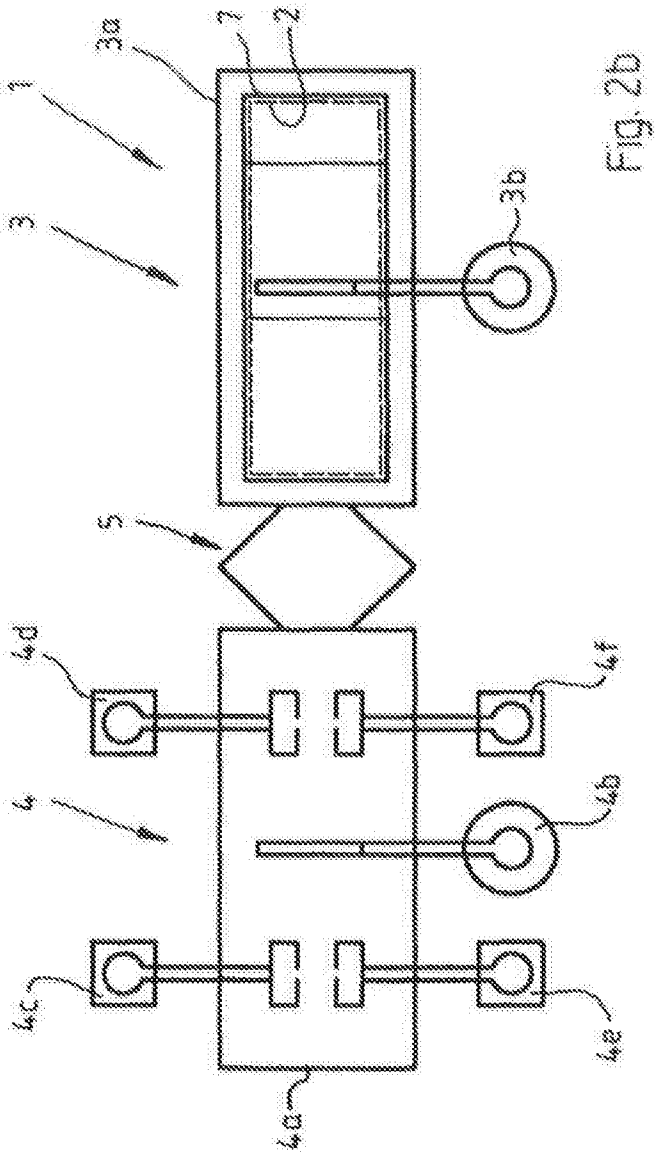


Fig. 2b

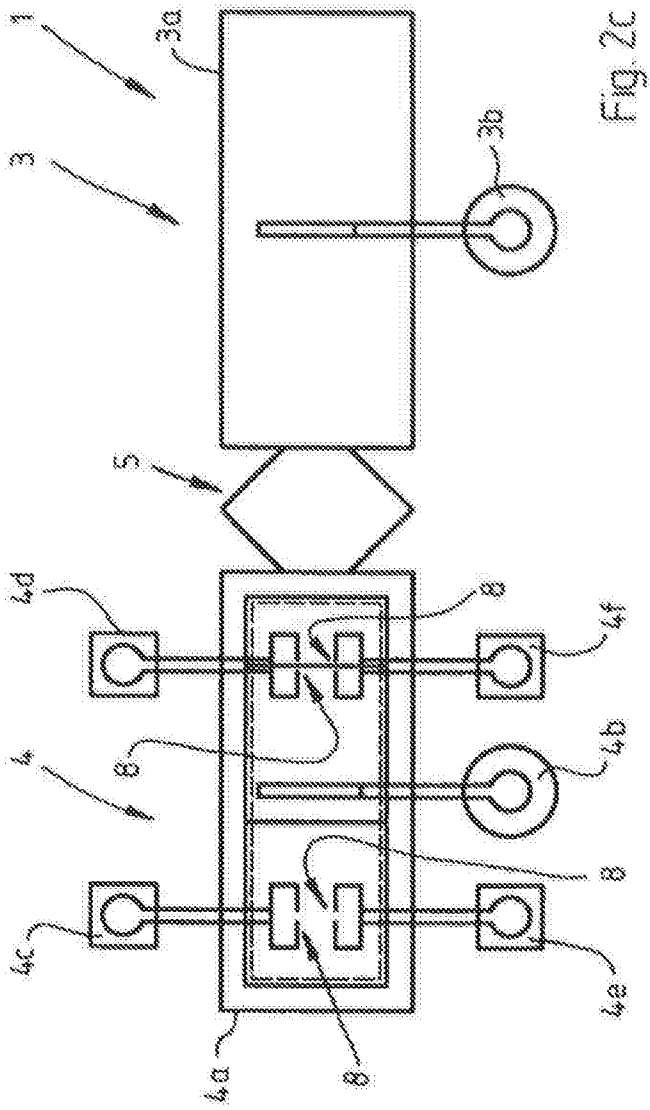


