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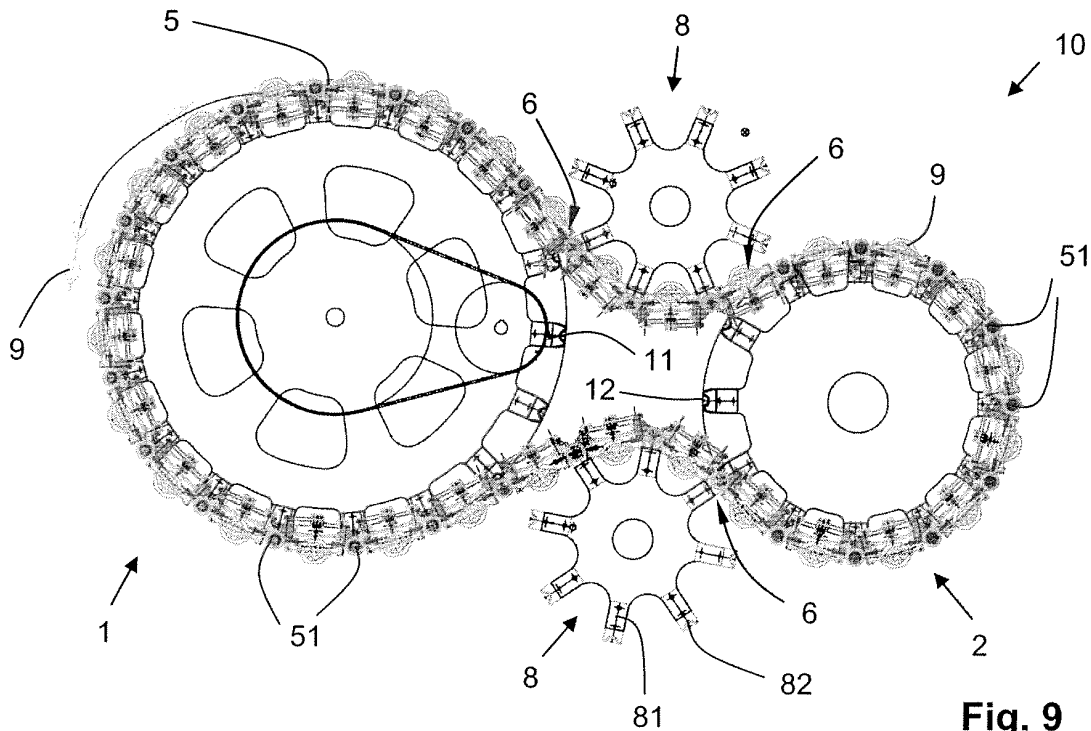
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(54) **Packaging module, machine and method for performing at least two operations on flexible containers**

(57) The present invention relates to a packaging module for performing at least two operations on containers arranged in a row, said operations being after the formation of said containers. The module comprises at least two rotating operational wheels of vertical shafts, at least one of which is motor-operated, provided with corresponding means for carrying out the respective op-

erations on the containers and a chain which, linked with the operational wheels, describes a closed trajectory. The angle of contact of the chain with the operational wheels is greater than 180° and the chain is provided with holding means for the suspension of the containers throughout their entire path and which means are operated by the relative movement of the chain with respect to another preferably static component.



**Fig. 9**

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## Description

### Technical Field of the Invention

[0001] The present invention relates to a packaging module in which at least two operations are performed on flexible containers arranged in a row, said operations being those which are performed after the actual formation of the containers, such as the operations of opening, filling and closing the containers. The packaging module comprises at least two rotating operational wheels of vertical shafts, at least one of which is motor-operated. Said operational wheels are provided with corresponding means for carrying out the aforementioned operations on the containers. The module also comprises a drive chain or belt which links with the operational wheels, describing a closed trajectory.

[0002] In addition to the packaging module, the invention also contemplates a horizontal packaging machine and a packaging method.

### Background of the Invention

[0003] There is a wide variety of automatic machines intended for the continuous packaging of liquid products, such as for example juices and soft drinks, granulated products, ground products or powdered products in flexible containers in the form of pouches. Generally, the known implementations of automatic packaging machines are provided with a formation line for forming pouches of a heat-sealing material and with a line for filling the pouches with the product to be packaged or packaging line which is linked with the former.

[0004] Patent document ES2226518 discloses an automatic packaging machine comprising pouch formation means or means for supplying pre-made pouches, determining a virtual longitudinal axis, means for conveying pouches for their packaging and means for packaging pouches. The means for conveying pouches are linked with the pouch formation means or with the means for supplying pre-made pouches by means of a pouch transfer device. The means for conveying pouches comprise a pouch conveying guide which describes a closed trajectory made up of a first semi-circumferential portion and a second semi-circumferential portion mutually facing one another at the inner face thereof and linked at the corresponding ends by means of straight portions, forming an oblong interior in which means for packaging pouches are arranged, the conveying guide determining a virtual longitudinal axis. Despite the savings in space that this machine involves compared to those in which the formation line for forming pouches and the packaging line are arranged longitudinally with respect to one another, it is desirable to further improve the packaging capacity with respect to the space occupied by the packaging line.

[0005] Horizontal packaging machines in turn are typically provided with a container formation module and a

packaging module which cooperate such that the containers manufactured in the formation module are transferred individually or in batches to the packaging module, where operations such as opening, filling and closing said containers are carried out.

[0006] The packaging modules known until now comprise a series of longitudinally aligned work stations where the aforementioned operations of opening, filling and closing are simultaneously carried out. To that end, the flexible containers are arranged in longitudinal alignment, separated from each other, according to the separating distance of the work stations, forming a packaging line which moves forward intermittently, thus displacing the containers from one station to the next. To that end, the machines are provided with a conveying carriage which simultaneously holds all the flexible containers of the packaging line and also simultaneously conveys them between two consecutive stations.

[0007] By way of example, patent document ES2257180 discloses a container conveying device that can be applied to automatic packaging machines, of the type provided with a formation line for forming flexible containers in the form of pouches from a sheet of heat-sealing material and with a packaging line in which the containers are at least filled and closed in corresponding stations in longitudinal alignment.

[0008] The drawback of this type of arrangement is that the movement of the containers or groups of flexible containers is not continuous, but rather intermittent. The forward movement speed of the containers during the different packaging stations is very limited compared to the speed that could be attained because when the containers move forward intermittently, the liquid, granulated or powdered product contained therein may come out before the container is closed due to the ripple effect that would occur if the speed is not controlled.

[0009] Therefore, the need for a packaging module that can be applied to any type of flexible containers and products, which has significant management capacity and allows performing the packaging operations after the formation of the flexible container in a rapid and safe manner and which occupies as little space possible is clear.

