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KH MA MD TN(30) Priority: **02.05.2022 IT 202200008549**(71) Applicant: **Azionaria Costruzioni Macchine****Automatiche****A.C.M.A. S.p.A.****40131 Bologna (IT)**(72) Inventor: **RIGHETTI, Marco****40131 Bologna (IT)**(74) Representative: **Puggioli, Tommaso****Bugnion S.p.A.****Via di Corticella, 87****40128 Bologna (IT)**(54) **CONVEYOR FOR A MACHINE FOR FORMING CONTAINERS FROM BLANKS**

(57) A working unit (1) for a conveyor (100) of a machine (200) for forming containers (500) from blanks (300, 300a, 300b) comprises a first and a second forming hopper (3, 4) and a connecting arm (5) for connecting the first hopper (3) to the second hopper (4); the first and

the second hopper are connected respectively to a first end (5a) of the connecting arm and to a second end (5b) of the connecting arm and, together with the connecting arm, define a main direction of extension (D1) of the working unit.

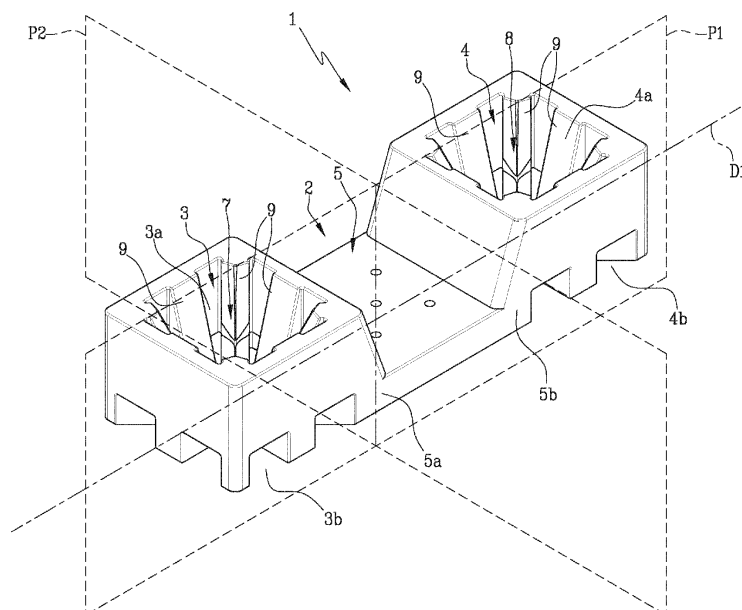


Fig.1

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Description

[0001] This invention relates to a working unit for a conveyor intended for a machine for forming containers from blanks, the conveyor, the machine and a method for forming containers from blanks.

[0002] These containers are used for packaging small-sized loose articles. For example, these containers may be used in the food industry for packaging loose confectionery products and the like. Generally speaking, these containers, for example, are shaped in such a way as to have a cross section that tapers from an upper portion of the container to a bottom portion of the container.

[0003] As is known, machines for forming containers are equipped with a conveyor provided with a plurality of pockets adapted to receive blanks (for example, tubular blanks, whether flat or pre-folded and partly glued) to move them along a path through operating stations which form them.

[0004] In this context, these containers have at least a main body defined by four side walls, a top opening (with upper end flaps) and a bottom opening (with lower end flaps). This container may be made of cardboard or other material suitable for containing the aforementioned small-sized loose articles. Generally, the blanks from which these containers are made are worked with suitable means to make creases and/or lines of weakness on them so that they are more compliant during final folding.

[0005] Next, the blank is conveyed to a part of the machine where two side rails act in conjunction to fold two opposite walls and two folders fold the other two walls. The folders are usually provided with elements that capture one of the panels of the blank and push it in controlled manner so it is folded correctly.

[0006] At the end of this operation, the walls are in a folded position and define the aforementioned cross section from the upper portion to the lower portion; the lower end flaps are then also glued in order to hold the blank in position.

[0007] The container is then filled and the upper end flaps glued in order to close the container thus formed.

[0008] Disadvantageously, prior art machines and methods like the ones described above lack precision and/or are slow in operation to ensure optimum forming to prevent the container from opening during one of the later forming operations.

[0009] In other words, state of the art machines are based on a sequence of operations which, if not adequately coordinated, lead to non-optimal formation of the container or possible damage to it, making it unsuitable for containing the above mentioned loose articles.

[0010] To overcome the above-mentioned drawbacks, the present Applicant developed the solution described in document WO2021/024079.

[0011] The machine described therein comprises a plurality of shaping hoppers, each of which has a top mouth and a bottom mouth, opposite to each other and open to define a shaping through channel, and which are

configured to receive respective blanks at the top mouth. Each hopper is internally provided with folding features giving the shaping channel a tapered cross-sectional shape in order to cause progressive folding of edges and/or side walls of the blank when the blank is inserted into the hopper. The machine comprises an endless conveyor on which are mounted in succession the hoppers and a plurality of pushing elements, each operating on one of the hoppers to push the respective blank into the shaping channel towards the bottom mouth so as to determine the progressive folding of edges and/or side walls of the blank and in such a way that end flaps of the blank protrude respectively from the top mouth and the bottom mouth. The pushing elements are movable in such a way as to follow the respective shaping hoppers along a stretch of the feed path and have a to-and-fro operating movement towards and away from the respective hopper along a direction transverse, preferably perpendicular, to the feed path. The machine comprises folding means disposed on the feed path downstream of the pushing elements and configured to fold the end flaps of the blank inside the respective hopper, thus producing, respectively, a top closure and/or a bottom closure of the blank.

[0012] The solution proposed is, however, difficult to set up in that the hoppers mounted in cantilever fashion upset the balance of the conveyor as they advance, making it necessary to proceed at particularly low speeds which in turn negatively impacts the efficiency of the machine. The action of the pushing elements on the cantilevered hoppers calls for exceptional care and reduced speeds.

[0013] The technical purpose of this invention is therefore to provide a conveyor for a machine for forming containers from blanks and a machine for forming containers from blanks to overcome the above mentioned disadvantages of the prior art.

[0014] The aim of this invention is therefore to provide a working unit for a conveyor of a machine for forming containers from blanks, a conveyor of a machine for forming containers from blanks, and a machine for forming containers from blanks comprising such a conveyor to allow the containers to be formed quickly and precisely.

[0015] This aim is achieved by a working unit for a conveyor of a machine for forming containers from blanks according to claim 1, by a conveyor of a machine for forming containers from blanks according to claim 6, by a machine for forming containers according to claim 10 and by a method for forming containers according to claim 16. The dependent claims correspond to possible different embodiments of the invention.

[0016] According to a first aspect, this invention relates to a working unit for a conveyor.

[0017] Preferably, the conveyor is a conveyor of a machine for forming containers from blanks.

[0018] The working unit has a structure comprising a first and a second forming hopper for forming a corresponding container.

[0019] The structure comprises a connecting arm for

connecting the first hopper to the second hopper.

[0020] The first and the second hopper are connected respectively to a first end of the connecting arm and to a second end of the connecting arm.

[0021] The first hopper, the second hopper and the connecting arm define a main direction of extension of the working unit.

[0022] The working unit comprises an engagement system for engaging or connecting or coupling the working unit to a traction system.

[0023] Preferably, the engagement system is provided in the connecting arm.

[0024] In use, the working unit is movable by the traction system along a feed direction transverse, preferably orthogonal, or parallel to the main direction of extension of the working unit itself.

[0025] Preferably, the first hopper and the second hopper each have a top mouth and a bottom mouth, opposite each other to define a first forming channel in the first hopper and a second forming channel in the second hopper. The first and the second hopper are configured to receive a first blank and a second blank in the corresponding top mouth, respectively.

[0026] The first and the second hopper are each internally provided with folding features that give the first forming channel and the second forming channel a preferably decreasing transverse cross section, to perform progressive folding of the edges and/or sidewalls of the first blank and second blank when the first blank is inserted into the first hopper and the second blank is inserted into the second hopper.

[0027] Preferably, the structure of the working unit is symmetrical about a plane of symmetry orthogonal to the main direction, so that a conveyor comprising a plurality of working units is well balanced.

[0028] Preferably, the structure of the working unit is symmetrical about a plane of symmetry parallel to the main direction.

[0029] Preferably, the first hopper, the second hopper and the connecting arm are made as one piece to define the structure of the working unit. Advantageously, the working unit is simple and compact.

[0030] Preferably, the first forming channel and the second forming channel are through channels. That way, it is possible to process blanks that protrude from both the top mouth and the bottom mouth with flaps that are necessary for forming a bottom closure or a lid of the container.

[0031] Preferably, the bottom mouth of the first hopper is closed or substantially closed and the bottom mouth of the second hopper is closed or substantially closed. Advantageously, it is thus possible to obtain a closed bottom container from a corresponding blank that is deformed and folded against the bottom wall.