Fig. 2c

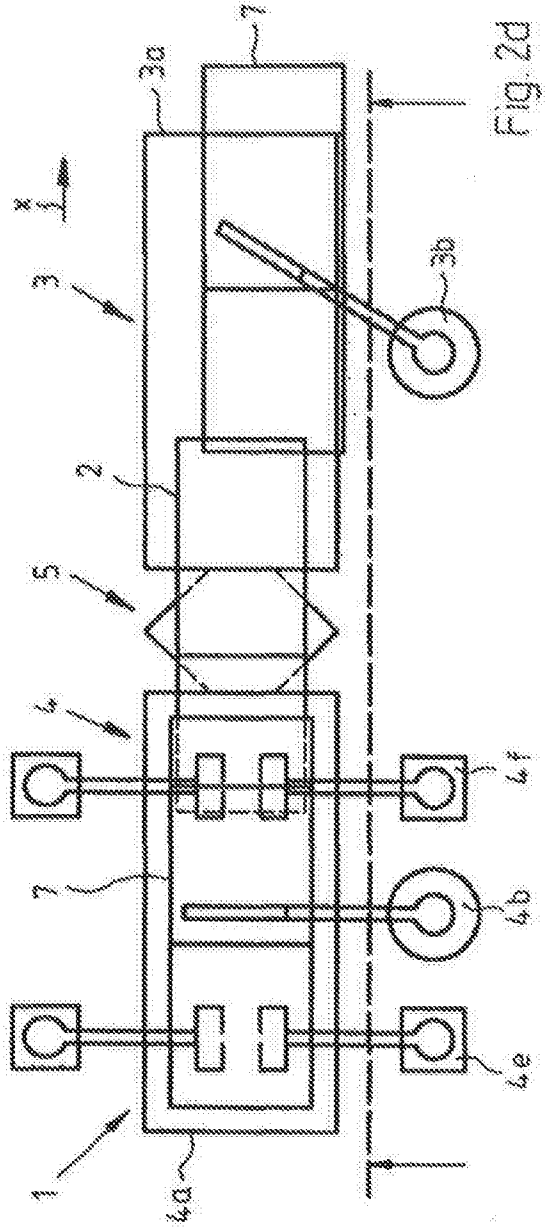


Fig. 2d