### Disclosure of the invention

[0010] For the purpose of providing a solution to the problems raised, a packaging module for performing at least two operations on flexible containers arranged in a row, said operations being after the actual formation of said containers, such as opening, placing a spout in, filling and/or closing said containers, is disclosed. The packaging module comprises at least two rotating operational wheels of vertical shafts, at least one of which is motor-operated, said operational wheels being provided with corresponding means for carrying out the respective operations on the containers, and a drive chain or belt which, linked with the operational wheels, describes a

closed trajectory.

**[0011]** The packaging module is essentially characterized in that the angle of contact of the chain with the operational wheels is greater than 180° and in that said chain is provided with holding means for the suspension of the flexible containers throughout their entire path, and said holding means are operated by the relative movement of the chain with respect to another preferably static component of the module. The component of the module with respect to which the chain moves for operating the holding means can be, for example, the bedplate of the module.

**[0012]** Since the angle of contact of the operational wheels is greater than 180°, multiple operations can be performed with a large volume of containers continuously, without having to enable a large space for the packaging module, i.e., the module is very compact. Furthermore, the packaging module itself, as indicated by its name, is modular as it allows adding or removing operational wheels according to if more or fewer operations with respect to the type of container and product contained therein are required.

**[0013]** From the time a flexible container is fed into the packaging module object of the invention, it is suspended by their respective holding means while the first operation up until the last operation are performed thereon, i.e., the holding means attached to the drive chain or belt assigned to a container do not abandon it until the packaging operations after the formation of the container end, unlike modules in which the container is suspended by a different clamp every time a different operation is to be performed on it and in which said interchanges generate imprecision in the different operations due to the fact that the container may have been bent or seized at a different point each time, etc.

**[0014]** The arrangement of the invention allows the flexible containers to move at a continuous and constant speed, preventing the content from being able to come out of the container while the relevant operations are performed in the corresponding operational wheels until closing the container, unlike what occurred in earlier packaging modules due to their intermittent movement. The speed therefore no longer has to be restricted to prevent the ripple effect, being able to reach speeds greater than those used up until now. In fact, this increase in speed allows attaining the same rate determined by the module for making the containers, i.e., the passage of the formed containers to the packaging module will no longer slow down the overall process because in the packaging module of the invention there is no risk of the content coming out of the container, thereby increasing the production of packaged units.

**[0015]** Another advantage is that since the ripple effect has been solved, it is no longer necessary to first place a stopper in the container for filling it through such stopper, through its small hole, but rather the container can be filled directly through the wide mouth of the container and the stopper can then be placed, simplifying and ac-

celerating the packaging process.

**[0016]** It should also be pointed out that in the packaging module object of the invention, operations are performed on the flexible containers precisely during the curved sectors of the trajectory of the chain, which coincide with most of the perimeter of the operational wheels, unlike the existing packaging modules in which operations are only performed on the containers in the straight sectors of the trajectory of the drive belt or chain between the two end drive wheels characteristic of a conventional carousel type system.

**[0017]** According to a feature of the invention, the rotating operational wheels are gear wheels the teeth of which are provided with notches in which corresponding pins linking the consecutive links of the chain in an articulated manner mesh or are inserted. The chain will therefore always be centered on the operational wheels and constant maintenance for adjusting it is not necessary like in other chains of packaging modules in which the chains frequently lose tension and must be tensioned again to solve the packaging defects caused by the imprecision of the positions of the containers with respect to the chain. The self-centering of the chain in the packaging module of the invention ensures precision in the operations performed on the containers upon their passage through the different operational wheels.

**[0018]** The teeth of the operational wheels are preferably interchangeable to facilitate their replacement in the event of wear and they are made of a non-metal material, so they are easier to machine and have fewer risks of the teeth being able to accidentally injure an operator who is replacing them or performing manipulation tasks with the operational wheels.

**[0019]** According to another feature of the invention, the packaging module comprises at least one deflection wheel arranged outside the closed trajectory of the chain and facing a sector of chain between two adjacent operational wheels, such that when the chain abandons one operational wheel it immediately links with the deflection wheel, an inflection point being determined in the trajectory of the chain when its curvature changes direction.

**[0020]** According to another feature of the invention, the packaging module comprises at least one deflection wheel arranged outside the closed trajectory of the chain and facing a sector of chain between two adjacent operational wheels, such that when the chain abandons the deflection wheel it immediately links with an operational wheel, an inflection point being determined in the trajectory of the chain when its curvature changes direction.

**[0021]** The arrangement of the deflection wheels thus contributes to the angle of contact of the chain with the operational wheels being greater than 180°, i.e., to most of the perimeter of the operational wheels coinciding with a sector of the trajectory of the chain. Between an operational wheel and a deflection wheel, or vice versa, the chain can go from one to the other virtually being linked with the teeth of a wheel at all times, whether they are the teeth of the operational wheel or of the deflection

wheel, which contributes to the chain not increasing in length after several cycles, whereby reducing maintenance costs.

**[0022]** According to another feature of the invention, the deflection wheel is also a gear wheel the teeth of which are provided with notches in which corresponding pins linking in an articulated manner the consecutive links of the chain mesh or are inserted.

**[0023]** The packaging module preferably comprises as many deflection wheels as operational wheels, and a deflection wheel is arranged between every two adjacent operational wheels outside the closed trajectory of the chain, such that when the chain abandons one operational wheel it immediately links with a deflection wheel, and when the chain abandons said deflection wheel it immediately links with the operational wheel adjacent to the former, respective inflection points being determined in the trajectory of the chain.

**[0024]** According to another feature of the invention, all the operational wheels are preferably arranged inside the closed trajectory of the chain.

**[0025]** The operational wheels can have the same diameter, though preferably at least two operational wheels have different diameters. The size will also depend on the elements necessary for carrying out the different packaging operations in the corresponding operational wheels.

**[0026]** According to another feature of the invention, the angle of contact of the chain with the operational wheels is greater than  $260^\circ$ , thereby optimally reducing the space necessary for housing the packaging module.

**[0027]** According to another feature of the invention, each holding means for the suspension of a flexible container comprises clamps operated by a respective sensing device arranged in the chain which follows a trajectory determined by a cam surface fixed to the component of the preferably static module, such that the separating distance between the ends of the clamps is adjustable depending on the point of the trajectory determined by the cam surface in which the sensing device is located. The preferably static component of the module can be, for example, the bedplate on which the vertical shafts of the operational wheels can be mounted. Thus, the cam surface in collaboration with the sensing devices, serves to move the clamps holding the flexible containers while the chain is in motion, for example, for opening and closing the containers. Optionally, the cam surface can also be configured to rotate the clamps to facilitate feeding the containers into the first operational wheel.