[0032] According to an aspect, this description relates to a conveyor of a machine for forming containers from blanks.

[0033] The conveyor comprises a traction system and

at least one working unit according to any one of the aspects set out above, engaged with or connected to or coupled to the traction system, preferably via the engagement system.

[0034] Preferably, the traction system comprises a linear electric motor comprising a stator and at least one slider that is electromagnetically coupled to the stator, where the engagement system of the working unit is engaged with a corresponding slider.

[0035] Preferably, the stator comprises at least one plurality of energizing coils and the slider comprises a permanent magnet.

[0036] Preferably, the conveyor comprises a plurality of working units, each coupled to a corresponding slider of the traction system. Advantageously, each working unit can be driven independently of the others, thus obtaining an extremely flexible conveyor. For example, it is possible to move one or more working units while one or more of the other working units remain stationary or to space the working units apart or group them together depending on the processes which the blanks and/or the containers must be subjected to.

[0037] Moving the working units with a double hopper via linear motors allows using simple, inexpensive motors, if necessary with low dynamics, since each working unit allows moving a pair of blanks.

[0038] Preferably, the stator defines a closed, endless path for the sliders of the conveyor.

[0039] Preferably, the main direction of each working unit is orthogonal to the feed direction of the working units themselves.

[0040] That way, the first and the second hopper are disposed on opposite sides of the traction system and the conveyor is well balanced.

[0041] According to an aspect, this description relates to a machine for forming containers from blanks.

[0042] The machine comprises:

- a conveyor according to any of the aspects set out above and comprising a plurality of working units, where the main direction of each working unit is orthogonal to the feed direction of the working units themselves.

[0043] The working units define a succession of first hoppers along a first feed path and a succession of second hoppers along a second feed path.

[0044] The machine comprises a first set of pushing means having a to-and-fro operating movement towards and away from the first hoppers along a direction perpendicular to the first feed path.

[0045] Each first pushing means acts in conjunction with at least one of the first hoppers to push the corresponding first blank into the corresponding first forming channel, so as to determine a progressive folding of edges and/or side walls of the first blank and in such a way that end flaps of the first blank protrude at least from the top mouth of the first hoppers.

[0046] The machine comprises a second set of pushing means having a to-and-fro operating movement towards and away from the second hoppers along a direction perpendicular to the second feed path.

[0047] Each second pushing means acts in conjunction with at least one of the second hoppers to push the corresponding second blank into the corresponding second forming channel, so as to determine a progressive folding of edges and/or side walls of the second blank and in such a way that end flaps of the second blank protrude at least from the top mouth of the second hoppers.

[0048] Preferably, the first and the second pushing means are located at a folding station of the machine.

[0049] Preferably, the machine comprises folding means disposed along the first and the second feed path, downstream of the folding station, to fold the end flaps of each first and second blank inserted in the respective first or second hopper to make at least one top closure of the first and the second blank. Preferably, the folding means are configured to make a bottom closure of the first and the second blank, in particular in the case where flaps of the blank protrude from the bottom mouths of the first and the second hopper. Preferably, at the folding station, the first pushing means are positioned over the first feed path.

[0050] Preferably, at the folding station, the second pushing means are positioned over the second feed path.

[0051] Preferably, the machine comprises first positioning and feed means for positioning the first blanks and feeding them to the first hoppers and second positioning and feed means for positioning the second blanks and feeding them to the second hoppers.

[0052] At the folding station, the first positioning means are movable between a position near the first feed path and a position far from the first feed path. Preferably, at the folding station, the first positioning means are movable along a direction orthogonal to the feed direction of the working units.

[0053] At the folding station, the second positioning means are movable between a position near the second feed path and a position far from the second feed path.

[0054] Preferably, at the folding station, the second positioning means are movable along a direction orthogonal to the feed direction of the working units.

[0055] Preferably, the first positioning means, when at the position near the first feed path, are interposed between the first pushing means and the first hoppers.

[0056] Preferably, the second positioning means, when at the position near the second feed path, are interposed between the second pushing means and the second hoppers.

[0057] Advantageously, the preferred architecture of the machine allows feeding the first and the second blanks to the first and the second hoppers respectively, so that the corresponding pushing means can form the containers even in groups of working units present at the folding station. Preferably, the traction system of the

working units in the container forming machine comprises a linear electric motor comprising a stator, common to the first and the second feed path and extending in the same direction as the working units, and a plurality of sliders which, for example, comprise permanent magnets and which are electromagnetically coupled to the stator.

[0058] Each working unit of the working units present is coupled to a respective slider of the linear electric motor by its own engagement system, so that each working unit can be moved independently of the others.

[0059] According to an aspect, this description relates to a method for forming containers.

[0060] Preferably, the method for forming containers is implemented with a machine for forming containers according to one of the aspects set out above. Preferably, the method comprises:

- feeding a first tubular blank to a respective first hopper;
- feeding a second tubular blank to a respective second hopper;
- pushing a first tubular blank into the first forming channel of the first hopper via one of the first pushing means;
- pushing a second tubular blank into the second forming channel of the second hopper via one of the second pushing means;
- folding the end flaps of the first tubular blank via the folding means;
- folding the end flaps of the second tubular blank via the folding means.

[0061] Preferably, the step of pushing the first tubular blank into the first forming channel of the first hopper and the step of pushing the second tubular blank into the second forming channel of the second hopper are carried out simultaneously.

[0062] Advantageously, simultaneously pushing the first and second blanks on opposite sides of the connecting arm of the first and second hoppers keeps the working unit balanced.

[0063] Further features and advantages of the above aspects are more apparent in the exemplary, hence non-limiting description of a preferred but non-exclusive embodiment of a conveyor for a machine for forming containers from blanks.

[0064] The description is set out below with reference to the accompanying drawings which are provided solely for purposes of illustration without restricting the scope of the invention and in which:

- Figure 1 illustrates a working unit for a conveyor of a machine for forming containers according to this description, in a schematic perspective view;
- Figure 2 illustrates the working unit of Figure 1 in a schematic perspective view from below;
- Figure 3 illustrates a portion of a conveyor of a ma-

chine for forming containers according to this description, in a schematic perspective view;

- Figure 4 is a schematic perspective view illustrating a blank for forming a container;
- Figure 5 illustrates a container obtained from the blank of Figure 4 in a step of its formation;
- Figure 6 illustrates a container obtained from the blank of Figure 4 after being completed;
- Figure 7 illustrates a machine for forming containers from blanks in accordance with the description, in a schematic plan view with some parts cut away for greater clarity;
- Figure 8 illustrates a folding station of the machine of Figure 7 in a schematic perspective view and with some parts cut away for better clarity;
- Figures 9 and 10 illustrate a detail of the machine of Figure 7 in two different operating configurations in schematic plan views.

[0065] With reference to the accompanying drawings, the numeral 1 denotes a working unit for a conveyor 100.

[0066] The conveyor 100 is intended for a machine for forming containers from blanks, an example of which is illustrated in Figure 7 and is labelled 200.

[0067] Figures 4 to 6 illustrate respectively an example of a blank 300, a semifinished item 400 obtained in the course of transforming the blank 300 into a container, and a container 500.

[0068] The blank 300 is, for example, a pre-glued tubular blank to which reference is made hereinafter without loss of generality.

[0069] The term "tubular blanks" is used to mean blanks 300 having a main body 301 defining side walls 302, a top opening 303 and a bottom opening 304. The blanks 300 illustrated have end flaps 305 at the openings 303, 304.

[0070] By "pre-glued" is meant that the blanks 300 that are originally flat are then folded, glued and flattened to define a partly formed blank that is ready to adopt the shape described above.

[0071] The flat blank 300 is folded and glued in such a way that, when processed, its flattened shape will easily adopt a tubular shape with, for example, a substantially rectangular cross section.

[0072] The blank 300 illustrated by way of example comprises four side walls 302 and four flaps 305 at the top opening 303 and four flaps 305 at the bottom opening 304 (only two of which are visible).

[0073] The example blank 300 has a main body 301 made in the shape of a square base parallelepiped, extending in height and hollow at the bottom and top bases. Other shapes of the blank 300 are imaginable but, for simplicity, this description hereinafter refers to the embodiment of Figures 4 and 5.

[0074] The blank 300 has a plurality of edges 306 and various different fold lines 307 located in proximity to the edges, and joining lines located between the flaps 305 and the side walls 302.

[0075] When the container 500 is fully formed, the flaps 305 at the opening 304 define a bottom closure 501 of the container 500.

[0076] When the container 500 is fully formed, the flaps 305 in the proximity of the opening 303 define a top closure or lid 502 of the container 500.

[0077] A preferred example of a container 500 has a box-shaped body, formed of the main body 301, whose cross section decreases from an upper portion to a lower portion of the main body 301.