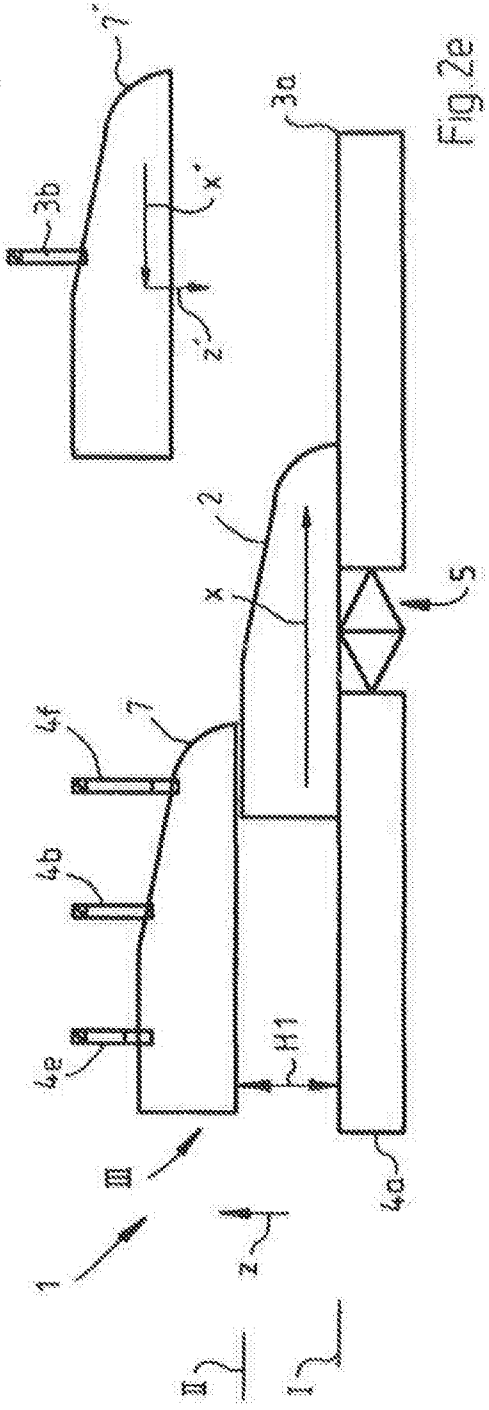


Fig. 2e

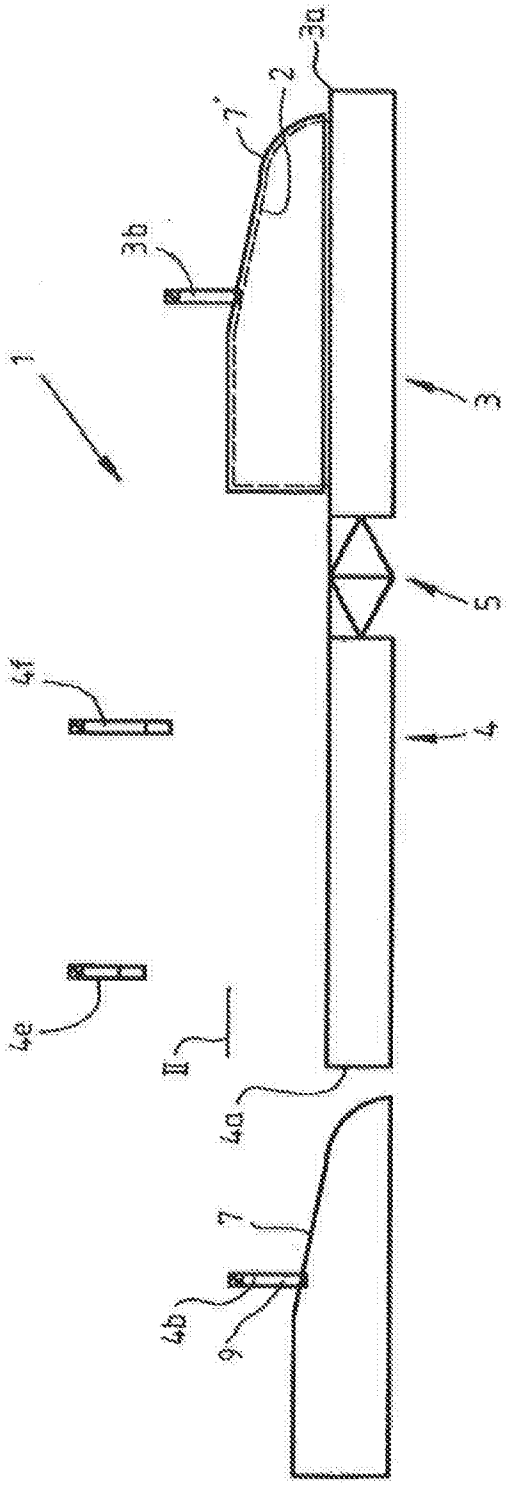