**[0028]** According to a second aspect of the invention, a horizontal packaging machine provided with a container formation module and a packaging module, which cooperate such that the containers manufactured in the formation module are transferred to the packaging module where the operations of opening, filling and/or closing the containers are carried out, is disclosed. The packaging machine is essentially characterized in that the packaging module is the one described above. As previously

mentioned, the packaging module contributes to the packaging machine being more compact and to increasing the production speed compared to other existing packaging machines.

**[0029]** According to a third aspect of the invention, a packaging method which comprises performing at least two operations on formed flexible containers arranged in a row, such as opening, filling and/or closing said containers, is disclosed.

**[0030]** The packaging method is essentially characterized in that it comprises the following steps:

- a) individually holding each of the formed containers in corresponding holding means provided in a drive chain or belt with a closed trajectory which in turn continuously moves forward linked with at least two rotating operational wheels of vertical shafts, at least one of which is motor-operated, the angle of contact of the chain with the operational wheels being greater than  $180^\circ$ ,
- b) conveying each container driven by the chain until reaching a first point of contact of the chain with the first operational wheel,
- c) conveying each container over more than half the perimeter of the first operational wheel, simultaneously subjecting each container to the action of the means carrying out the first operation provided in the first operational wheel,
- d) conveying each container driven by the chain until reaching a point in which the chain is released from the first operational wheel,
- e) conveying each container driven by the chain until reaching a first point of contact of the chain with the second operational wheel,
- f) conveying each container over more than half the perimeter of the second operational wheel, simultaneously subjecting each container to the action of the means carrying out the second operation provided in the second operational wheel,
- g) conveying each container driven by the chain until reaching a point in which the chain is released from the second operational wheel,
- h) individually releasing each container from their respective holding means.

#### **Brief Description of the Drawings**

**[0031]** The attached drawings show by way of non-limiting example several embodiments of the packaging module object of the invention, as well as an embodiment of a horizontal packaging machine provided with one of said packaging modules. In said drawings:

Figures 1 to 8 are schematic plan views of the arrangement of the operational wheels, of the deflection wheels and of the chain according to eight different embodiments of packaging modules according to the invention;

Figure 9 is a plan view with more details of the packaging module of Figure 5;

Figure 10 is a detailed view of the coupling of a tooth of one of the operational wheels to a sector of the chain of the module of Figure 9;

Figure 11 is a sectional view according to a vertical plane of section of the coupling between a tooth of an operational wheel with a sector of the chain of Figure 10;

Figure 12 is a detailed plan view of the holding means for the flexible containers of the sector of the chain of Figure 10;

Figure 13 is a partially sectioned view of the chain with the holding means according to a vertical plane of section upon its passage through a sector of the cam surface provided in a bedplate;

Figure 14 is a sectional view according to section A-A of Figure 13;

Figure 15 is a plan view of the links and pins of the chain of Figure 13;

Figure 16 is an elevational view of a horizontal packaging machine according to the invention; and

Figure 17 is a plan view of the packaging machine of Figure 16.

### Detailed Description of the Drawings

**[0032]** Figures 16 and 17 depict a horizontal packaging machine 100 comprising a formation module 20 for forming flexible containers 9 and a packaging module 10. The flexible containers 9 are manufactured in the formation module 20, for example from continuous sheets of flexible material which are cut, folded and welded to form flexible containers 9 in the form of a pouch, suitable for containing liquid, granulated, ground or powdered products. The containers 9 manufactured in the formation module 20 are transferred in a row to the packaging module 10, where the packaging operations, such as opening the container 9, filling it with the product, placing straws and/or stoppers and finally closing the container 9, are performed.

**[0033]** The packaging module 10 forming part of the horizontal packaging machine 100 depicted in Figures 16 and 17 comprises four rotating operational wheels 1, 2, 3 and 4 of vertical shafts, at least one of which is motor-operated, in this case wheel 1. The operational wheels 1, 2, 3 and 4 are provided with corresponding means for carrying out the respective operations on the flexible containers 9, i.e., each operational wheel 1, 2, 3 and 4 forms a station in which a determined operation is carried out on the formed container 9.

**[0034]** As the formed containers 9 are fed into the packaging module 10 in a row, they are seized by respective holding means 7 provided in a drive chain 5 or belt which, linked with the operational wheels 1, 2, 3 and 4, describes a closed trajectory, such that one holding means 7 holds a specific container 9 from the time it is fed into the packaging module 10 and does not release it until the delivery

thereof. Specifically, each holding means 7 for the suspension of a flexible container 9 comprises clamps 71 (see Figures 12, 13 and 14) operated by a respective sensing device 72 arranged in the chain 5 which follows a trajectory determined by a cam surface 75 mounted in a static component of the module 10, for example the bedplate 74, such that the separating distance between the ends of the clamps 71 is adjustable depending on the point of the trajectory determined by the cam surface 75 in which its respective sensing device 72 is located. The bedplate 74 is a static element on which the vertical shafts of the operational wheels 1 to 4 can be mounted. Thus, the cam surface 75 in collaboration with the sensing devices 72, serves to move the clamps 71 holding the flexible containers 9 while the chain 5 is in motion, for example, for opening and closing the containers 9. The cam surface 75 can also be configured to rotate the clamps 71 to facilitate feeding the containers 9 into the first operational wheel 1.

**[0035]** In the detail of the clamps 71 depicted in Figure 13 and 14, it can be observed that the adjustment capacity is determined, among others, by the existence of several oblong holes and elements 73a, 73b and 73c which allow the sliding of the arms of the clamps 71 to move to one side, up, down, to move closer to or farther from one another, according to the point of the trajectory of the cam surface 75 where the sensing device 72 of the clamps 71 in question is located.

**[0036]** As can be seen in Figure 17, the angle of contact  $\alpha$  of the chain 5 with the operational wheels 1, 2, 3 and 4 is greater than  $180^\circ$ , i.e., the closed trajectory of the chain 5 comprises a series of sectors in which its trajectory coincides with more than half the perimeter of each operational wheel 1, 2, 3 and 4.

**[0037]** In addition to the operational wheels 1, 2, 3 and 4 in which the corresponding packaging operations are carried out, it can be seen that the packaging module 10 of Figure 17 comprises four deflection wheels 8, each of them arranged outside the closed trajectory of the chain 5 and facing a sector of chain 5 between two adjacent operational wheels 1-2, 2-3, 3-4 and 4-1. The arrangement of the deflection wheels 8 in said packaging module 10 is such that when the chain 5 abandons one operational wheel 1, 2, 3 or 4, it immediately links with the deflection wheel 8, an inflection point 6 thus being determined in the trajectory of the chain 5 when its curvature changes direction. Likewise, when the chain 5 abandons the deflection wheel 8, it immediately links with the adjacent operational wheel 2, 3, 4 or 1, another inflection point 6 being determined in the trajectory of the chain 5 when its curvature changes direction again.

