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(72) Inventors:
• **Cavini, Renzo**
48018 Faenza RA (IT)
• **Cusumano, Dario**
48018 Faenza RA (IT)

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(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

(71) Applicant: **Roberto Bucci e. C. SpA**
48018 Faenza (RA) (IT)

(54) **Product grouping station**

(57) A product grouping station (1), of the type that comprises a product pickup and conveyance member (2), a unit (3) for forming groups of products and a compaction apparatus (4). The station (1) comprises at least one movable carriage (5), which is arranged downstream of the pickup and conveyance member (2), for insertion in at least one compartment (6) of the products to be

grouped, a pusher (7) for transferring the groups of products in the compaction apparatus (4). The compaction apparatus (4) comprises at least one lateral face (8) that can perform a translational motion from a maximum distance with respect to the face (9) that lies opposite thereto to a minimum distance, in order to reduce the overall bulk of the group.

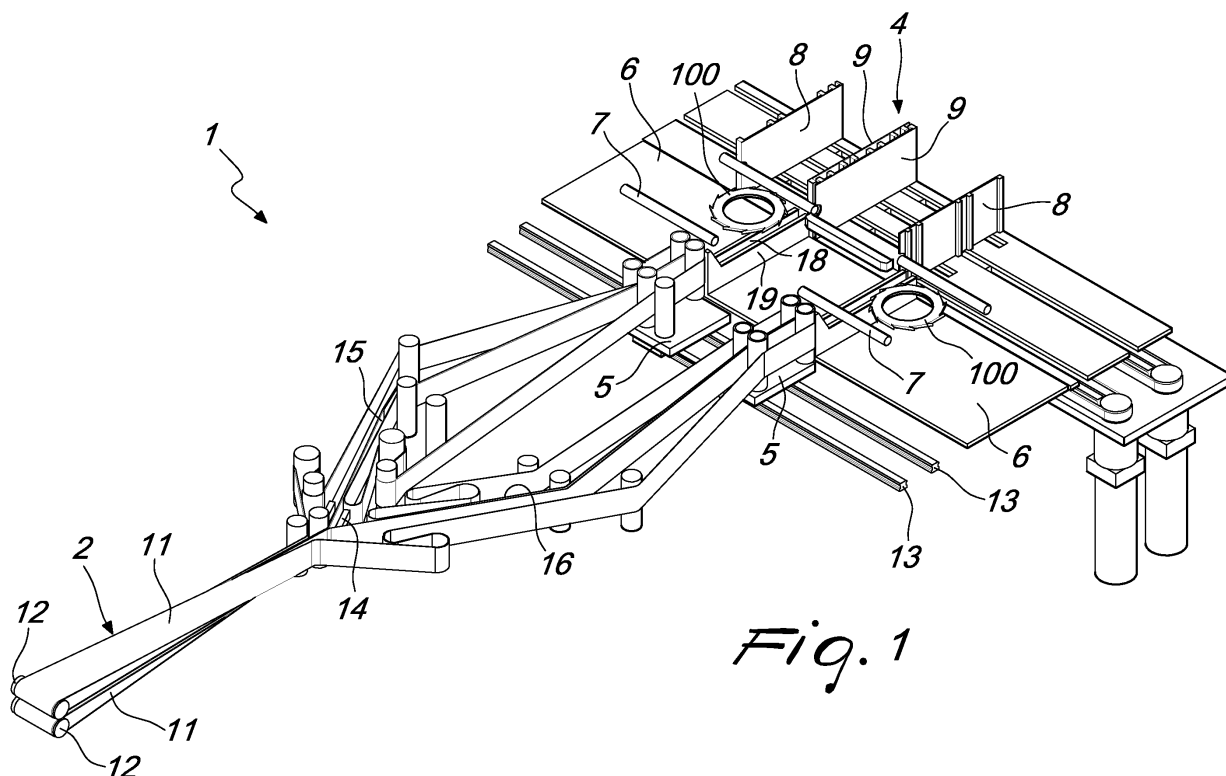


Fig. 1

Description

[0001] The present invention relates to a product grouping station, particularly suitable for packaging and packing lines, in order to prepare the product in a configuration that is suitable for insertion within appropriate packages.

[0002] Production and packaging lines generally comprise a first stage for the production of the products, a station for grouping and sorting such products, and the actual final packaging machine.

[0003] In particular, with reference to products such as sanitary towels, diapers and the like (i. e., products which are particularly soft and include a considerable amount of air), a compaction process is also necessary during grouping and sorting so that they can be packaged so as to reduce their bulk. This bulk reduction must in any case be preset depending on the characteristics of the materials that constitute the products so that the formation of permanent deformations of such products is avoided.

[0004] For performing sorting, grouping and compaction of the products, stations are known which consist of an input line that is adapted to convey products on a rack.

[0005] By means of a suitable pickup member, the products are transferred from the rack to a unit for compaction in groups of preset size (depending on the dimensions set by the final package).

[0006] The compaction unit must operate at a speed that is lower than a maximum limit at which products may accidentally escape from the group, with consequent degeneration of the cycle. This upper limit for the compaction speed is one of the factors that constrain the entire station to work within low speed ranges.

[0007] Stations of this type are generally designed specifically to work with products that have certain characteristics (dimensions, softness) and in order to provide predefined packages.

[0008] Changing format and changing count (i. e., the number of products contained in each package to be provided) are often complex and onerous operations (additional components are needed to adapt the entire station to the new format).

[0009] Grouping and compaction performed with standard stations provide for the presence of a large number of moving members: this leads to rapid wear of the components and to a high probability of malfunction.

[0010] The structural configuration of a known type of grouping station entails that the product feed line (whose axis is substantially aligned with the axis of the output of the stage for production of such products) is offset with respect to the output line of the sorted and compacted product groups.

[0011] The axial offset causes poor utilization of installation spaces: part of the industrial building cannot be used, because it is occupied by the station in at least one of its portions.

[0012] With stations of the traditional type it is possible

to supply the sorted and compacted products to one packaging machine only; this makes it impossible to implement packaging that can be obtained by arranging on the side of the packaging machine operators who simultaneously perform manual packaging on another group.

[0013] With traditional grouping stations, in case of malfunction of the packaging machine, a damage occurs which corresponds to the scattering of the groups of products that have already been formed up to the moment when the supply of products to the station is stopped.

[0014] Moreover, the versatility of traditional stations is distinctly limited, since modifying them in order to implement their performance is particularly complicated.

[0015] The aim of the present invention is to solve the above-mentioned drawbacks, by proposing a product grouping station in which format changing (and count changing) is simple and straightforward and does not require complex and expensive auxiliary components.

[0016] Within this aim, an object of the invention is to propose a product grouping station that is scarcely subject to wear and malfunctions caused by the moving masses.

[0017] Another object of the invention is to propose a product grouping station that does not have a negative effect on the bulk of the entire production and packaging line to which it belongs.

[0018] Another object of the invention is to propose a product grouping station in which a malfunction of the packaging machine arranged downstream of said station does not cause scattering/loss of the groups of products that have already been sorted and compacted.

[0019] Another object of the invention is to propose a product grouping station in which implementation of performance is relatively simple.

[0020] Another object of the invention is to propose a product grouping station in which the compaction speed of the group of products does not have limits caused by the possible breakup of said group.

[0021] Another object of the invention is to propose a product grouping station that can be obtained easily starting from commonly commercially available elements and materials.

[0022] Another object of the invention is to propose a product grouping station that can be embodied at low cost.

[0023] This aim and these and other objects which will become better apparent hereinafter are achieved by a product grouping station, of the type that comprises a product pickup and conveyance member, a unit for forming groups of products and a compaction apparatus, **characterized in that** it comprises at least one movable carriage, which is arranged downstream of said pickup and conveyance member, for insertion in at least one compartment of the products to be grouped, a pusher for transferring the groups of products in the compaction apparatus, said compaction apparatus comprising at least one lateral face that can perform a translational motion from a maximum distance with respect to the face that

lies opposite thereto to a minimum distance, in order to reduce the overall bulk of the group.