Fig 2f

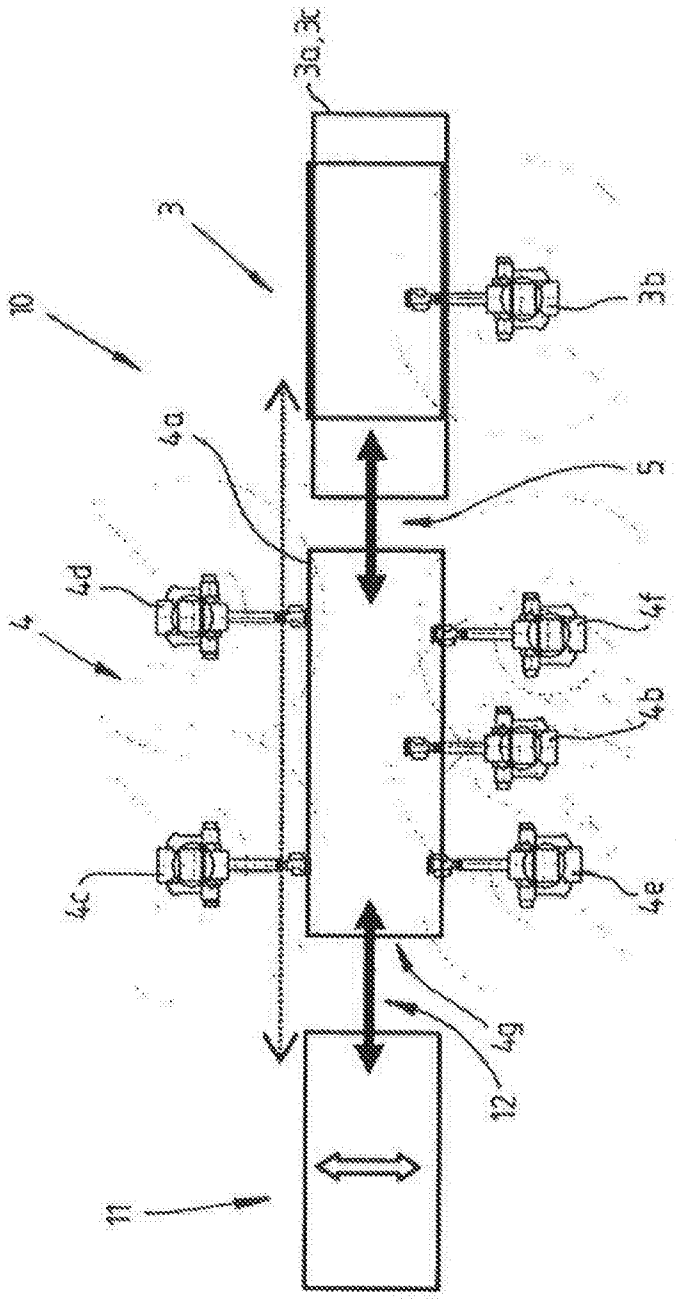


Fig. 3a