**[0038]** Figures 1 to 8 schematically depict different packaging modules 10, showing the arrangement of the assembly formed by the operational wheels 1-4, the deflection wheels 8 and the chain 5. All packaging modules 10 comprise at least two operational wheels 1 and 2 and a drive chain 5 or belt which, linked with them, describes a closed trajectory in which, as previously stated, the

angle of contact  $\alpha$  of the chain 5 with the operational wheels 1-4 is greater than  $180^\circ$ . The angle of contact  $\alpha$  being greater than  $180^\circ$  is achieved by suitably arranging at least one deflection wheel 8, as is clearly shown in the following examples.

**[0039]** Figures 1 to 5 schematically depict five packaging modules 10 comprising two operational wheels 1 and 2 and a chain 5 the angle of contact  $\alpha$  of which with the operational wheels 1 and 2 is greater than  $180^\circ$ , and even greater than  $260^\circ$  in some cases (see Figures 3 to 5), which contributes to the module 10 being more compact. The packaging modules 10 of Figures 1 and 2 further comprise a deflection wheel 8 facing the upper sector of the chain 5 between the operational wheels 1 and 2. The difference between the packaging modules 10 of Figures 1 and 2 lies in the closed trajectory of the chain 5 in Figure 2 having two inflection points 6, because when a specific sector of the chain 5 abandons the first operational wheel 1 it then immediately links with the deflection wheel 8, and when it then abandons said deflection wheel 8 it immediately links with the other operational wheel 2. In contrast, in the case of Figure 1, there is a brief time period between the first operational wheel 1 abandoning the chain 5 and linking with the deflection wheel 8, and the same between abandoning the deflection wheel 8 and linking with the second operational wheel 2.

**[0040]** In Figures 3 to 5, there are two deflection wheels 8, each of them arranged facing a sector of the chain 5 between the two operational wheels 1 and 2. The deflection wheels 8 can have the same size (Figures 3 and 5) or different size (Figure 4) and can be arranged such that the chain 5 immediately links with them when it abandons one operational wheel 1 or 2 in the two sectors of the chain 5 between the two operational wheels 1 and 2 (Figure 5) or in a single sector (Figure 4, lower sector).

**[0041]** Depending on the different packaging operations necessary for a determined container 9 and product, the packaging module 10 has more or less stations, which translates into a determined number of operational wheels 1-4 the size of which depends on the means and time necessary for performing a determined packaging operation. Thus, the packaging modules 10 of Figures 6 and 7 comprise three operational wheels 1, 2 and 3, and module 10 of Figure 8 four operational wheels 1, 2, 3 and 4.

**[0042]** The operational wheels 1 to 4 are gear wheels the teeth 11 of which are provided with notches 12 in which corresponding pins 51 linking the consecutive links 52 of the chain 5 in an articulated manner mesh or are inserted (see Figure 15). This structure is shown in module 10 of Figure 9 and in the details of the chain 5 depicted in Figures 10 to 12. Likewise, the deflection wheels 8 are also gear wheels the teeth 81 of which are provided with notches 82 in which corresponding pins 51 linking the consecutive links 52 of the chain 5 in an articulated manner mesh or are inserted (see Figure 9). Both the teeth 11 of the operational wheels 1-4 and the teeth 81 of the

deflection wheels 8 are interchangeable teeth made of a non-metal material. As can be seen in Figure 11, the interchangeable teeth 11 made of non-metal material are attached to the body of the operational wheels 1-4 by screwing plates 13 (only the holes without the screws are depicted in the drawing). The plates 13 are not depicted in Figure 10 in order to better see the shape of the interchangeable tooth 11. The chain 5 is always centered on the operational wheels 1-4 and on the deflection wheels 8 by means of coupling the pins 51 in the notches 12 and 82, constant maintenance for adjusting it is not necessary, considerable precision in the operations performed on the containers 9 upon their passage through the different operational wheels 1-4 furthermore being ensured.

**[0043]** When observing the arrangement of the different elements forming the packaging module 10 depicting multiple variants, the savings in space it entails is clear, as well as the ability of the flexible containers 9 to move at a continuous and constant speed, preventing the content from being about to come out of the container while the relevant operations are performed in the corresponding operational wheels 1, 2, 3 and 4 until closing the container 9, unlike what occurred in earlier packaging modules due to their intermittent movement. The speed therefore no longer has to be restricted to prevent the ripple effect, and higher speeds can be reached according to the rate determined by the module 20 for making the containers 9, for example four hundred containers 9 per minute in both modules.

**[0044]** Even though in all the packaging modules 10 depicted in the drawings the operational wheels 1, 2, 3 and 4 are arranged inside the closed trajectory of the chain 5, packaging modules 10 in which one or some of the operational wheels 1, 2, 3 and 4 are arranged outside said trajectory but all the operational wheels 1 to 4 still being linked by the chain 5 and the angle of contact  $\alpha$  of the chain 5 with all of them at all times being greater than  $180^\circ$ , and advantageously greater than  $260^\circ$ , are also contemplated.

**[0045]** The different steps forming part of the packaging method carried out in a packaging module 10 comprising three operational wheels 1-3 are described below by way of example:

- a) The containers 9 formed in the formation module 20 are fed into the packaging module 10 in a row. Upon being fed in, each container 9 is held by corresponding holding means 7, generally in the form of clamps 71 provided in the chain 5 with a closed trajectory which continuously moves forward linked with the operational wheels 1-3 with which the module 10 is provided. The clamps 71 assigned to a corresponding container 9 will not abandon it until its path through the packaging module 10 ends.
- b) Each container 9 is driven by the chain 5 until reaching a first point of contact of the chain 5 with the first operational wheel 1.
- c) Each container 9 is conveyed driven by the chain

5 over more than half the perimeter of the first operational wheel 1, in turn subjecting each container 9 to the action of the specific means provided in the first operational wheel 1 carrying out the first packaging operation, for example separating means widening the mouth of the container 9 to prepare it for filling in the following station (in the operational wheel 2).

d) Each container 9 is conveyed driven by the chain 5 until reaching a second point in which the chain 5 is released from the first operational wheel 1.

e) Each container 9 is conveyed driven by the chain 5 until reaching a first point of contact of the chain 5 with the second operational wheel 2,

f) Each container 9 is conveyed driven by the chain 5 over more than half the perimeter of the second operational wheel 2, in turn subjecting each container 9 to the action of the specific means provided in the second operational wheel 2 carrying out the second packaging operation, for example filling means which introduce the product inside the container 9 open at its upper end.

g) Each container 9 is conveyed driven by the chain 5 until reaching a point in which the chain 5 is released from the second operational wheel 2,

h) Each container 9 is conveyed driven by the chain 5 until reaching a first point of contact of the chain 5 with the third operational wheel 3,

i) Each container 9 is conveyed driven by the chain 5 over more than half the perimeter of the third operational wheel 3, in turn subjecting each container 9 to the action of the specific means provided in the third operational wheel 3 carrying out the third packaging operation, for example means for placing a stopper and closing the container 9.

j) Each container 9 is conveyed driven by the chain 5 until reaching the point in which the chain 5 is released from the third operational wheel 3.

k) Each container 9 is released from their respective holding means 7.