[0078] The main body 301, the top closure 502 and the bottom closure 501 delimit a containing space in which to hold loose articles, specifically small-sized loose articles.

[0079] For example, the container 500 is suitable for use in the food industry for packaging loose confectionery products and the like. The closure 502 can be opened by a user to gain access to the containing space in order to take out the loose articles contained therein.

[0080] The working unit 1 has a structure 2 comprising a first and a second forming hopper 3, 4 for forming a corresponding container 500.

[0081] In the example illustrated in Figure 3, the hopper 3, in use, receives a first blank 300a and the hopper 4, in use, receives a second blank 300b.

[0082] The structure 2 comprises a connecting arm 5 for connecting the hoppers 3, 4.

[0083] The hoppers 3, 4 are connected respectively to a first end 5a and to a second end 5b of the arm 5.

[0084] The hoppers 3, 4 and the arm 5 define a main direction of extension D1 of the working unit 1.

[0085] In the embodiment illustrated, the hopper 3, the hopper 4 and the arm 5 are made as one piece to define the structure 2. In alternative embodiments, the hoppers 3 and 4 and the arm 5 are distinct components, for example, joined together by fastening devices to obtain the structure 2.

[0086] In the embodiment illustrated, the structure 2 is symmetrical about a plane P1 parallel to the direction D1.

[0087] In the embodiment illustrated, the structure 2 is symmetrical about a plane P2 orthogonal to the direction D1.

[0088] The working unit 1 comprises an engagement system 6, configured for engaging or connecting or coupling the working unit 1 to a traction system. As illustrated, the engagement system 6 is integral with the arm 5 or formed therein.

[0089] The hoppers 3, 4 each have a top mouth 3a, 4a and a bottom mouth 3b, 4b, confronting each other to define a forming channel 7 in the hopper 3 and a forming channel 8 in the hopper 4.

[0090] In the embodiment illustrated, the channels 7 and 8 are through channels. In an alternative embodiment, the bottom mouths 3b, 4b are closed or substantially closed.

[0091] The top mouth 3a, 4a is the part of the hopper 3, 4 that is configured to initially receive the tubular blanks 300a, 300b,

[0092] The hopper 3 is configured to receive the respective blank 300a at the mouth 3a.

[0093] The hopper 4 is configured to receive the respective blank 300b at the mouth 4a.

[0094] Each hopper 3, 4 is internally provided with folding features 9 giving the channel 7, 8 a decreasing cross-sectional size.

[0095] In an embodiment not illustrated, the channels 7, 8 may have a constant or increasing cross-sectional size.

[0096] In the example illustrated, the inside walls of the hoppers 3, 4 have a series of recesses and/or protuberances defining the folding features 9 giving the channels 7, 8 a cross section that decreases in size from the mouths 3a, 4a to the mouths 3b, 4b. The features 9 are made in such a way as to progressively fold the edges 306 and/or the side walls 302 of the blanks 300a, 300b while the blanks 300a, 300b are being inserted into the respective hoppers 3, 4.

[0097] During insertion of the blanks 300a, 300b into the hoppers 3, 4 respectively, the features 9 press against the edges 306 and/or the side walls 302 so as to give the main body 301 of the corresponding container 500 the shape with the decreasing cross sectional size.

[0098] The conveyor 100 comprises a traction system 101 and a plurality of working units 1.

[0099] The engagement systems 6 of the individual working units 1 are engaged with or coupled to or connected to the system 101 so that it moves the working units 1 along a feed direction D.

[0100] As illustrated, the direction D1 of each working unit 1 is orthogonal to the feed direction D of the working units 1.

[0101] The hoppers 2, 3 are disposed on opposite sides of the traction system 101. In the preferred embodiment illustrated, the system 101 comprises a linear electric motor 102, comprising a stator 103 and a plurality of sliders 104, each electromagnetically coupled to the stator 103.

[0102] The stator 103 defines a closed, endless path for the sliders 104 of the conveyor 100.

[0103] In an embodiment, the sliders 104 are essentially in the form of permanent magnets.

[0104] Each working unit 1 is movable along the stator 103 independently of the others; depending on the operations to be carried out with the blanks, either on the blanks themselves or on the containers, the working units 1 may be, for example, grouped together or spaced apart.

[0105] The engagement system 6 of each working unit 1 is engaged with a corresponding slider 104.

[0106] In practice, each working unit 1 of the conveyor 100 is driven by its own linear electric motor, comprising the respective slider 104 and the stator 103; each working unit 1 is driven or drivable independently of the others. When driven by linear motors, the working units 1 are hereinafter also referred to as "carriages".

[0107] In alternative embodiments, the traction system 101 comprises, for example, a movable cleated belt

which the individual working units 1 are attached to.

[0108] In an example embodiment, as illustrated in Figure 7, the machine 200 comprises a conveyor 100 which comprises a plurality of working units 1 whose main direction of extension D1 is orthogonal to the feed direction D of the working units 1. Looking at Figure 7, the working units 1 move in a clockwise direction V.

[0109] The hoppers 3 follow a feed path P3 and the hoppers 4 follow a feed path P4, parallel to the path P3.

[0110] In the example illustrated, the path P3 and the path P4 each have four straight stretches joined by four curved stretches.

[0111] The row of working units 1 defines a succession of hoppers 3 along the path P3 and a succession of hoppers 4 along the path P4.

[0112] The machine 200 comprises a set 201 of pushing means 202 having a to-and-fro operating movement towards and away from the hoppers 3 along a direction D2 perpendicular to the path P3.

[0113] The pushing means 202 are positioned over the feed path P3.

[0114] Each pushing means 202 acts in conjunction with one of the hoppers 3 to push the corresponding blank 300a into the corresponding forming channel 7, causing the progressive folding of the edges 306 and/or of the side walls 302 of the blank 300a and in such a way that the flaps 305 of the blank 300a protrude at least from the top mouth 3a of the hoppers 3.

[0115] A preferred example of the pushing means 202 and its operation is described in document WO2021024079 (*pushing element 5*) which is incorporated herein by reference for completeness of description.

[0116] With reference in particular to Figure 8, it is noted that the machine 200 comprises a set 203 of pushing means 204 having a to-and-fro operating movement towards and away from the hoppers 4 along a direction D2 perpendicular to the path P4.

[0117] The pushing means 204 are positioned over the feed path P4.

[0118] Each pushing means 204 acts in conjunction with one of the hoppers 4 to push the corresponding blank 300b into the corresponding forming channel 8, causing the progressive folding of the edges 306 and/or of the side walls 302 of the blank 300b and in such a way that the flaps 305 of the blank 300b protrude at least from the top mouth 4a of the hoppers 4.

[0119] A preferred example of the pushing means 204 and its operation is described in document WO2021024079 (*pushing element 5*).

[0120] As shown in Figure 8, the to-and-from movement of the pushing means 202, 204 is performed coaxially with the respective channels 7, 8.

[0121] The pushing means 202, 204 are located at and define a folding station 205 for folding the blanks 300 in the machine 200.

[0122] It should be noted that in Figure 7, for simplicity, the blanks 300a, 300b are illustrated and labelled only

at the station 205.

[0123] The machine 200 comprises first positioning and feed means 206 for positioning the blanks 300a and feeding them to the hoppers 3 and second positioning and feed means 207 for positioning the blanks 300b and feeding them to the hoppers 4.

[0124] At the folding station 205, the means 206 are movable between a position near the feed path P3 and a position far from the path P3.

[0125] At the folding station 205, the positioning means 206 are movable along a direction orthogonal to the feed direction of the working units, that is to say, parallel to the direction D1.

[0126] At the folding station 205, the means 207 are movable between a position near the feed path P4 and a position far from the path P4.

[0127] At the folding station 205, the positioning means 207 are movable along a direction orthogonal to the feed direction of the working units, that is to say, parallel to the direction D1.

[0128] Figures 9 and 10 illustrate an example of the movement of the means 206 at the station 205; in particular, Figure 9 illustrates the positioning means 206 at the position near the path P3 and Figure 10 illustrates the positioning means 206 at the position far from the path P3. The positioning means 207 are preferably movable in a manner substantially similar to the means 206 and not illustrated.

[0129] At the position near the feed path P3, the positioning means 206 are interposed between the pushing means 202 and the hoppers 3.

[0130] At the position near the feed path P4, the positioning means 207 are interposed between the pushing means 204 and the hoppers 4.

[0131] The means 206, 207 have a transverse cross section that is substantially C-shaped so they can correctly hold respective blanks 300a, 300b to position them correctly at respective hoppers 3, 4 and pushing means 202, 204.

[0132] In the example illustrated, the positioning means 206, 207 are movable along a respective, closed path P206, P207, positioned partly over the set 201 of pushing means 202 and the set 203 of pushing means 204, respectively.

[0133] In the example illustrated, the means 206 move clockwise and the means 207 anticlockwise.