[0024] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of a product grouping station according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic perspective view of a first possible embodiment for a product grouping station according to the invention;

Figure 2 is a schematic perspective view of a second possible embodiment for a product grouping station according to the invention;

Figure 3 is a schematic perspective view of a third possible embodiment for a product grouping station according to the invention;

Figure 4 is a schematic perspective view of a fourth possible embodiment for a product grouping station according to the invention;

Figure 5 is a schematic perspective view of a fifth possible embodiment for a product grouping station according to the invention;

Figure 6 is a schematic perspective view of a sixth possible embodiment for a product grouping station according to the invention;

Figure 7 is a schematic perspective view of a seventh possible embodiment for a product grouping station according to the invention.

Figure 8 is a schematic perspective view of an eighth possible embodiment for a product grouping station according to the invention;

Figure 9 is a scheme of the operation cycles of a product grouping station according to the invention.

[0025] With reference to the figures, the reference numeral 1 generally designates a product grouping station.

[0026] The grouping station 1 comprises a member 2 for picking up and conveying products, a unit 3 for forming groups of products and a compaction apparatus 4.

[0027] The station 1 according to the invention comprises at least one movable carriage 5, which is arranged downstream of the pickup and conveyance member 2, for insertion of the products to be grouped in at least one fixed compartment 6.

[0028] Each fixed compartment is functionally associated with a pusher 7, which is designed to transfer the groups of products into the compaction apparatus 4.

[0029] The compaction apparatus 4 comprises at least one side wall 8, which can perform a translational motion from a maximum distance, with respect to a face 9 that lies opposite thereto, to a minimum distance, in order to reduce the overall bulk of the group. The mutual approach of the two faces entails the compression of the products that constitute the group, with consequent expulsion of the air stored inside them: once the approach has been completed, the overall bulk of the group is considerably

smaller than at the beginning.

[0030] The minimum constructive configuration according to the invention is shown schematically in Figure 6: the pickup member 2 receives the products from a store or from the machine that produces them; said products are conveyed to the movable carriage 5, which is instantaneously aligned with the point that is suitable for insertion of the product in the respective compartment 6. Once the cycle has been completed (the compartment 6 contains a number of products equal to the number suitable for final packaging), the pusher 7 performs a translational motion, parallel to itself, from its inactive configuration arranged upstream of the compartment to a stroke limit configuration, in which it is aligned with an end edge 10 of the compartment 6. At this point the products are located on the compaction apparatus 4: the approach of the opposite faces 8 and 9 produces the compaction of the group.

[0031] Once the group of products has been compacted, it can be expelled, by suitable expulsion means, or picked up by specific elements associated with the input stage of the packaging machine arranged downstream of the grouping station 1 according to the invention.

[0032] Specifically, it can be noted that the pickup member 2 (according to a possible non-limiting embodiment related to the adoption of possible kinematically equivalent variations) consists of a pair of belts 11, which are wound around respective pulleys 12 and are adapted to define a gap within which the product enters for conveyance toward the carriage 5.

[0033] In particular, it can be noted that even if the product arrives arranged in a horizontal configuration, the geometry of the belts 11 allows tipping for the transfer of the product to the carriage 5 in a vertical configuration (a configuration that is suitable for forming the group and for the subsequent compaction thereof).

[0034] The carriage 5 is mounted on respective guides 13 that allow its movement along a preset direction.

[0035] Motion of the carriage 5 is ensured by a respective motor: the motor can be associated with the carriage 5 by mechanisms such as belts and pulleys, chains and pinions, or gears and worm gears. The possibility of moving the carriage 5 by means of a linear actuator, be it electrical, of the induction type (for example a linear induction motor), pneumatic or hydraulic (pneumatic or hydraulic cylinders), is not excluded.

[0036] In this case, the compartment 6 is preferably fixed and comprises a plurality of partitions designed to divide it: said partitions (and their function) will be described hereinafter exhaustively.

[0037] In this case, filling of the compartment 6 is achieved by arranging a predefined number of products (in Figure 9 reference letters a) b) c) d) e) f)) that corresponds to the number of products needed to form a group. At this point, the carriage performs a translational motion by a distance that is equal to the space corresponding to "n" products: the insertion of "n" products in the compartment 6 on the part of the carriage 5 requires

the same time that is needed to transfer the products a) b) c) d) e) f) from the compartment 6 previously filled to the compaction apparatus 4.

[0038] This means that the carriage 5 moves with an alternating motion (loads the products a) b) c) d) e) f), moving from the left to the right, and the products a') b') c') d') e') f) from the right to the left), and that therefore, by skipping "n" steps between the delivery of the product f) and the delivery of the product a'), while the station 1 transfers the products a) b) c) d) e) f) onto the apparatus 4, the carriage 5 arranges the products a') b') and c') on the compartment 6. This operating process optimizes the performance of the station 1 (the process is explained in Figure 9).

[0039] The motion of the face 8 (or of both faces 8 and 9, if they are both movable) is also achieved by means of suitable movement elements: in this case as well, the adoption of belts (or chains) and pulleys (or pinions) moved by a respective motor (electric, pneumatic or hydraulic) has been considered particularly suitable, but the possibility of using linear actuators or other equivalent apparatuses is not excluded.

[0040] According to a particular embodiment that is of particular interest in practice and in application as a consequence of the higher operating speed, there can be at least two movable carriages.

[0041] In this case, the pickup and conveyance member 2 shall comprise a controlled redirection unit 14 for sorting the products on at least two respective lines 15 and 16 for product transfer. The redirection unit 14 can be actuated electrically or by means of suitable hydraulic or pneumatic cylinders: in any case, it is controlled by a suitable control and management unit designed to count the products. The control unit sorts the products from one line 15 to the other line 16 after the supply of all the products needed to form a group to the line 15 has been completed; this operation is repeated continuously during the cyclic operation of the station 1.

[0042] More specifically, with reference to an embodiment that has excellent operating performance, the controlled redirection unit 14 has a plurality of outputs, at least two of which are associated lines 15 and 16 that lead to a respective carriage 5 and at least one of which is associated with a line (not shown in the accompanying figures) that leads to a container for collecting defective products. The control and management unit comprises sensors, arranged along the initial portion of the member 2, designed to verify the characteristics of the product: a product that does not conform or is defective is sent by the redirection unit 14 to the line that leads to the waste container.

[0043] According to a possible embodiment, each fixed compartment 6 comprises a plurality of equidistant partitions 17.

[0044] These partitions 17 are needed for the stable and tidy accommodation of a respective product in the interspace formed between two contiguous partitions 17.

[0045] In an alternative embodiment, each compart-

ment 6 comprises two side walls 18 and 19, at least one of which is movable.

[0046] Each product delivered by the respective movable carriage 5 into the corresponding compartment 6 is, in this case, accommodated in the interspace formed between the two walls 18 and 19, optionally with the interposition of the other products previously delivered by the carriage 5 to the compartment 6.

[0047] In order to achieve a high sorting and compaction speed of the station 1, it may be convenient for the movable carriages 5 to be at least two, each associated with a respective compartment 6.

[0048] As shown in Figures 4 and 5, it is possible to provide a station 1 in which the movable carriages 5 (two in the example shown in the figure, but potentially in any number) are actuated by means of a single motor: this produces a synchronous motion with a constant center distance of the two carriages 5.