## Claims

1. A packaging module (10) for performing at least two operations on flexible containers (9) arranged in a row, said operations being after the actual formation of said containers, such as opening, filling and/or closing said containers, comprising:

- at least two rotating operational wheels (1, 2, 3, 4) of vertical shafts, at least one of which is motor-operated, said operational wheels being provided with corresponding means for carrying out the respective operations on the containers, and
- a drive chain (5) or belt which, linked with the operational wheels, describes a closed trajectory-

ry,

**characterized in that** the angle of contact ( $\alpha$ ) of the chain with the operational wheels is greater than  $180^\circ$  and **in that** said chain is provided with holding means (7) for the suspension of the flexible containers throughout their entire path and said holding means are operated by the relative movement of the chain with respect to another preferably static component of the module.

2. The packaging module (10) according to claim 1, **characterized in that** the rotating operational wheels (1, 2, 3, 4) are gear wheels the teeth (11) of which are provided with notches (12) in which corresponding pins (51) linking the consecutive links (52) of the chain (5) in an articulated manner mesh or are inserted.

3. The packaging module (10) according to claim 2, **characterized in that** the teeth (11) of the operational wheels (1, 2, 3, 4) are interchangeable and made of a non-metal material.

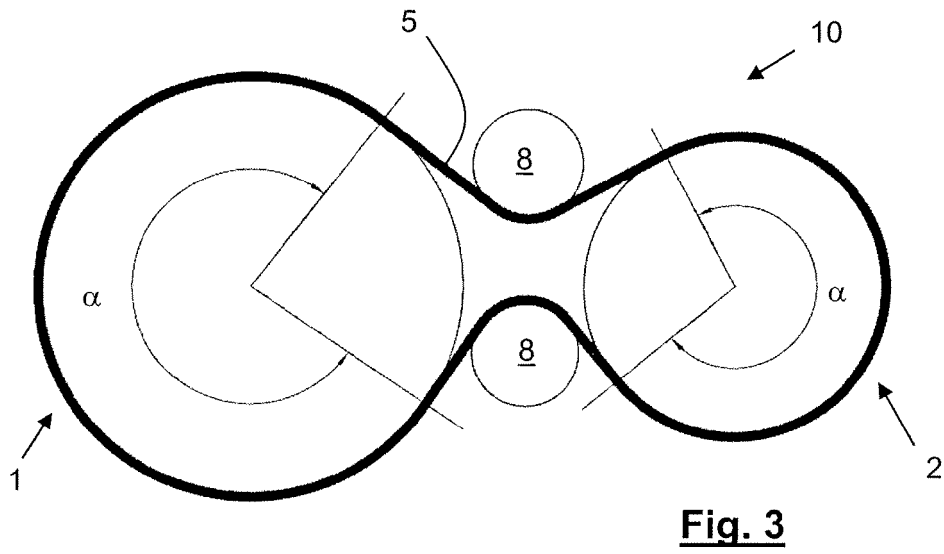
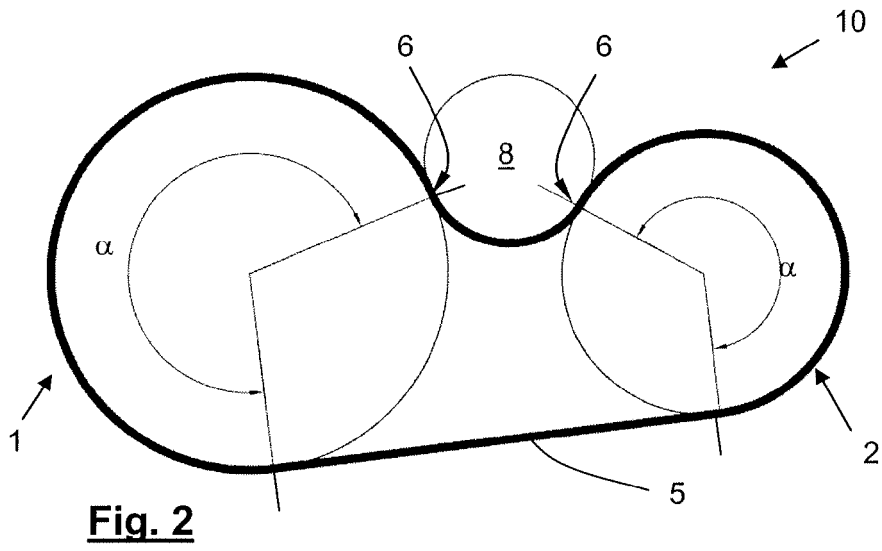
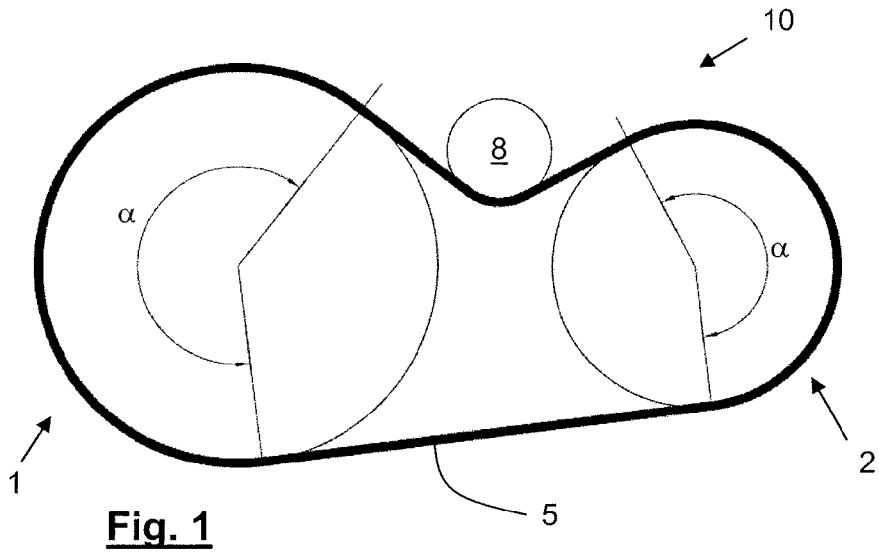
4. The packaging module (10) according to any one of the previous claims, **characterized in that** it comprises at least one deflection wheel (8) arranged outside the closed trajectory of the chain (5) and facing a sector of chain between two adjacent operational wheels (1, 2, 3, 4) such that when the chain abandons one operational wheel it immediately links with the deflection wheel, an inflection point (6) being determined in the trajectory of the chain when its curvature changes direction.