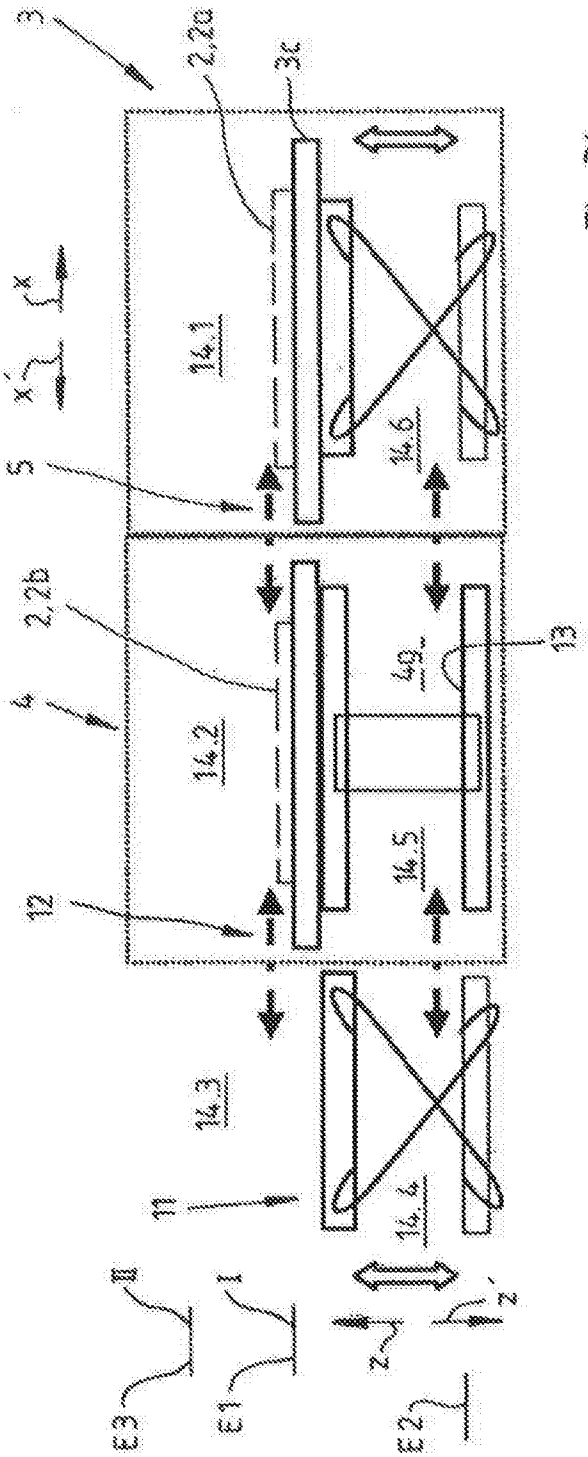


Fig.3b

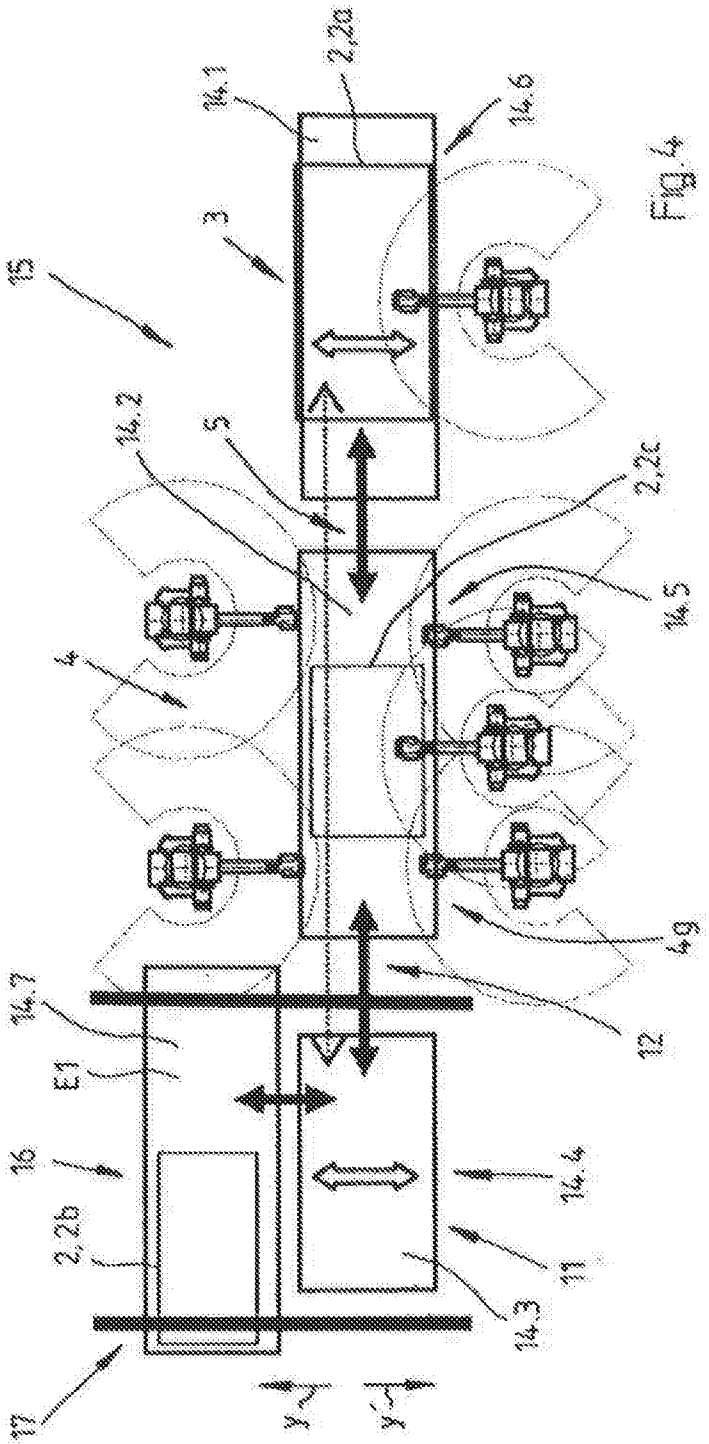


Fig.4