[0049] In this case, while the first carriage 5 fills the corresponding compartment 6 (for example from the central wall 19 to the outer wall 18), the second carriage 5 is not active. Once the first compartment 6 has been filled, the condition is reached in which the second carriage is substantially aligned with the position for insertion of the first product in the corresponding second compartment 6: in practice, the pusher 7 can empty the first compartment 6 while the second carriage 5 fills the second compartment 6. In this manner, the cycle for sorting, forming the group and compacting it is continuous and very efficient.

[0050] As shown in Figures 1, 2 and 3, it is possible to provide a station 1 in which the movable carriages 5 (two in the example shown in the figure, but potentially in any number) are actuated by means of respective motors for the independent movement of the two carriages 5.

[0051] With respect to the embodiment described earlier, the adoption of independent motor drives enables a considerable increase in the overall speed of the station 1 and the possibility to adopt simple and inexpensive solutions to cool each motor. While one carriage 5 is motionless, it is in fact possible to strike the corresponding motor with a cooling jet: in the case of movable motors, instead, the cooling jet dispensing nozzle would have to follow the corresponding motor step by step, leading to high production costs.

[0052] As already mentioned earlier, for each compartment 6 the compaction apparatus 4 comprises at least one lateral face 8 that can perform a translational motion from a maximum distance with respect to the other face 9 that faces it to a minimum distance. The translating face 8 and the corresponding other face 9 are, according to at least one configuration for receiving the group of products from the compartment 6, arranged so as to face each other and be proximate to the corresponding compartment 6.

[0053] For each compartment 6, each compaction apparatus 4 comprises two movable faces 8 and 9, and the mutual approach of the faces 8 and 9 causes the com-

paction of the group of products; the translational motion of both faces 8 and 9 produces the movement of the group of products from the pickup region, which faces and is proximate to the corresponding compartment 6, to a dispensing region (which faces and is proximate to the input of the packaging machine arranged downstream of the station 1).

[0054] The pusher 7 comprises a bar which constitutes the actual pusher 7 and which is actuated slidingly along slots 20 provided on the side walls 18 and 19 of the compartment 6 from a raised configuration for not interfering with the stroke of the products from the carriage 5 to the compartment 6 to a configuration of alignment with the end edge of the compartment 6: in this second configuration, the bar faces and is proximate to the compaction apparatus 4.

[0055] It should be noted that in a station 1 according to the invention it is possible to adopt a compartment 6 which comprises a lamina that forms a containment and covering roof 21: the roof 21 ensures maximum correctness in the arrangement of the products within the compartment for forming the group.

[0056] Likewise, the compaction apparatus 4 can also comprise a plate that forms a containment and covering roof: in this case, it should be noted that the products constituting the group are kept in position by the lateral faces 8 and 9 and by the plate (roof) during compaction. Containment of the products during compaction makes it possible to adopt extremely high compaction speeds, since breakup of the group (caused for example by the streams of air expelled from the products) is prevented indeed by the box-like shape of the compaction apparatus 4.

[0057] The station 1 according to the invention allows the speed of extraction of the group to be independent of the speed of transfer of the product from the carriage 5 to the compartment 6. Only the number of cycles affects the extraction speed: the execution of many cycles per unit time in fact entails the provision of groups consisting of a small number of products and therefore a high speed; the execution of a small number of cycles per unit time entails providing groups consisting of many products and therefore a low speed.

[0058] It should be noted that the station 1 according to the invention, with respect to grouping units of a known type, ensures that the input axis of the product is analogous to the axis of the packaging machine arranged downstream of the station. This makes it possible first of all to provide a single version of the station 1 (there are no right-handed or left-handed versions depending on the direction of the axial offset, as in traditional stations) and secondly facilitates better utilization of the installation space within the industrial building.

[0059] The station 1 can be associated with any known type of packaging machine without requiring particular modifications.

[0060] The possibility of adopting a rejection line downstream of the redirection unit 14, further, implements the

functions of the station 1 with respect to known types of stations.

[0061] The possibility is not excluded to provide a station 1 according to the invention in which each individual compaction apparatus 4 (aligned with a corresponding compartment 6 supplied by a respective carriage 5) supplies autonomously the compacted groups to a suitable packaging machine: in this manner it would also be possible to provide groups having different dimensions (or consisting of different numbers of products) on separate compartments 6, each group leading, by means of the corresponding apparatus 4, to a specific packaging machine. This embodiment has never been adopted in known types of stations.

[0062] Neither is the possibility of installing a level lifting unit excluded, which is functionally associated with the compaction apparatus 4: this solution makes it possible to provide the compacted groups to packaging machines with inputs at heights that are different from the height of the working level of the station 1 or to provide the compacted groups to multiple packaging machines whose inputs are stacked.

[0063] It is useful to note that the operating buffer (i.e. the maximum quantity of products that can be stored without blockage even if the output groups are not picked up by the packaging machine) is composed of a few groups. This is because the normal cycle provides for one area being filled and one area being emptied toward the packaging machine, but if a delay on the clearance of the packaging machine occurred, the following conditions would arise: first compaction apparatus 4 full and ready for emptying; second compaction apparatus 4 freshly filled; first compartment 6 being filled, and, in an extreme case, the second compartment 6 being filled as well. A total of four groups in the station 1 while the packaging machine is motionless.

[0064] The station 1 therefore can increase the operating performance (both in input and in terms of packages in output) by increasing the number of components (and processes): the geometric/structural characteristics of the simpler version shown in Figure 6 and of the complex (and fast) versions of Figures 1, 2, 3 and 7 are in fact similar. If needed, implementation can take place during installation simply by adding the components needed to reach the required performance.

[0065] The versatility of the station 1 is reflected also in the particular ease of format change and count change (modification of the number of products per group): these variations can be provided simply by acting on the control software of the station in order to modify the entered parameters; practically all the components are in fact movable and partly motorized, and their position therefore can be set rapidly and easily by the operator.

[0066] With these solutions, a variation of the distance of the walls 18 and 19 (and of the dimensions of the group) depending on the actual thickness of the product is possible. If the thickness of the product in input is controlled, it is possible to vary the spacing of the carriage 5 (which

corresponds to each expulsion of a product in the compartment 6) and the spacing of the walls 18 and 19 of the compartment 6 in order to provide the seat for accommodating the particular product.

[0067] By reducing the number of moving parts, in the station 1 according to the invention, with respect to known types of stations, a considerable reduction in malfunctions and wear of the components (particularly of high-wear and low-mass components) takes place as well. The adoption of linear motions further facilitates maintenance and adjustment of the station 1.

[0068] For very small stacks (low counts), it is possible to extract two stacks at a time (arranged laterally adjacent for each apparatus 4).

[0069] In this case, each apparatus comprises three walls, a central one of which is fixed and two lateral ones of which produce, by moving mutually closer, compaction of the product. The products are first dispensed in an area of the compartment 5 that faces the interspace formed between the first wall and the fixed wall and then in another area of the compartment 5 that faces the interspace formed between the second wall and the fixed wall. Compaction of the groups of products occurs by moving the outer walls toward the fixed central wall. Transfer of the compacted groups to the packaging machine occurs sequentially: first the group compacted between the first wall and the central wall and then the other one.

[0070] It must be noted that it is possible to associate with each type of station 1 according to the invention suitable bodies 100 which are aligned with the corresponding carriage 5 and are designed to receive the product, brake it and facilitate correct deposition and positioning thereof with respect to the others already deposited in the compartment 6, and maintain the position of each product (and also of the freshly formed group) with an operation that is equivalent to the operation of a wall 18. The presence of these bodies 100 makes the entire grouping and compaction process more stable.

[0071] In the figure, it can be seen that the body 100 consists of a wheel provided with perimetric pockets designed to accommodate the products temporarily; the use of helical members or other components having a suitable profile (cams and the like) is not excluded.

[0072] In order to allow (when the station 1 comprises a single driving source for both carriages 5) efficient and quick operation even when there is only a very small number of products for each group, it is necessary to operate on the station in order to modify its parameters.