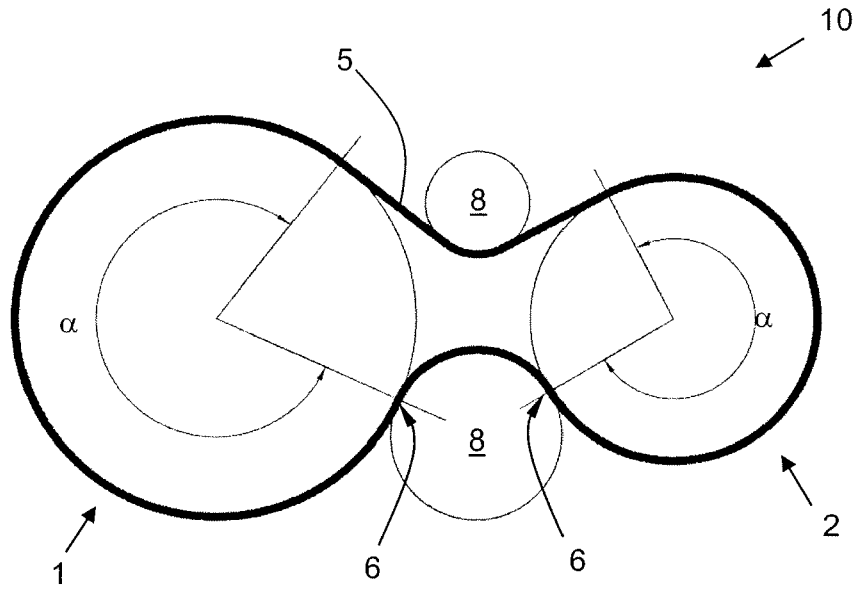
5. The packaging module (10) according to any one of the previous claims, **characterized in that** it comprises at least one deflection wheel (8), arranged outside the closed trajectory of the chain (5) and facing a sector of chain between two adjacent operational wheels (1, 2, 3, 4) such that when the chain abandons the deflection wheel it immediately links with an operational wheel, an inflection point (6) being determined in the trajectory of the chain when its curvature changes direction.

6. The packaging module (10) according to claim 4 or 5, **characterized in that** the deflection wheel (8) is a gear wheel the teeth (81) of which are provided with notches (82) in which corresponding pins (51) linking the consecutive links (52) of the chain (5) in an articulated manner mesh or are inserted.

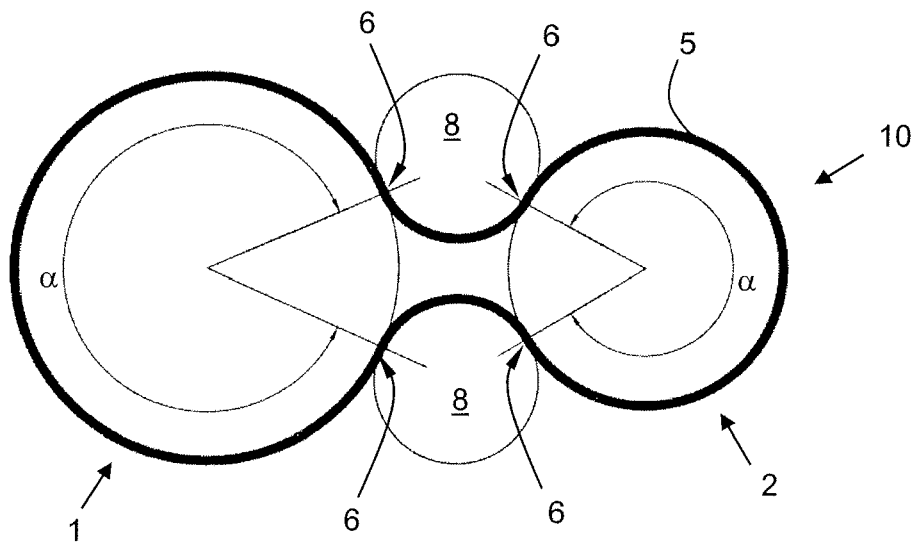
7. The packaging module (10) according to any one of claims 4 to 6, **characterized in that** it comprises as many deflection wheels (8) as operational wheels (1, 2, 3, 4) and **in that** a deflection wheel is arranged between every two adjacent operational wheels outside the closed trajectory of the chain (5), such that

- when the chain abandons one operational wheel it immediately links with a deflection wheel, and when the chain abandons said deflection wheel it immediately links with the operational wheel adjacent to the former, respective inflection points (6) being determined in the trajectory of the chain. 5
8. The packaging module (10) according to any one of the previous claims, **characterized in that** all the operational wheels (1, 2, 3, 4) are arranged inside the closed trajectory of the chain (5). 10
9. The packaging module (10) according to any one of the previous claims, **characterized in that** at least two operational wheels (1, 2, 3, 4) have different diameters. 15
10. The packaging module (10) according to any one of the previous claims, **characterized in that** the angle of contact ( $\alpha$ ) of the chain (5) with the operational wheels (1, 2, 3, 4) is greater than  $260^\circ$ . 20
11. The packaging module (10) according to any one of the previous claims, **characterized in that** each holding means (7) for the suspension of a flexible container (9) comprises clamps (71) operated by a respective sensing device (72) arranged on the chain (5) which follows a trajectory determined by a cam surface (75) fixed to the preferably static component of the module, such that the separating distance between the ends of the clamps is adjustable depending on the point of the trajectory determined by the cam surface in which the sensing device is located. 25  
30
12. A horizontal packaging machine (100) provided with a container formation module (20) and a packaging module (10) which cooperate such that the containers (9) manufactured in the formation module are transferred to the packaging module where the operations of opening, filling and/or closing the containers are carried out, **characterized in that** the packaging module is the one defined in any one of claims 1 to 11. 35  
40
13. A packaging method which comprises performing at least two operations on formed flexible containers (9) arranged in a row, such as opening, filling and/or closing said containers, **characterized in that** it comprises the following steps: 45  
50
- a) individually holding each of the formed containers in corresponding holding means (7) provided in a drive belt or chain (5) with a closed trajectory which in turn continuously moves forward linked with at least two rotating operational wheels (1, 2, 3, 4) of vertical shafts, at least one of which is motor-operated, the angle of contact ( $\alpha$ ) of the chain with the operational wheels being greater than  $180^\circ$ , 55
- b) conveying each container driven by the chain until reaching a first point of contact of the chain with the first operational wheel,
- c) conveying each container over more than half the perimeter of the first operational wheel, simultaneously subjecting each container to the action of the means carrying out the first operation provided in the first operational wheel,
- d) conveying each container driven by the chain until reaching a point in which the chain is released from the first operational wheel,
- e) conveying each container driven by the chain until reaching a first point of contact of the chain with the second operational wheel,
- f) conveying each container over more than half the perimeter of the second operational wheel, simultaneously subjecting each container to the action of the means carrying out the second operation provided in the second operational wheel,
- g) conveying each container driven by the chain until reaching a point in which the chain is released from the second operational wheel,
- h) individually releasing each container from their respective holding means.