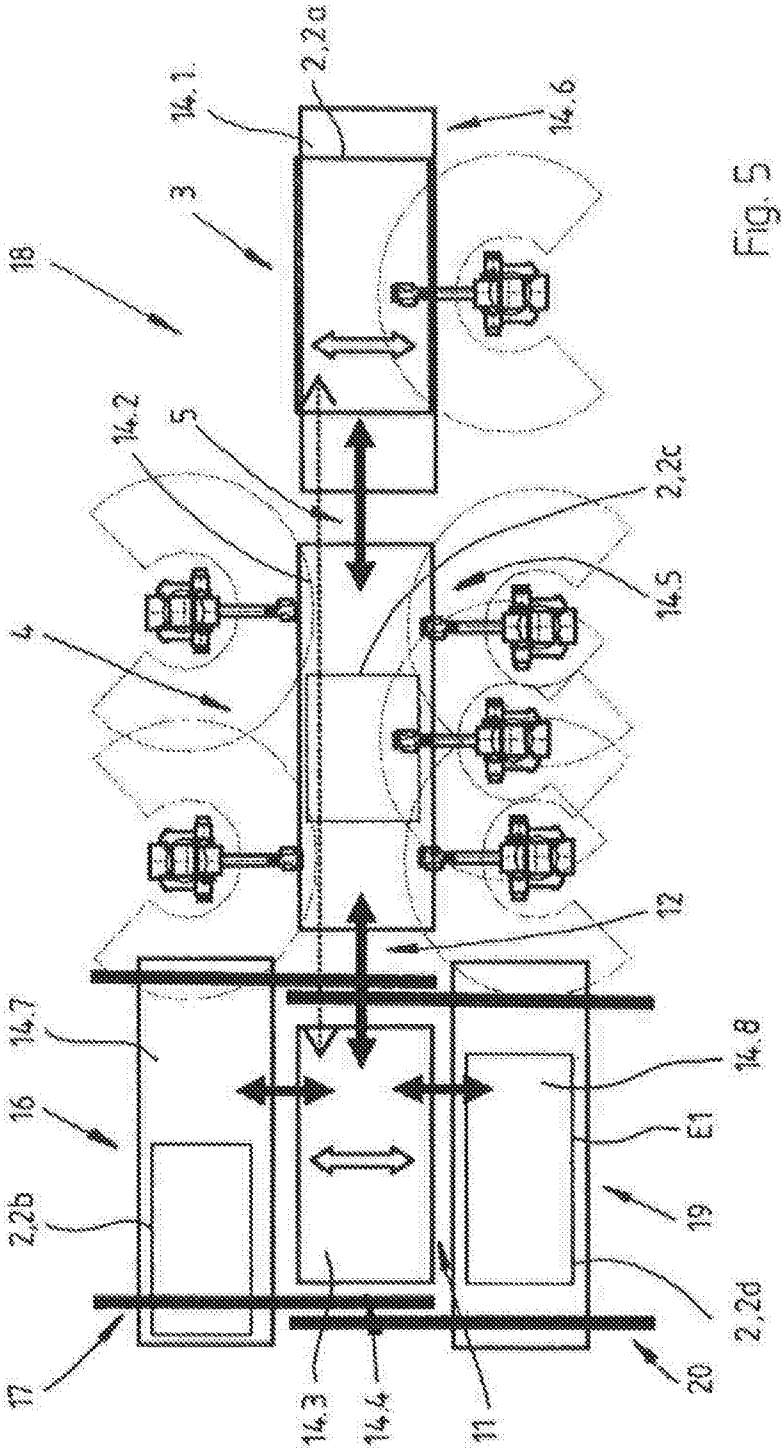
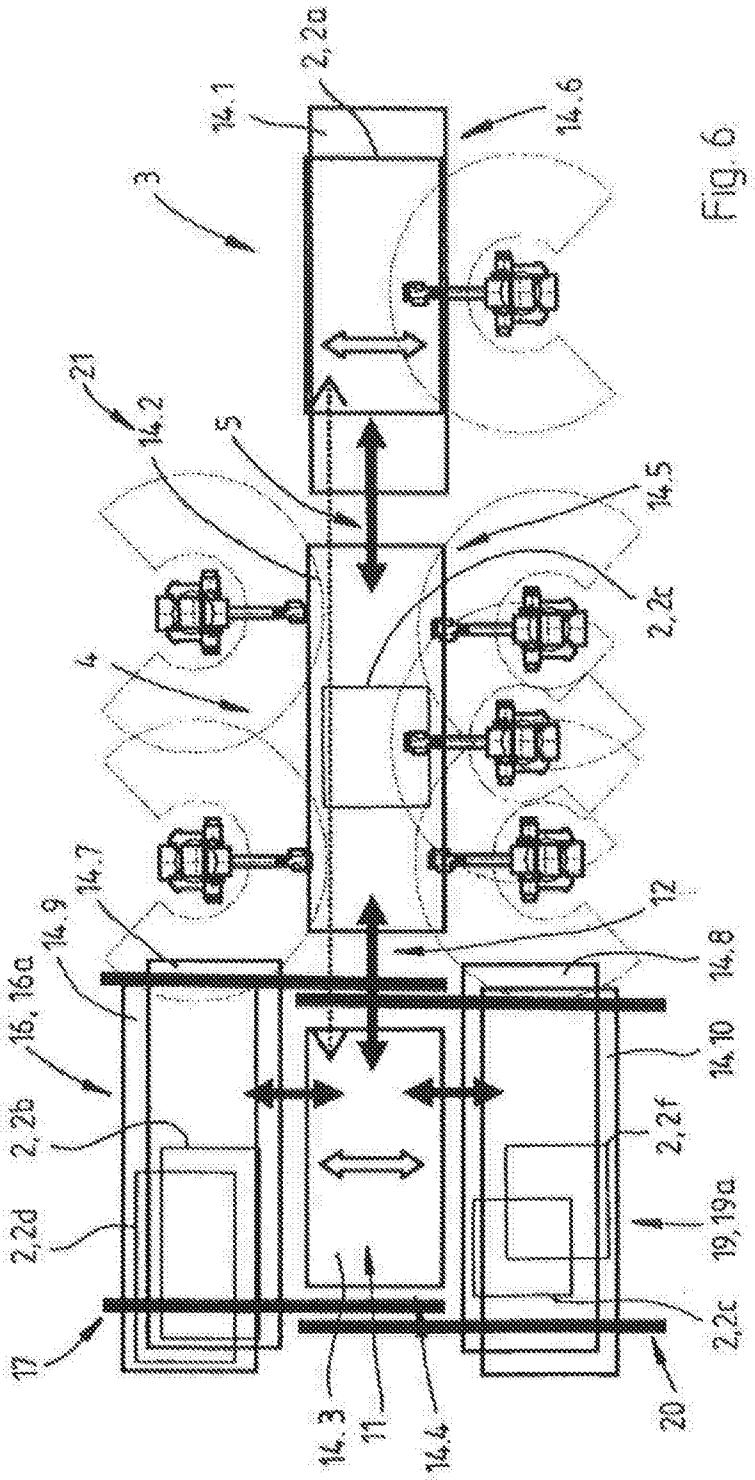