[0073] In practice it is possible to vary the mutual position of the walls 19 (moving them apart or closer) until the condition occurs in which, when the first carriage 5 has delivered the last product in the respective first compartment 6, the second carriage 5 is ready to dispense the first product in the first position of the second compartment 6.

[0074] As an alternative, it is possible to keep the walls 19 fixed and vary the center distance between the two carriages 5 in order to obtain the same alignment condi-

tions described above.

[0075] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0076] In the exemplary embodiments shown, individual characteristics, mentioned with reference to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0077] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0078] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0079] The disclosures in Italian Patent Application No. BO2008A00057 from which this application claims priority are incorporated herein by reference.

[0080] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A product grouping station, of the type that comprises a product pickup and conveyance member (2), a unit (3) for forming groups of products and a compaction apparatus (4), **characterized in that** it comprises at least one movable carriage (5), which is arranged downstream of said pickup and conveyance member (2), for insertion of the products to be grouped in at least one compartment (6), a pusher (7) for transferring the groups of products in the compaction apparatus (4), said compaction apparatus (4) comprising at least one lateral face (8) that can perform a translational motion from a maximum distance with respect to the face (9) that lies opposite thereto to a minimum distance, in order to reduce the overall bulk of the group.
2. The station according to claim 1, **characterized in that** said movable carriages (5) are at least two, said pickup and conveyance member (2) comprising a redirection unit (14) actuated for sorting the products on at least two respective product transfer lines (15, 16).
3. The station according to claim 2, **characterized in that** said controlled redirection unit (14) has a plurality of outputs, of which at least two are associated

lines (15, 16) that lead to a respective carriage (5) and at least one is associated with a line that leads to a container for collecting the defective products.

4. The station according to claim 1, **characterized in that** each compartment (6), which is preferably fixed, comprises a plurality of equidistant partitions (17) for the stable and sorted accommodation of a respective product in the interspace formed between two contiguous partitions (17). 5
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5. The station according to claim 1, **characterized in that** each compartment (6) comprises two side walls (18, 19), at least one of which is movable, each product dispensed by the respective movable carriage (5) in said compartment (6) being accommodated in the interspace formed between the two walls (18, 19), optionally with the interposition of the other products dispensed previously by the carriage (5) to the compartment (6). 15
20
6. The station according to claim 1, **characterized in that** said movable carriages (5) are at least two, each associated with a respective compartment (6). 25
7. The station according to claim 6, **characterized in that** said at least two movable carriages (5) are actuated by means of a single motor, for synchronous motion with constant center distance of the at least two carriages (5). 30
8. The station according to claim 6, **characterized in that** each one of said at least two movable carriages (5) is actuated by means of a respective motor for the independent motion of the at least two carriages (5). 35
9. The station according to claim 1, **characterized in that** for each compartment (6), said compaction apparatus (4) comprises at least one lateral face (8) which can perform a translational motion from a maximum distance with respect to the other face (9) that faces it to a minimum distance, said translatable face (8) and the corresponding other face (9) being, according to at least one configuration for receiving the group of products, arranged so as to face and be proximate to a corresponding compartment (6). 40
45
10. The station according to claim 9, **characterized in that** for each compartment (6), each said compaction apparatus (4) comprises two movable faces (8, 9), the mutual approach of said faces (8, 9) producing the compaction of the group of products, the translational motion of both faces (8, 9) producing the movement of said group of products from the pickup region that faces and is proximate to a corresponding compartment (6) to a dispensing region. 50
55

11. The station according to claim 1, **characterized in that** said pusher (7) comprises a bar that is actuated so that it can slide along slots (20) provided in the side walls (18, 19) of said compartment (6) from a raised configuration for non-interference with the stroke of the products from the carriage (5) to the compartment (6) to a configuration for alignment with the end edge of the compartment (6), with the bar facing and proximate to said compaction apparatus (4). 5
10
12. The station according to one or more of the preceding claims, **characterized in that** said compartment (6) comprises a lamina that forms a containment and covering roof (21). 15
13. The station according to one or more of the preceding claims, **characterized in that** said compaction apparatus (4) comprises a plate that forms a containment and covering roof. 20