[0134] The means 206, 207 are movable between a feed station 208, where the blanks 300a, 300b are fed to the means 206, 207 themselves, and the folding station 205, where the blanks are folded.

[0135] Each positioning means 206, 207 is movable between an engaged configuration in which it is engaged with a respective blank 300a, 300b, corresponding to the position near the respective path P3, P4, and a disengaged configuration in which it is disengaged from the respective blank 300a, 300b, corresponding to the position far from the respective path P3, P4.

[0136] By "engaged configuration" is meant that the

positioning means 206, 207 fits around a respective blank 300a, 300b in such a way as to engage a respective part of a respective pushing means 202, 204. The engaged configuration corresponds to a respective position where the positioning means 206, 207 keeps the blank 300a, 300b aligned with the respective hoppers 3, 4 and with the pushing means 202, 204. The engaged configuration is maintained until the pushing means 202, 204 start pushing the corresponding blank 300a, 300b into the corresponding shaping channel 7, 8.

[0137] By "disengaged configuration" is meant a configuration in which the positioning means 206, 207 allows the respective pushing means 202, 207 to push the blank 300a, 300b into the shaping channel 7, 8. The disengaged configuration corresponds to a position where the means 206, 207 is far from the respective blank 300a, 300b so that the pushing means 202, 204, which is by now engaged with the blank 300a, 300b, can push the blank 300a, 300b into the forming channel 7, 8 without interference.

[0138] The machine 200 comprises folding systems, not illustrated, located along the first and the second feed path P3, P4, downstream of or at the folding station 205, for folding the end flaps 305 of the blanks 300a, 300b, inserted in the respective hopper 3 or 4 to form the bottom closure 501 and the top closure 502 of the containers 500.

[0139] In an embodiment, the bottom closure 501 is formed at the station 205 when the corresponding blank 300a, 300b is pushed into the respective hopper 3, 4.

[0140] The machine 200 comprises a filling station 209 for filling the containers, where the loose products are inserted into the containers 500 and which is located downstream of the station where the bottom closures 501 are formed.

[0141] The folding systems which make the top closure 502 may be located downstream of the filling station to make the lid and close it.

[0142] In an embodiment, the folding systems may fold the flaps 305 to form the lid 502 upstream of the station 209 and close it downstream of the same station.

[0143] Preferably, the machine 100 comprises gluing means (not illustrated), located upstream of the folding systems (or of each folding system) and configured to glue portions of the flaps 305. That way, once the flaps 305 have been folded, the flaps 305 are glued to each other and define the bottom and top closures 501, 502.

[0144] In an embodiment, illustrated by way of example, the machine 100 comprises a first and a second zone 210, 211 where, for example, the containers 500 can be closed and/or other operations can be performed on them. As illustrated, thanks to the linear motors which drive the working units 1, five carriages 1, that is to say, ten containers, are filled at the station 209 simultaneously, while in the zones 210 and 211, one and two carriages are processed at a time, respectively.

[0145] The machine 1 comprises an unloading station 212, where the finished containers 500 are unloaded from the conveyor 100. In the example illustrated, one

carriage 1 is unloaded at a time at the unloading station 212. In use, the blanks 300a, 300b are fed to the positioning means 206, 207 at the station 208. The means 206, 207, following the respective paths P206, P207, carry the blanks 300a, 300b to the station 205.

[0146] At that station, the means 206, 207 preferably find a train of working units 1 with the respective hoppers 3, 4 positioned along the respective paths P3, P4.

[0147] The working units 1 are stationary and positioned so that the hoppers 3, 4 are under the corresponding pushing means 202, 204.

[0148] The tubular blanks 300a, 300b are interposed by the means 206, 207 between a respective hopper 3, 4 and a respective pushing means 202, 204.

[0149] At this point, the pushing means 202, 204 advance towards the respective hopper 3, 4 with a to-and-fro movement.

[0150] Each of the means 202, 204 moves down towards the hopper 3, 4 until it engages the respective blank 300a, 300b and is inserted into it. Once the means 202, 204 has engaged the respective blank 300a, 300b, the positioning means 206, 207 move to the respective far position, illustrated in Figure 10.

[0151] The pushing means 202, 204 now move in such a way as to fully insert the blanks 300a, 300b into the corresponding hoppers 3, 4.

[0152] The means 202, 204 complete their to-and-fro movement by moving away from the respective hoppers 3, 4 and the working units 1 can proceed to the stations or zones downstream, individually or in groups, depending on the operations to be carried out on the blanks or containers. In a preferred embodiment, for example, filling is carried out by groups of working units 1. A method for forming the containers 500 is implemented by the machine 200 for forming containers. The method comprises:

- feeding a tubular blank 300a to a respective hopper 3;
- feeding a tubular blank 300b to a respective hopper 4, opposite the hopper 3 on the same working unit 1;
- pushing the blank 300a into the forming channel 7 of the hopper 3 via one of the pushing means 202;
- pushing the blank 300b into the forming channel 8 of the hopper 4 via one of the pushing means 203;
- folding the end flaps 305 of the blank 300a via the folding systems;
- folding the end flaps 305 of the blank 300b via the folding systems.

[0153] Preferably, the step of pushing the blank 300a into the channel 7 and the step of pushing the blank 300b into the channel 8 are carried out simultaneously.

Claims

1. A working unit for a conveyor (100) of a machine (200) for forming containers (500) from blanks (300,

300a, 300b), the working unit comprising a structure (2) comprising

a first and a second forming hopper (3, 4), each having

a top mouth (3a, 4a) and a bottom mouth (3b, 4b), opposite each other to define a first forming channel (7) in the first hopper (3) and a second forming channel (8) in the second hopper (4), the first and second hoppers (3, 4) being configured to receive a first blank (300a) and a second blank (300b) in the corresponding top mouth, respectively, and each being internally provided with folding features (9) that give the first forming channel (7) and the second forming channel (8) a preferably decreasing transverse cross section, to perform progressive folding of the edges (306) and/or sidewalls (302) of the first blank (300a) and second blank (300b) when the first blank (300a) is inserted into the first hopper (3) and the second blank (300b) is inserted into the second hopper (4),

the structure (2) comprising a connecting arm (5) for connecting the first hopper (3) to the second hopper (4), the first and second hoppers being connected, respectively, to a first end (5a) of the connecting arm and to a second end (5b) of the connecting arm and, together with the connecting arm, defining a main direction of extension (D1) of the working unit, the working unit being movable, by a traction system, along a feed direction (D) transverse, preferably orthogonal, or parallel to the main direction of extension (D1).

2. The working unit according to claim 1, comprising an engagement system (6) in the connecting arm (5) and configured to connect the working unit to a traction system.
3. The working unit according to claim 1 or 2, wherein the structure (2) has at least one plane of symmetry (P1, P2), orthogonal or parallel to the main direction of extension (D1) and to the feed direction (D).
4. The working unit according to any one of the preceding claims, wherein the first hopper (3), the second hopper (4) and the connecting arm (5) are made as one piece to define the structure (2).
5. The working unit according to any one of the preceding claims, wherein the first forming channel (7) and the second forming channel (8) are through channels.
6. The working unit according to any one of claims 1 to 4, wherein the bottom mouth (3b) of the first hopper (3) is closed and the bottom mouth (4b) of the second

hopper (4) is closed.

7. A conveyor of a machine (200) for forming containers from blanks, the conveyor comprising a traction system (101) and at least one working unit (1) according to any one of claims 1 to 6, the working unit comprising an engagement system (6) in the connecting arm (5) coupled to the traction system (101). 5
8. The conveyor according to claim 7, wherein the traction system (101) comprises a linear electric motor (102) comprising a stator (103) and at least one slider (104) electromagnetically coupled to the stator (103), the engagement system (6) being engaged with the slider (104). 10 15
9. The conveyor according to claim 7 or 8, wherein the stator (103) defines a closed, endless path for the slider. 20
10. The conveyor according to any one of claims 7 to 9, wherein the main direction of extension (D1) is orthogonal to the feed direction (D), the first and the second hopper (3, 4) being disposed on opposite sides of the traction system (101). 25
11. A machine for forming containers from blanks (300, 300a, 300b), comprising:
- a conveyor according to claim 10 comprising a plurality of the working units (1);
the working units (1) defining a first succession of the first hoppers (3) along a first feed path (P3) and a second succession of the second hoppers (4) along a second feed path (P4),
the machine comprising
a set (201) of first pushing means (202), each acting in conjunction with at least one of the first hoppers (3) to push the corresponding first blank (300a) into the corresponding first forming channel (7), thereby causing the progressive folding of the edges (306) and/or sidewalls (302) of the first blank (300a) in such a way that end flaps (305) of the first blank (300a) protrude at least from the top mouth (3a) of each first hopper (3),
the first pushing means (202) having a respective to-and-fro operating movement towards and away from the first hoppers (3) along a direction perpendicular to the first feed path (P3);
a set (203) of second pushing means (204), each acting in conjunction with at least one of the second hoppers (4) to push the corresponding second blank (300b) into the corresponding second forming channel (8), thereby causing the progressive folding of the edges (306) and/or sidewalls (302) of the second blank (300b) in such a way that end flaps (305) of the second blank (300b) protrude at least from the top mouth 30 35 40 45 50 55

(4a) of each second hopper (4), the second pushing means (204) having a respective to-and-fro operating movement towards and away from the second hoppers (4) along a direction perpendicular to the second feed path (P4);
the first and second pushing means (202, 204) being located in a folding station (205) of the machine,
the machine comprising folding systems disposed along the first and second feed paths (P3, P4), downstream of the folding station (205), configured to fold the end flaps (305) of each first and second blank (300a, 300b) inserted in the respective first or second hopper (3, 4) and to make at least one top closure (502) of the first and second blank (300a, 300b).