2,2a
14.1
14.6
3
18
14.2
5
2,2c
14.5
4
12
14.7
14.8
16
E1
2,2b
19
2,2d
17
20
14.3
14.4
11

Fig. 5


14.1
2,2a
14.6
3
21
14.2
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14.5
2,2c
4
14.7
14.9
12
14.8
16, 16a
14.10
2,2b
2,2f
2,2d
19, 19a
17
2,2c
20
14.3
11
14.4

Fig. 6

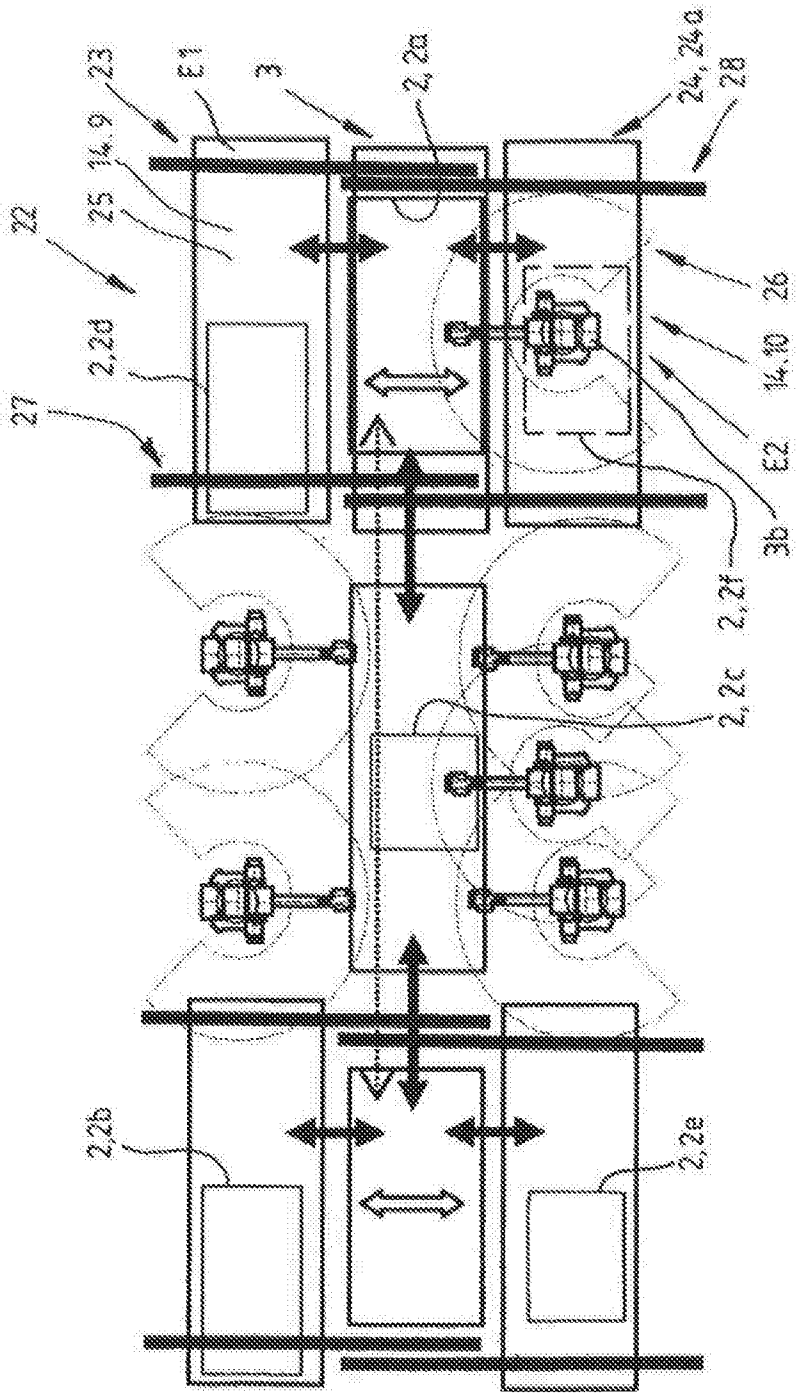
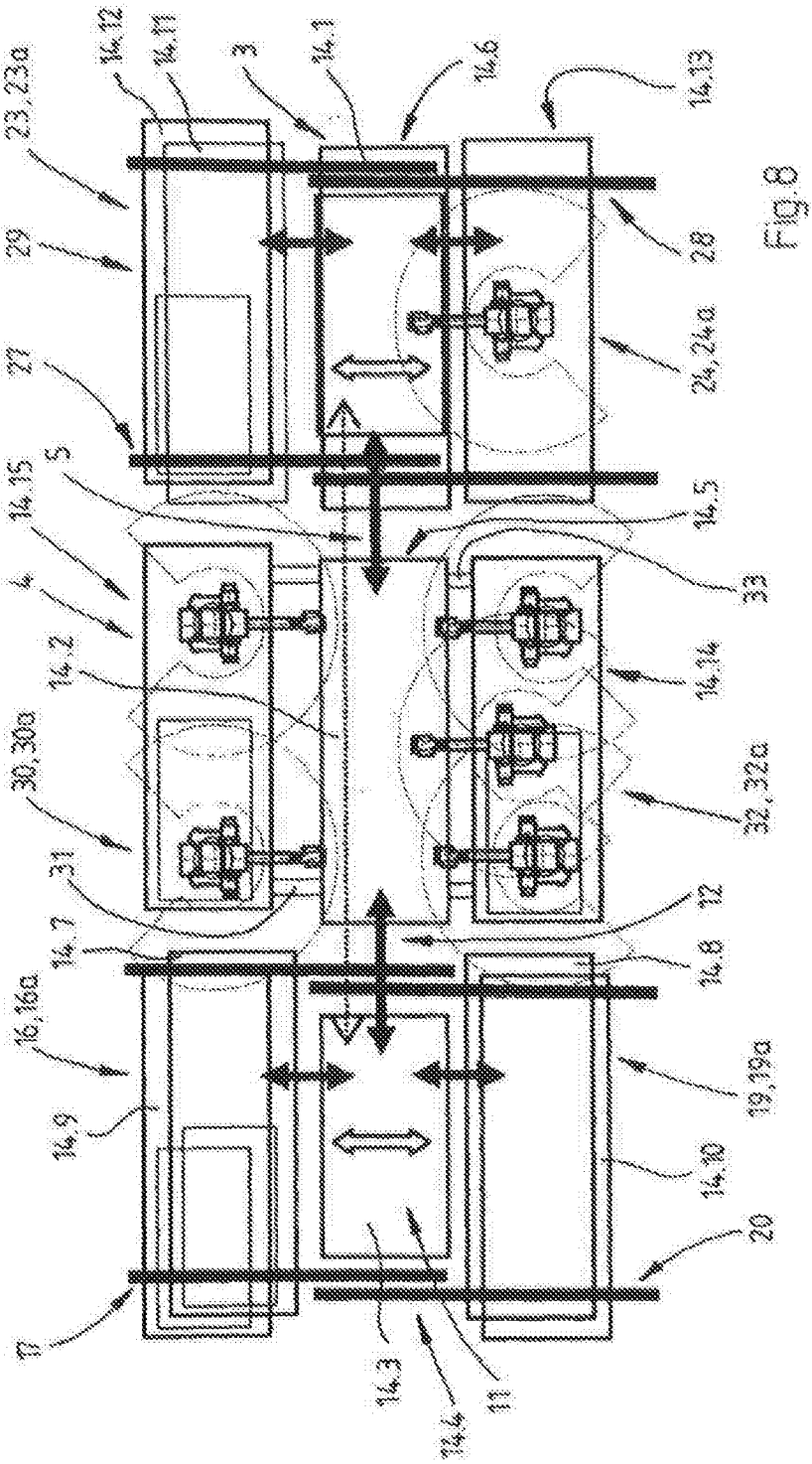


Fig. 7


14.12
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14.14
30, 30a
32, 32a
31
12
14.7
14.8
16, 16a
19, 19a
14.9
14.10
20
17
14.3
14.4
11

Fig.8