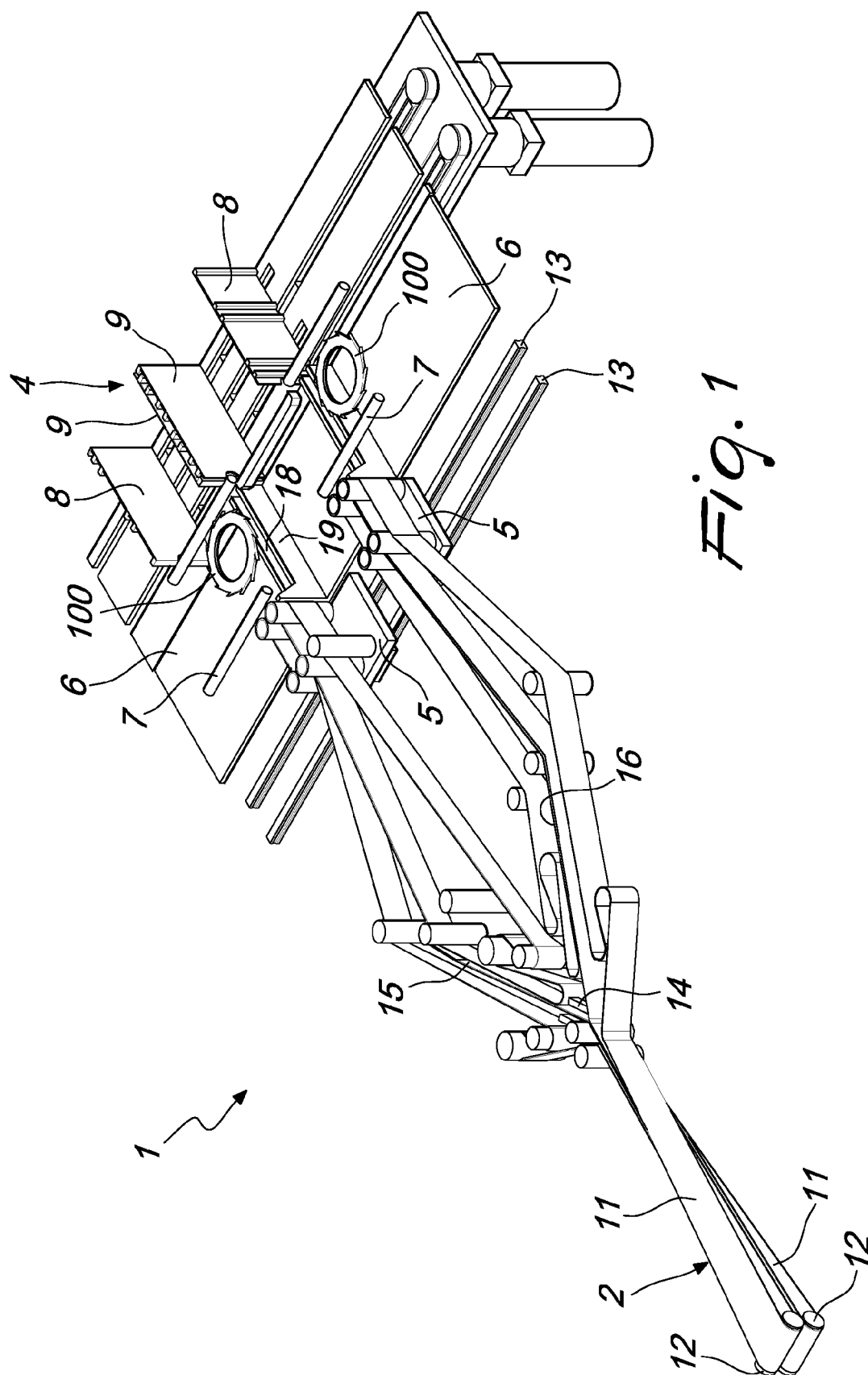
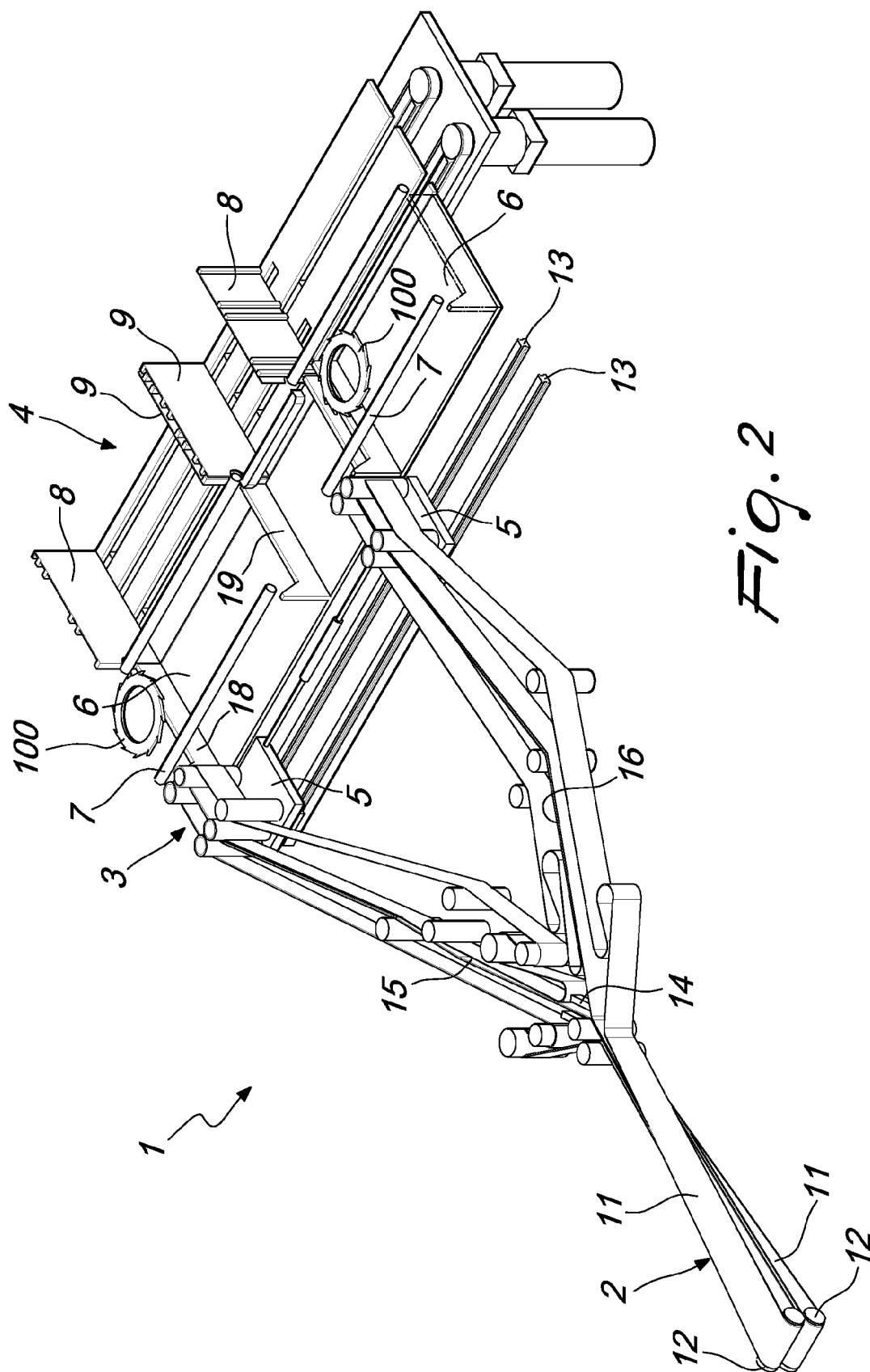