12. The machine according to claim 11, wherein the first pushing means (202) are positioned over the first feed path (P3) in the folding station (205) and the second pushing means (204) are positioned over the second feed path (P4) in the folding station (205).
13. The machine according to claim 11 or 12, comprising first positioning means (206) for positioning the first blanks (300a) and second positioning means (207) for positioning the second blanks (300b), the first positioning means (206) being movable between a position near the first feed path (P3) and a position far from the first feed path (P3), the first positioning means (206), when at the position near the first feed path (P3), being interposed between the first pushing means (202) and the first hoppers (3), the second positioning means (207) being movable between a position near the second feed path (P4) and a position far from the second feed path (P4), the second positioning means (207), when at the position near the second feed path (P4), being interposed between the second pushing means (204) and the second hoppers (4).
14. The machine according to claim 13, wherein the first positioning means (206) are movable between the position near the first feed path (P3) and the position far from the first feed path (P3) along the main direction of extension (D1) of the working unit (1) and wherein the second positioning means (207) are movable between the position near the second feed path (P4) and the position far from the second feed path (P4) along the main direction of extension (D1) of the working unit (1).
15. The machine according to any one of claims 11 to 14, wherein the traction system (101) comprises a linear electric motor (102) comprising a stator (103), common to both the first and the second feed path (P3, P4) and extending along the same, and a plurality of sliders (104), electromagnetically coupled to

the stator (103), each working unit (1) of the plurality of working units being coupled to a respective slider (104) of the linear electric motor (102) by its own engagement system (6).

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- 16.** The machine according to any one of claims 11 to 15, wherein the folding systems are configured to make a bottom closure (501) of the first and the second blank (300a, 300b).

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- 17.** A method for forming containers (500) in a machine (100) according to any one of claims 11 to 16, comprising the following steps:

- feeding a first blank (300a) to a respective first hopper (3); 15
- feeding a second blank (300b) to a respective second hopper (4) opposite the first hopper (3) in the same working unit (1);
- pushing the first blank (300a) into the first forming channel (7) of the first hopper (3) using one of the first pushing means (202); 20
- pushing the second blank (300b) into the second forming channel (8) of the second hopper (4) using one of the second pushing means (204); 25
- folding the flaps (305) of the first blank (300a) by means of the folding systems;
- folding the flaps (305) of the second blank (300b) by means of the folding systems; 30

- 18.** The method according to claim 17, wherein the step of pushing the first blank (300a) into the first forming channel (7) of the first hopper (3) using one of the first pushing means (202) and the step of pushing the second blank (300b) into the second forming channel (8) of the second hopper (4) using one of the second pushing means (204) are carried out simultaneously.

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- 19.** The method according to claim 17 or 18, wherein the step of feeding a first blank (300a) to a first hopper (3) and the step of feeding a second blank (300b) to a second hopper (4) are carried out simultaneously.

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- 20.** The method according to any one of claims 17 to 19, comprising individually moving each of the working units (1) in the forming machine (100).

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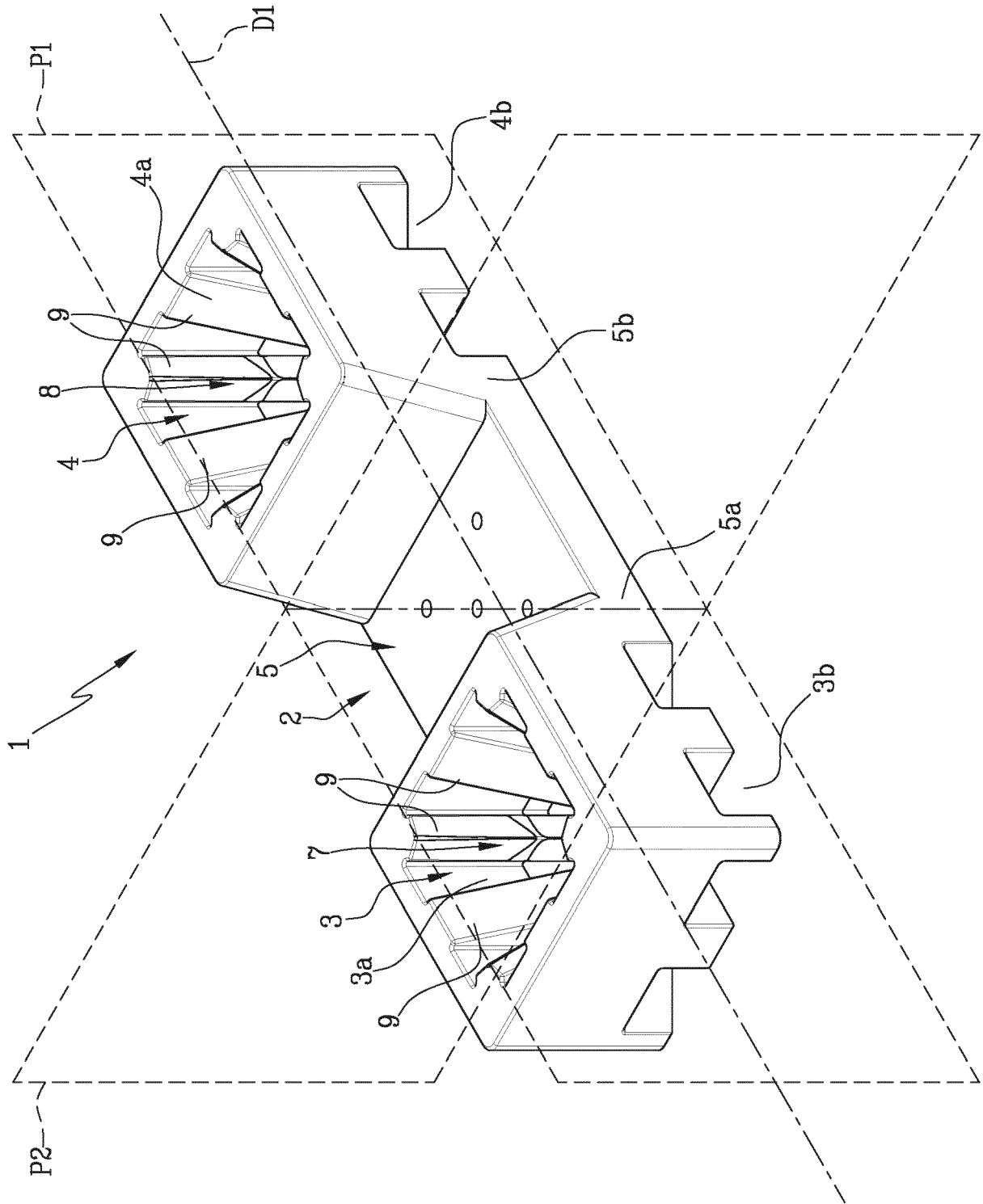
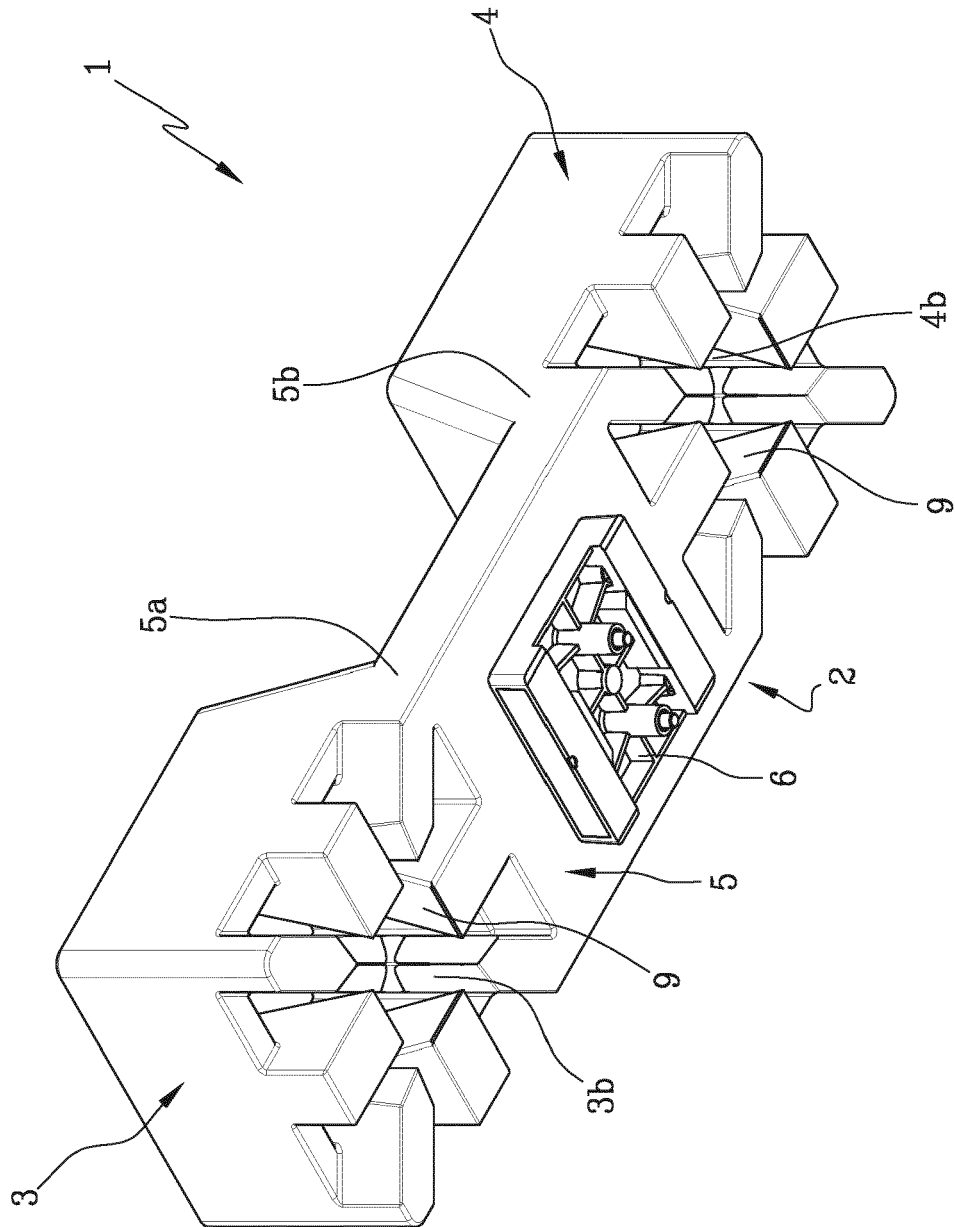