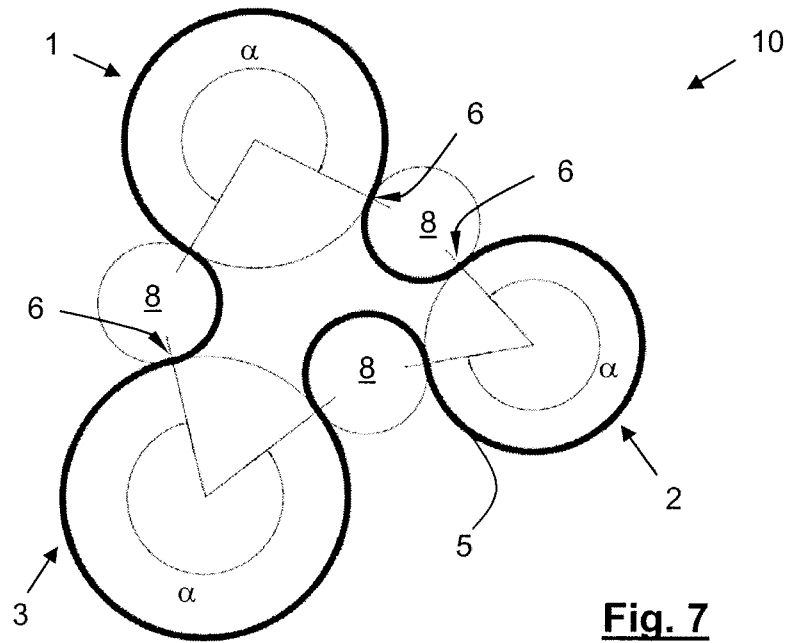
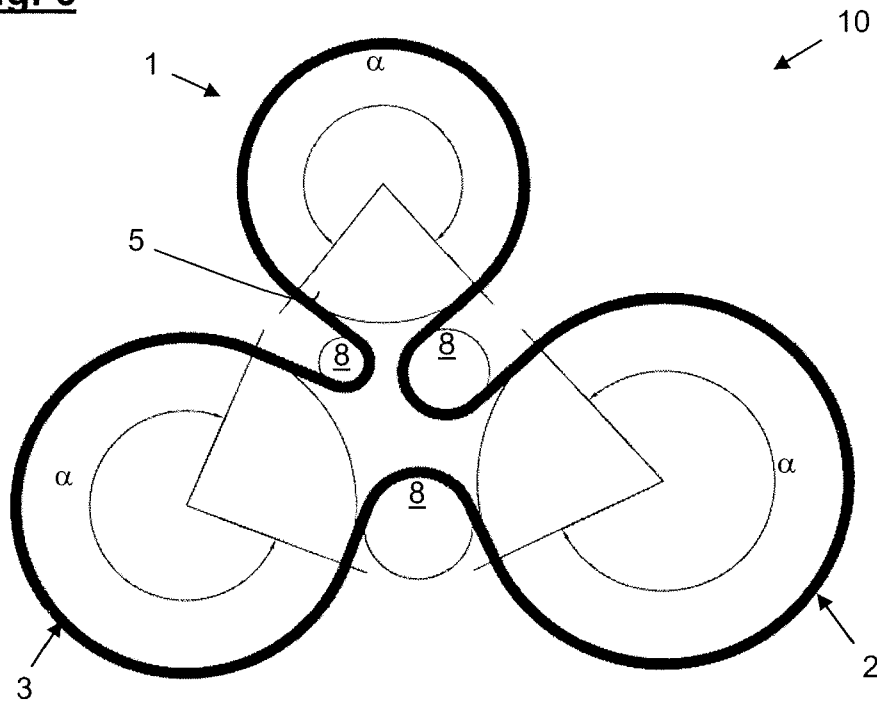