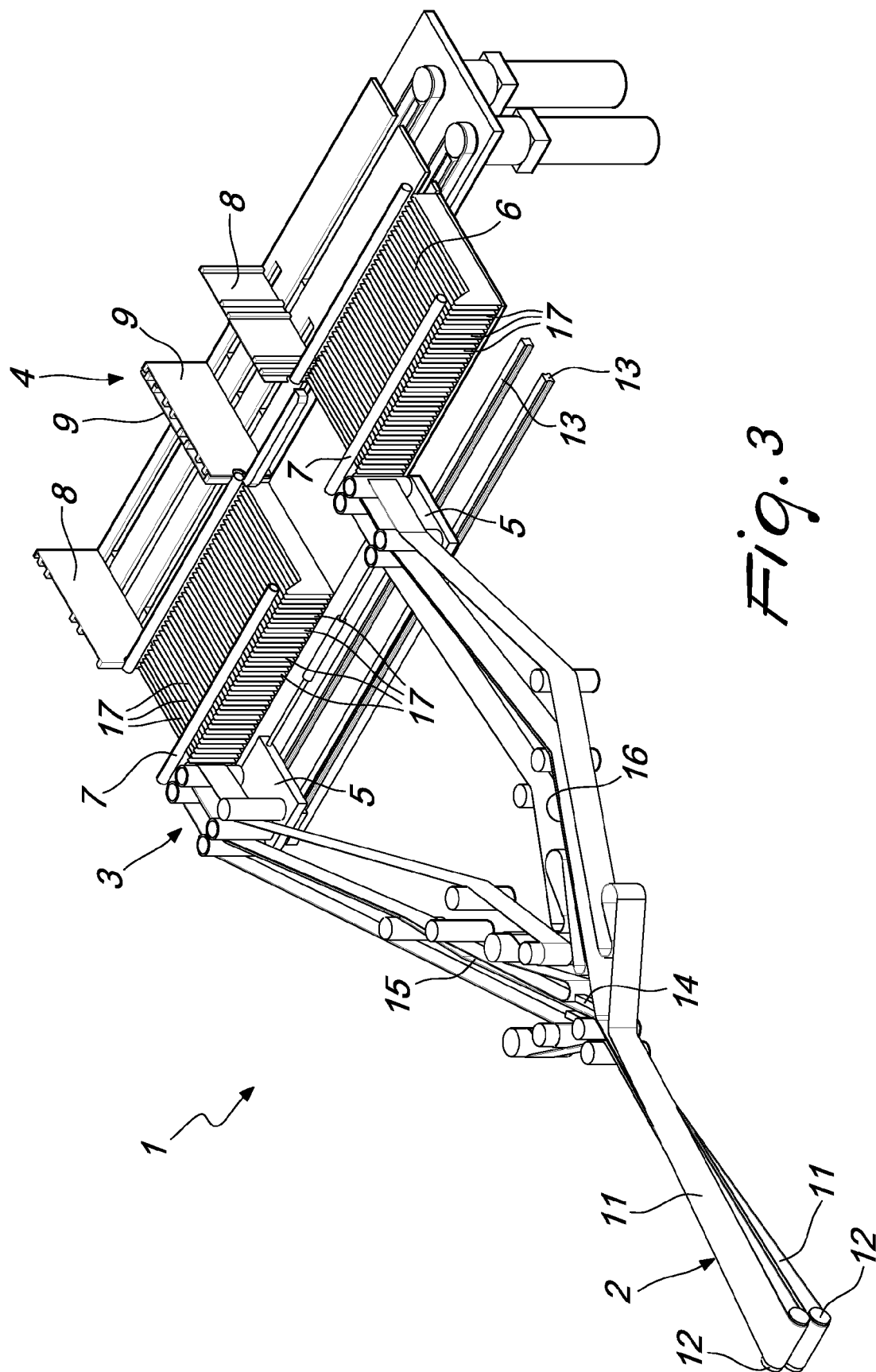