Fig.1



Fi. 2.

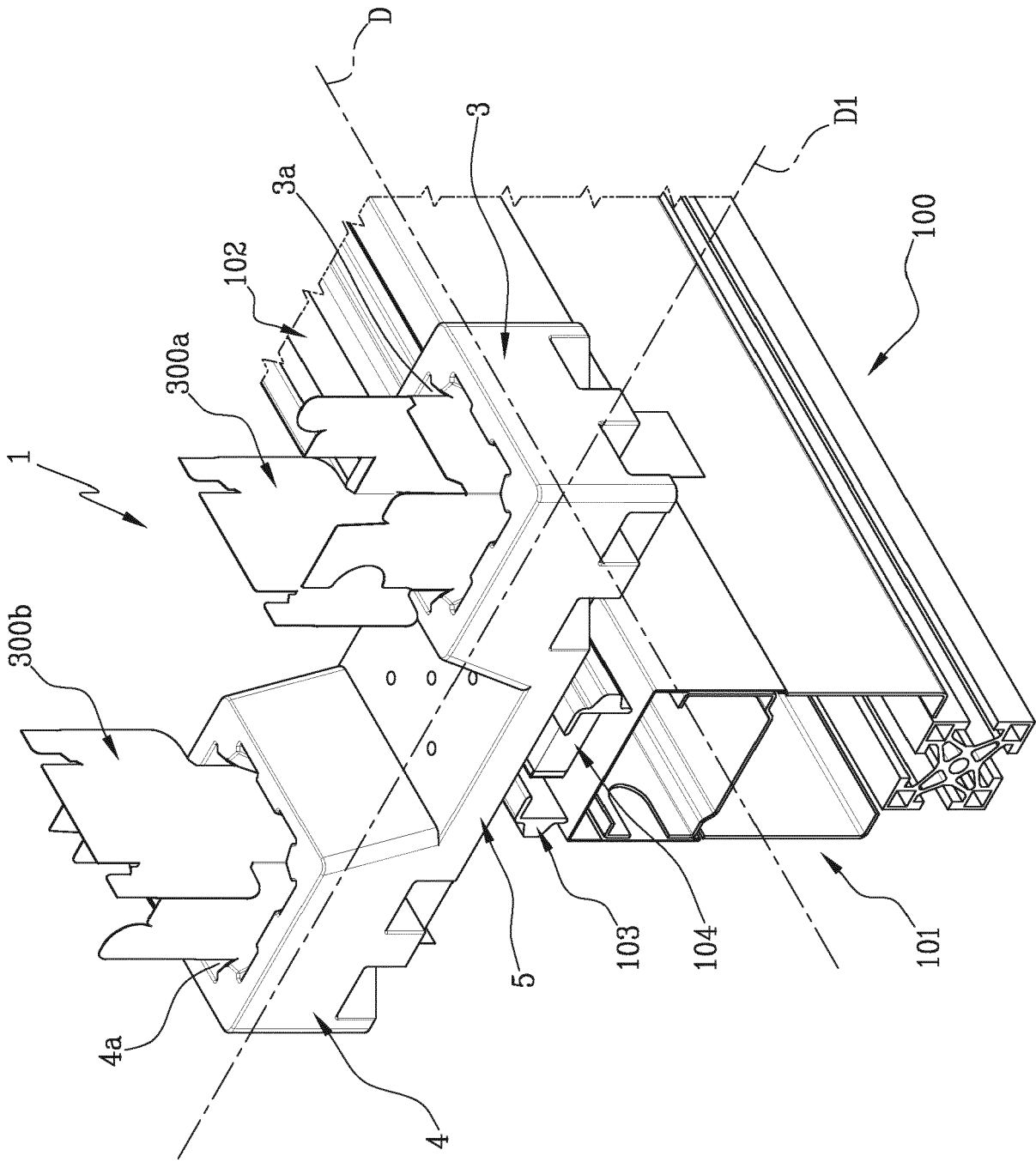


Fig.3

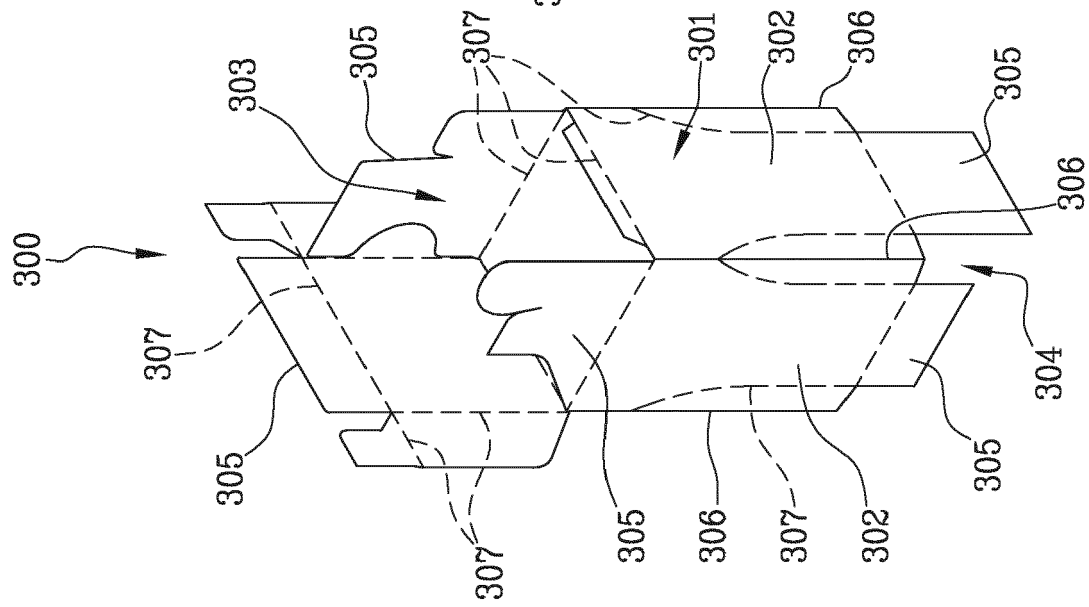


Fig. 4

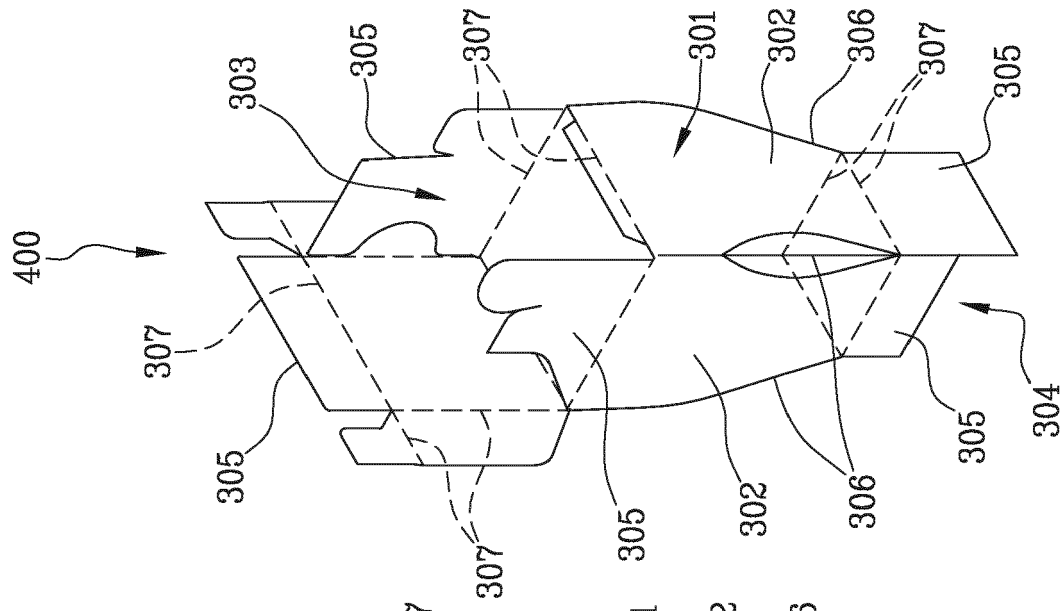


Fig. 5

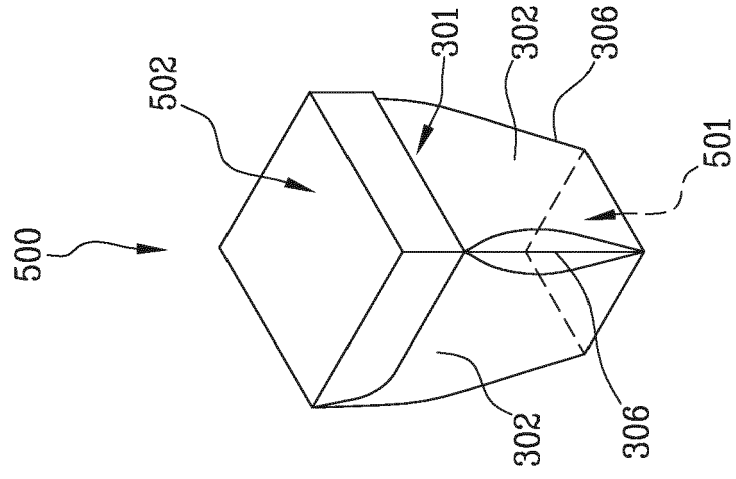


Fig. 6

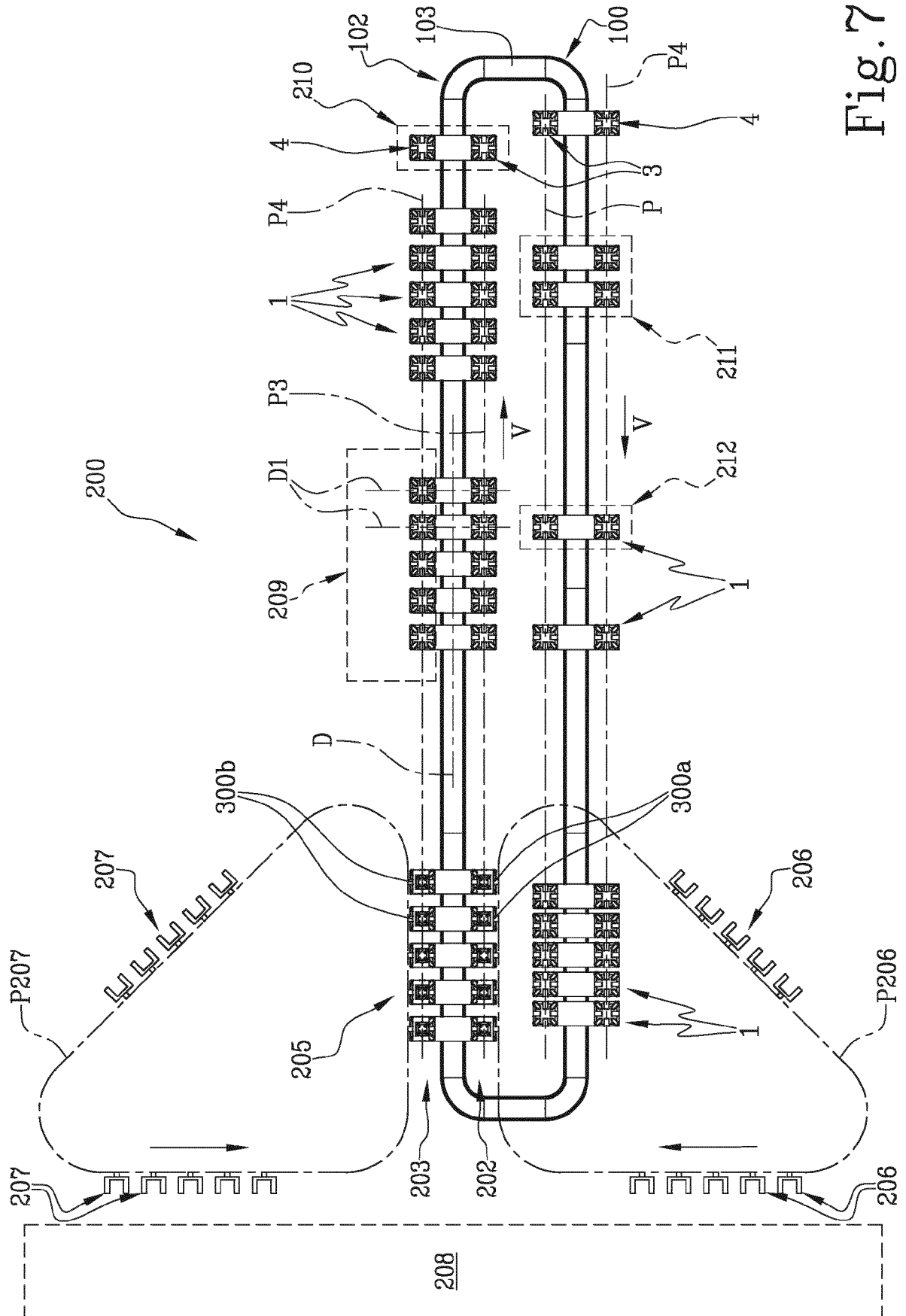


Fig. 7

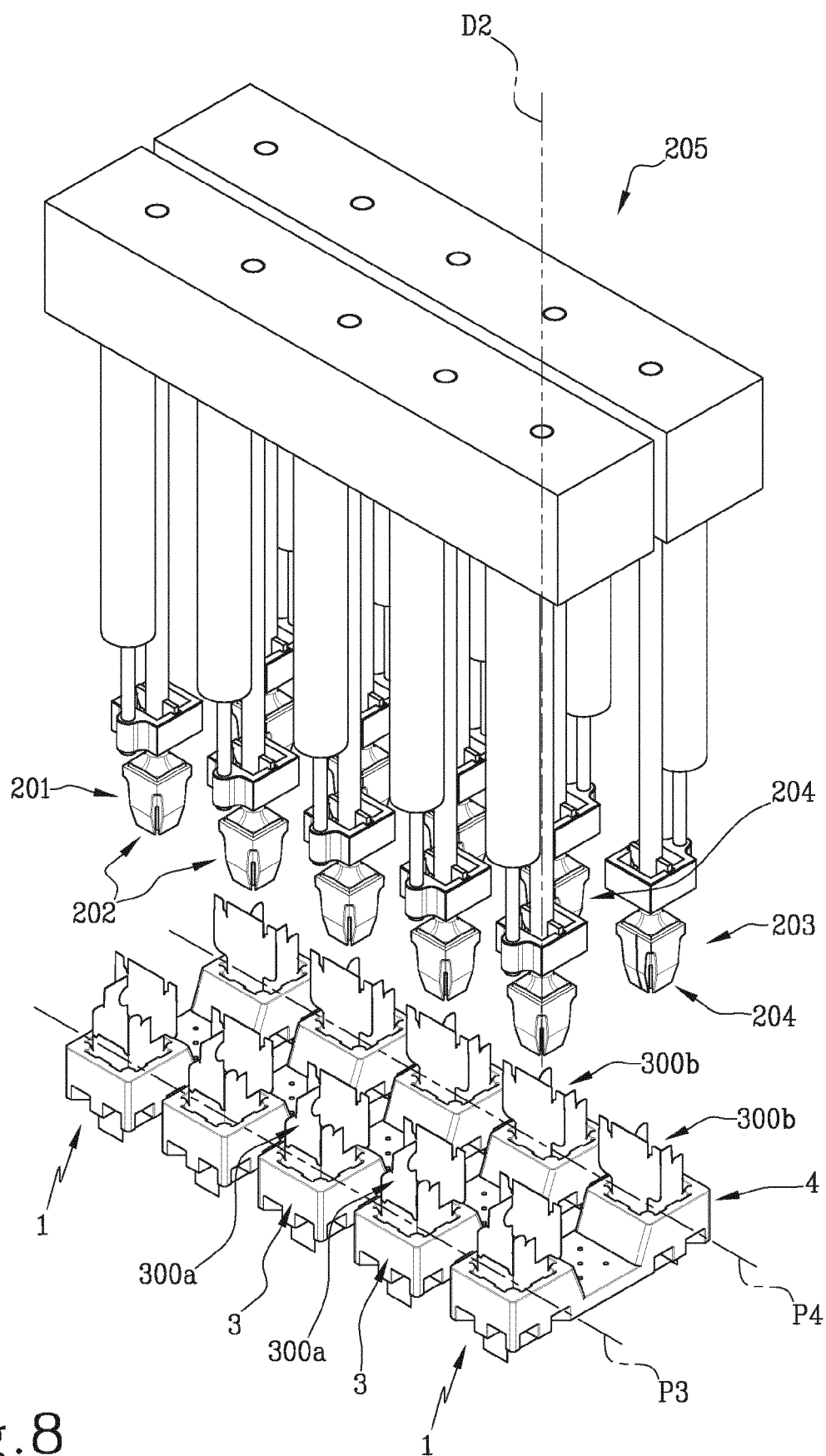


Fig.9

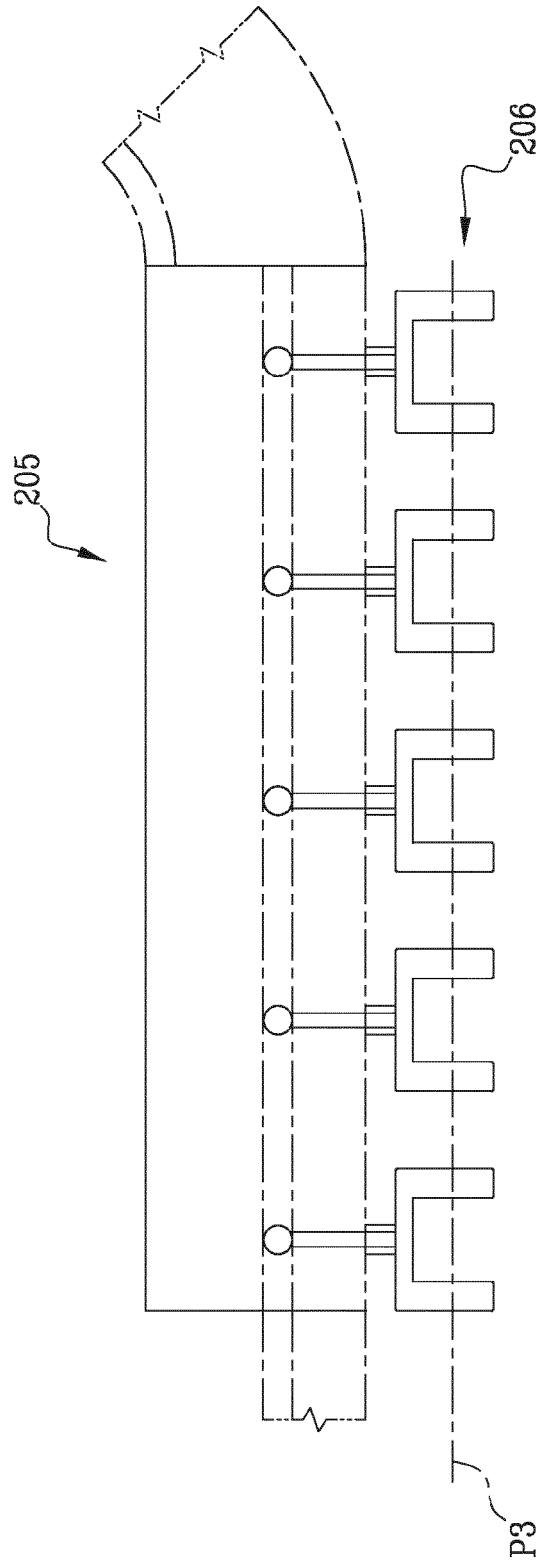
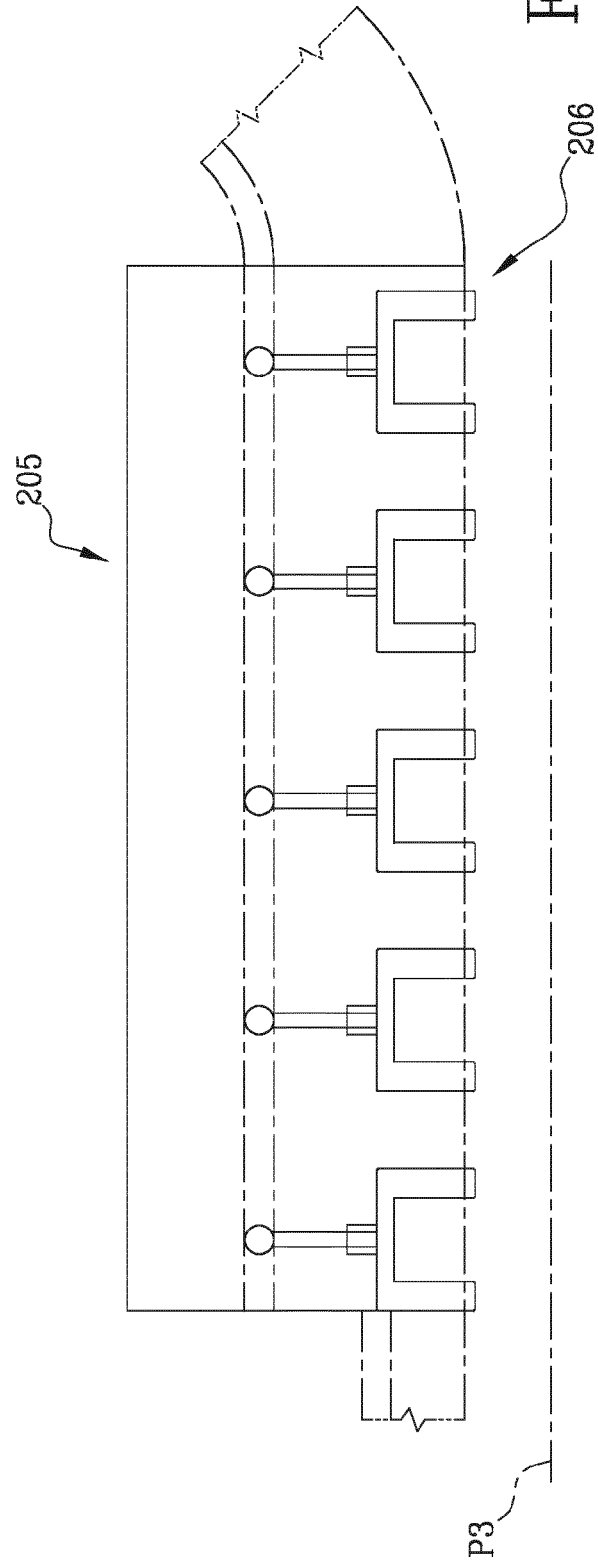


Fig.10





EUROPEAN SEARCH REPORT

Application Number

EP 23 17 0855

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A, D	WO 2021/024079 A1 (AZIONARIA COSTRUZIONI ACMA SPA [IT]) 11 February 2021 (2021-02-11) * the whole document *	1-20	INV. B31B50/44 B31B50/59 B31B50/00 B65B25/00 B65B1/02
A	US 2012/190520 A1 (RIVERA ADRIAN [US]) 26 July 2012 (2012-07-26) * paragraph [0024] - paragraph [0030]; figures 1-3 *	1-20	ADD. B31B100/00 B31B110/10 B31B110/35 B31B120/10
			TECHNICAL FIELDS SEARCHED (IPC)
			B31B B65B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		21 August 2023	Johne, Olaf
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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21-08-2023

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