Fig. 1





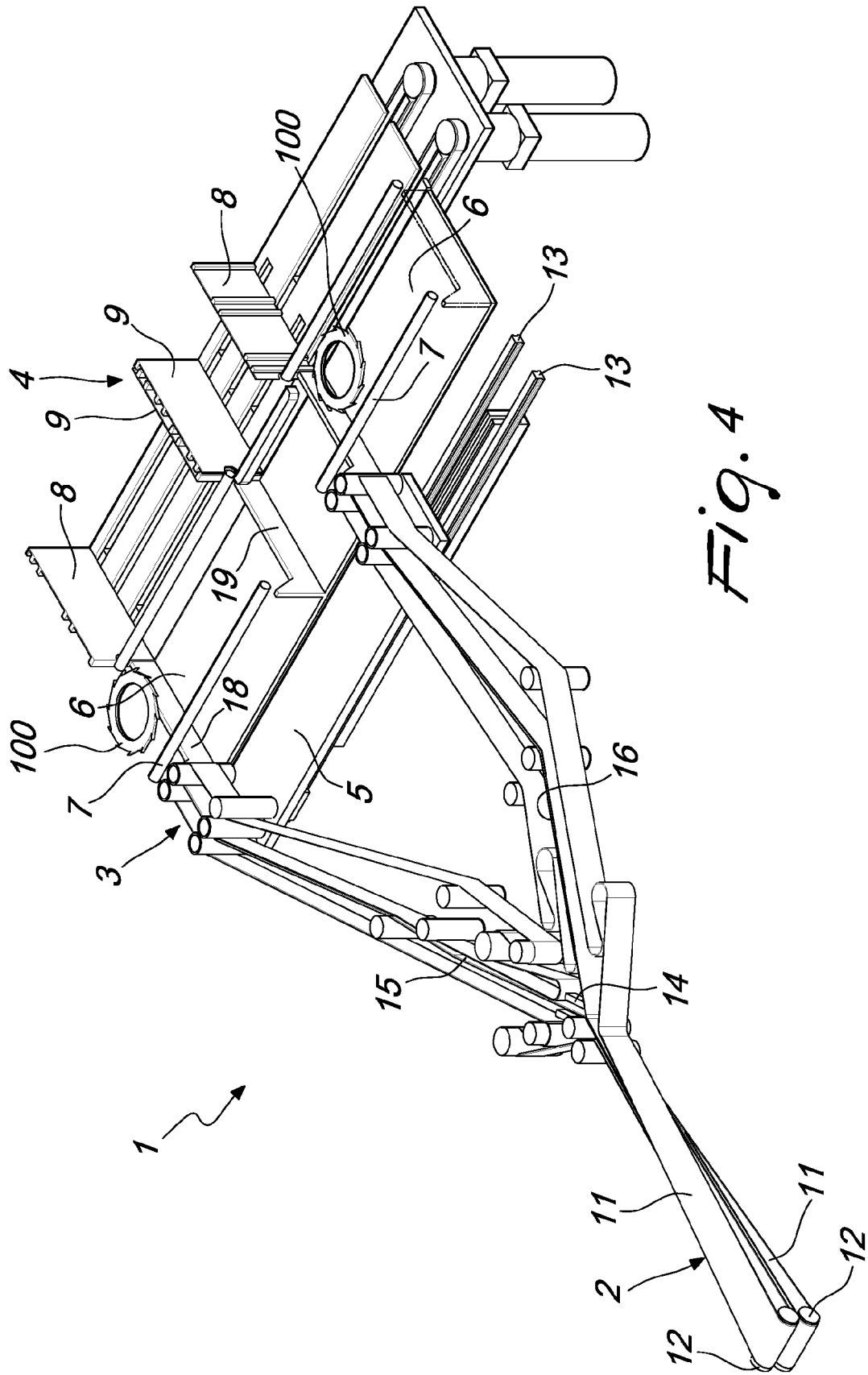


Fig. 4

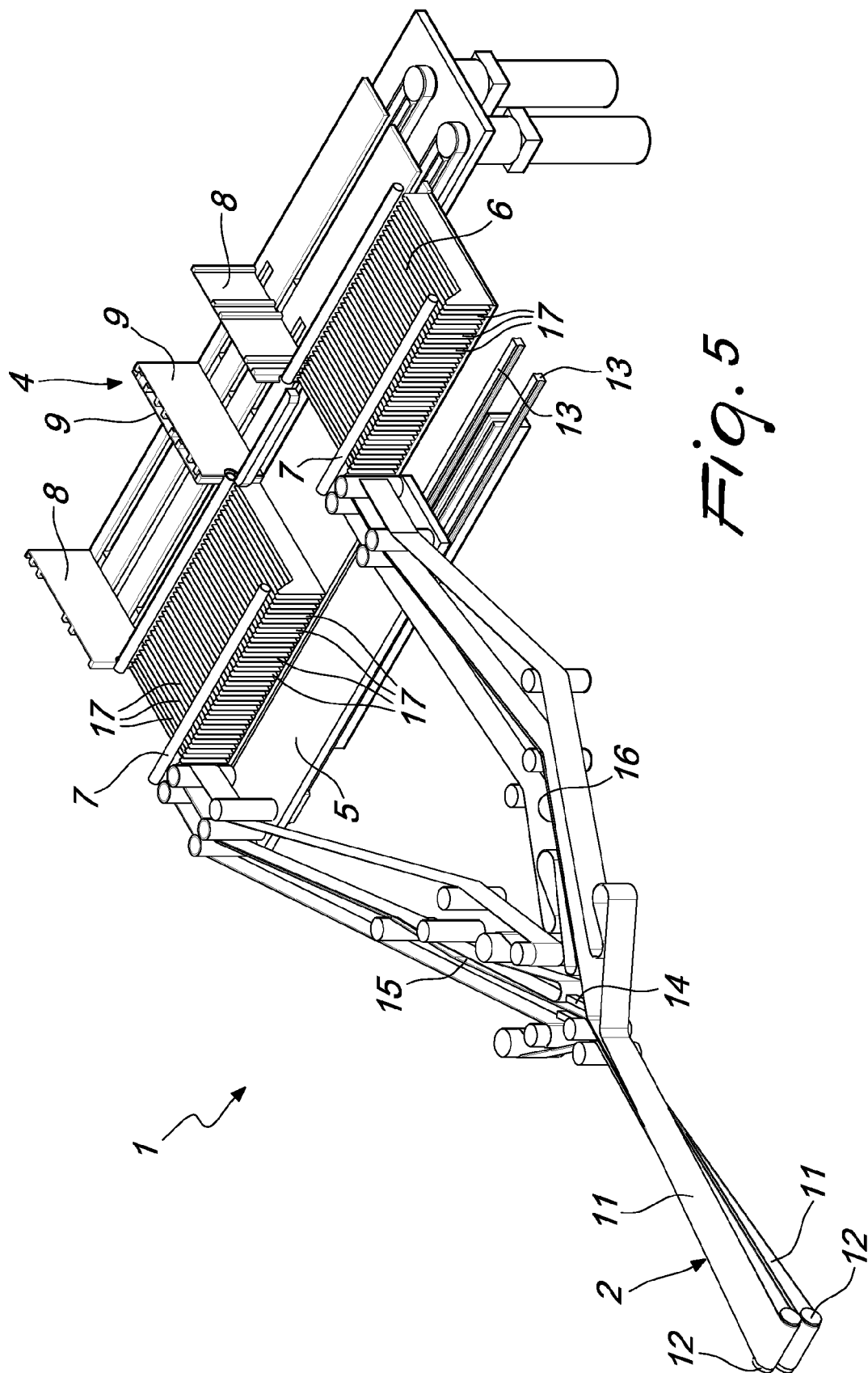
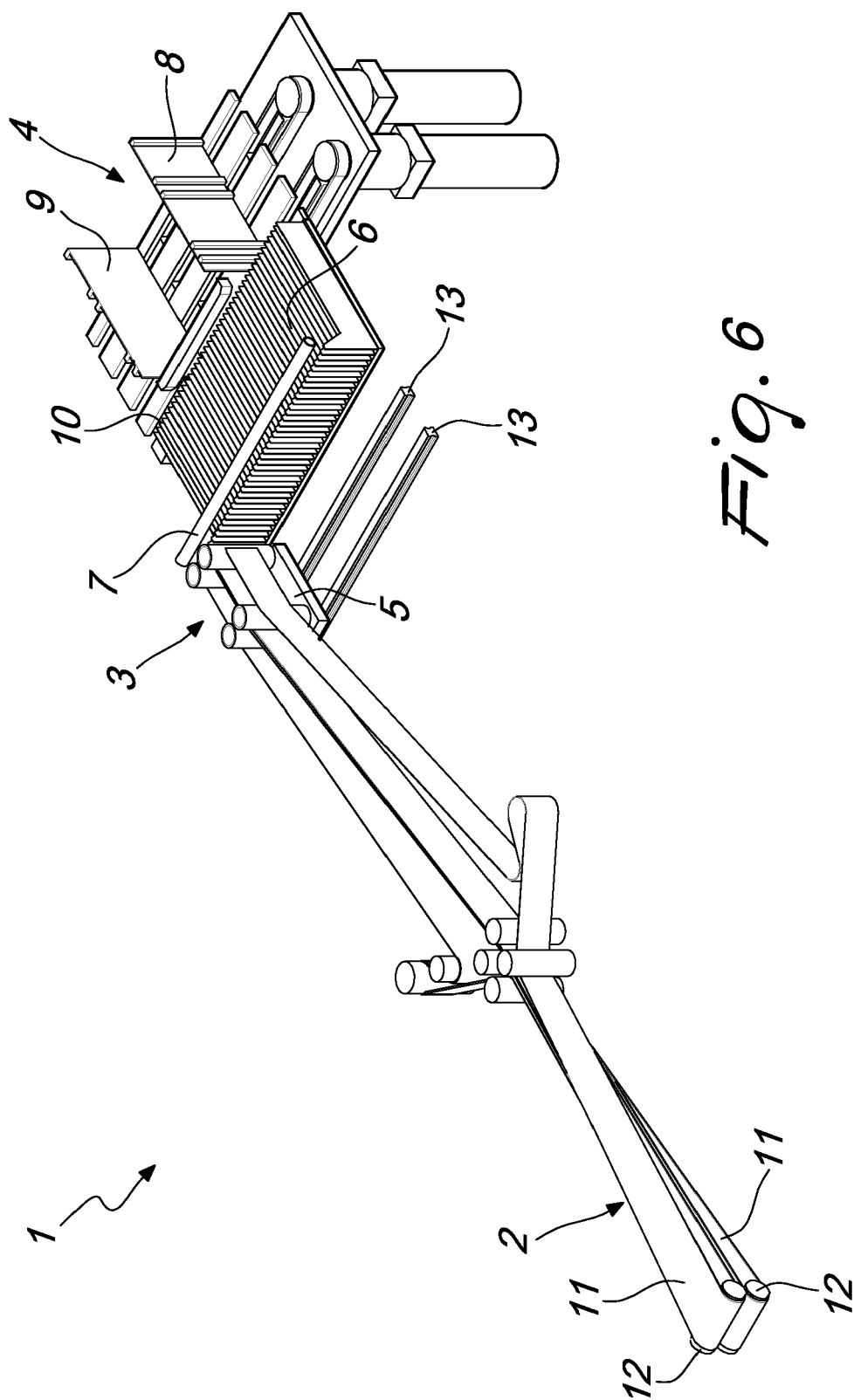


Fig. 5



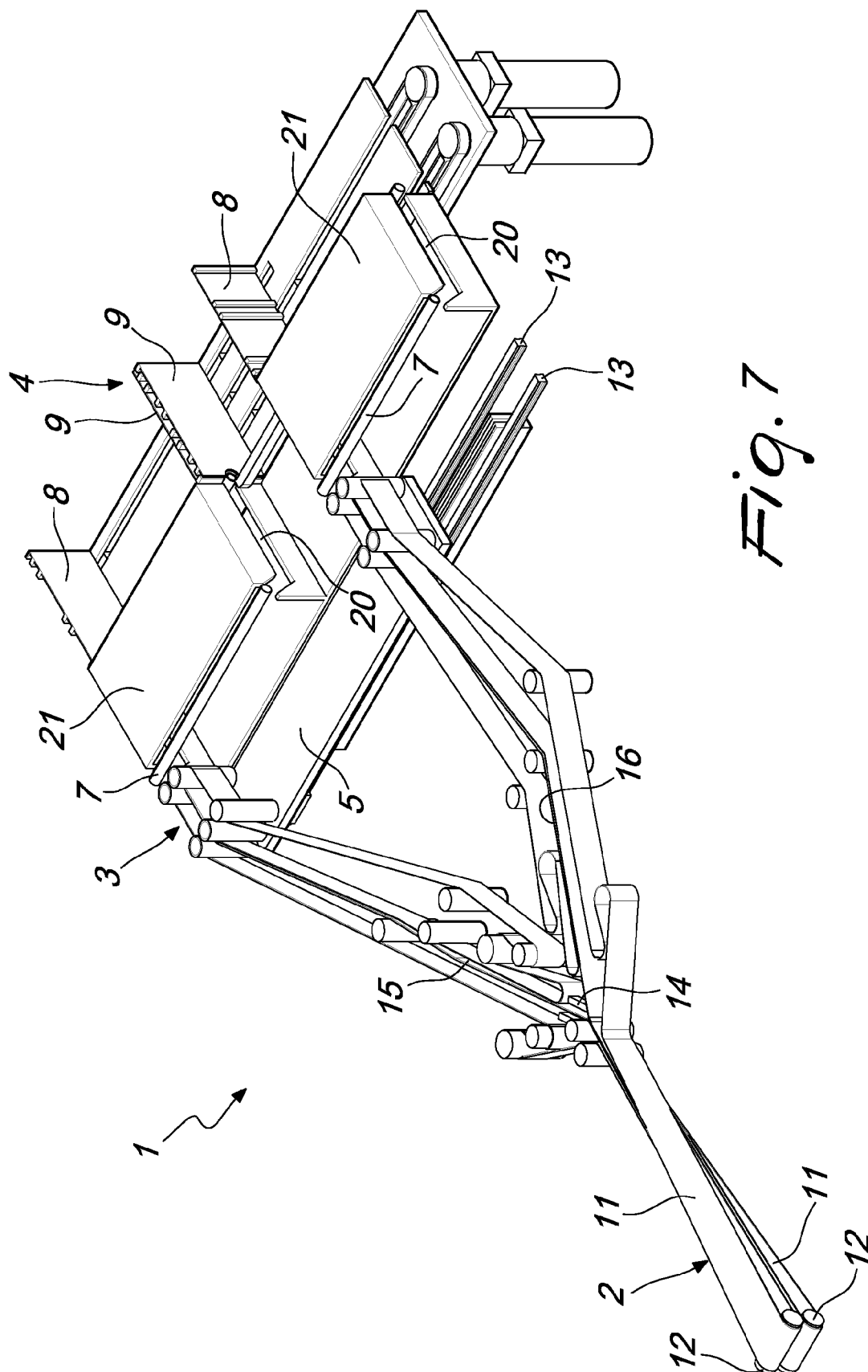


Fig. 7

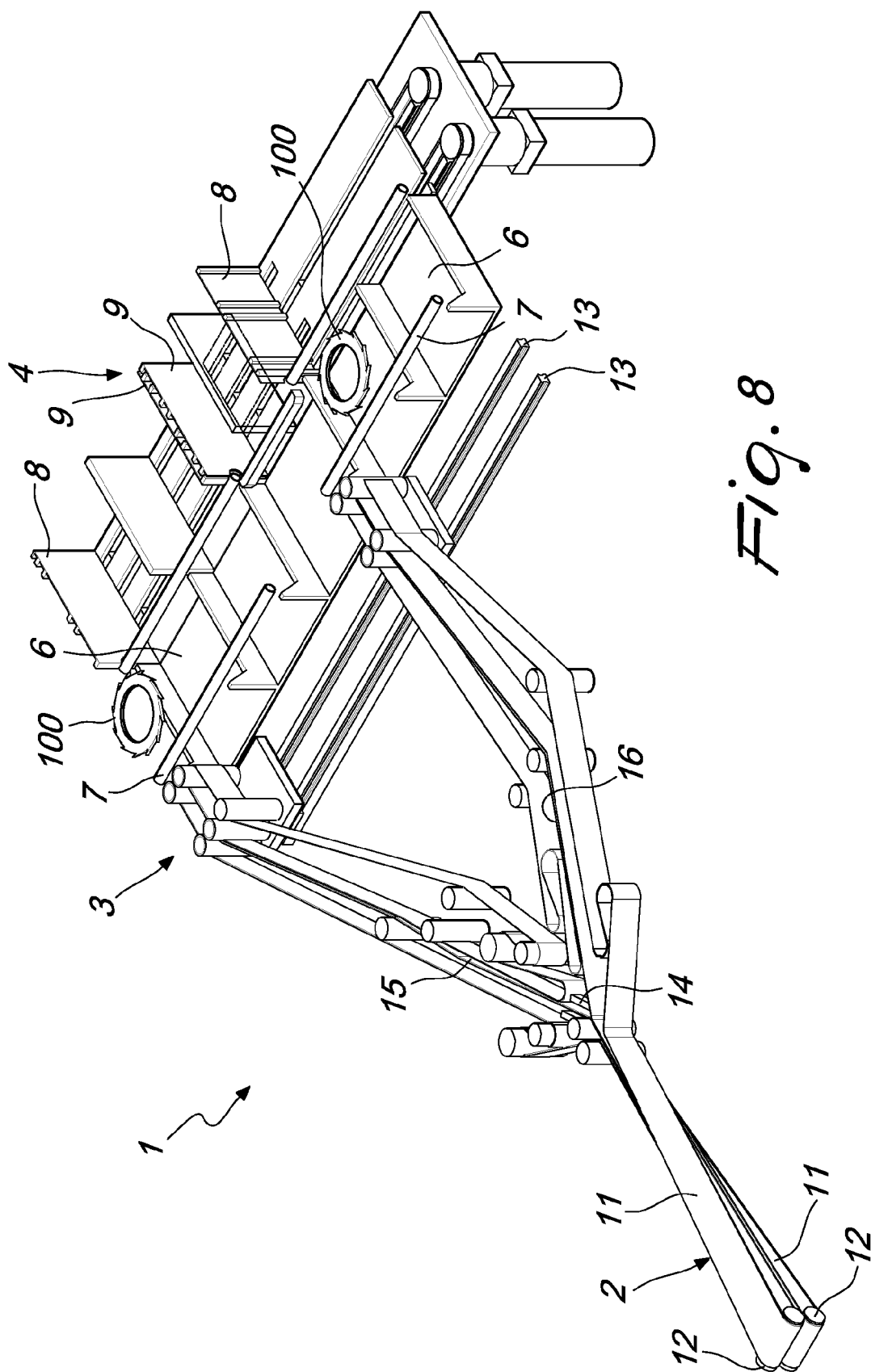


Fig. 8

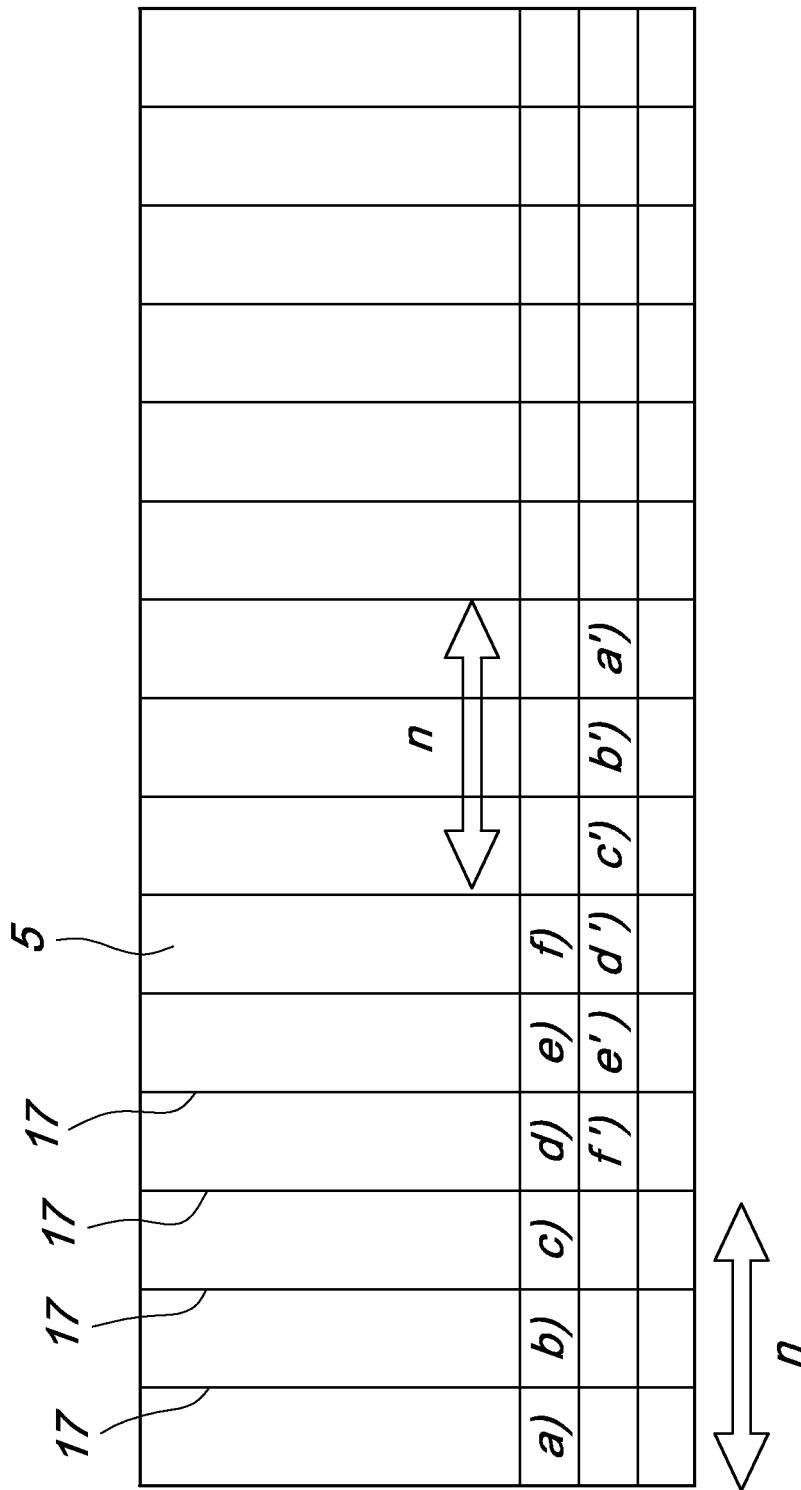


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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