**Fig. 4**

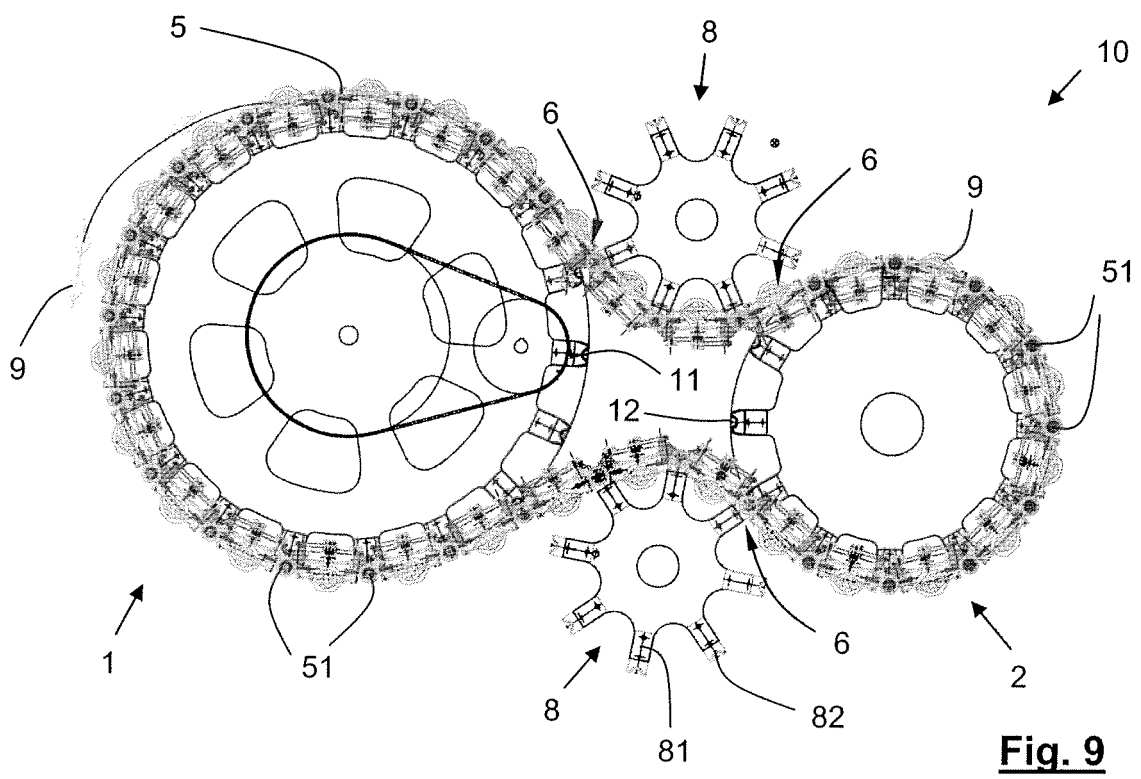
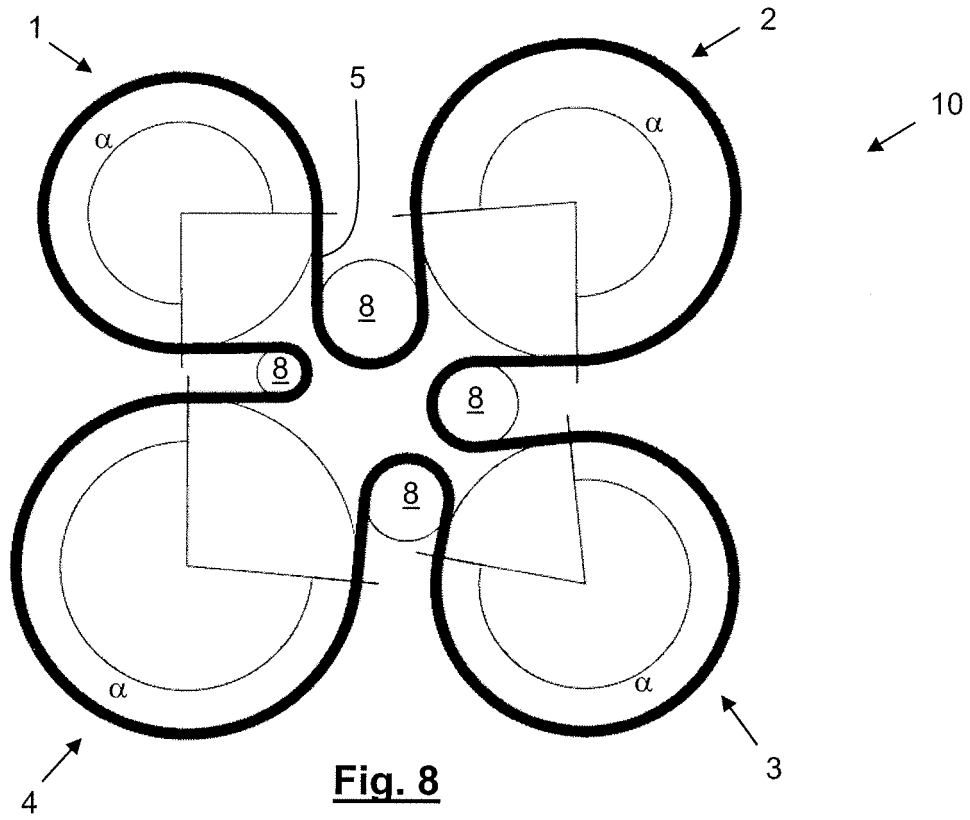


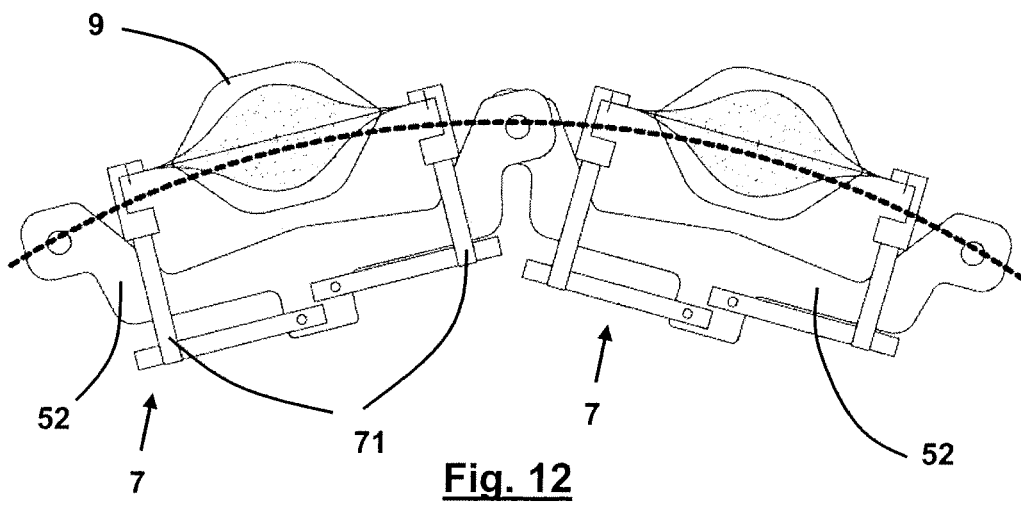
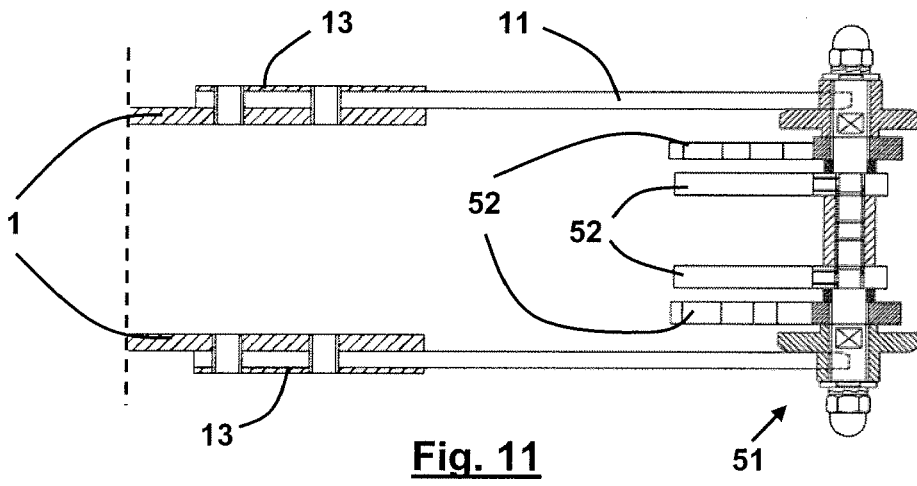
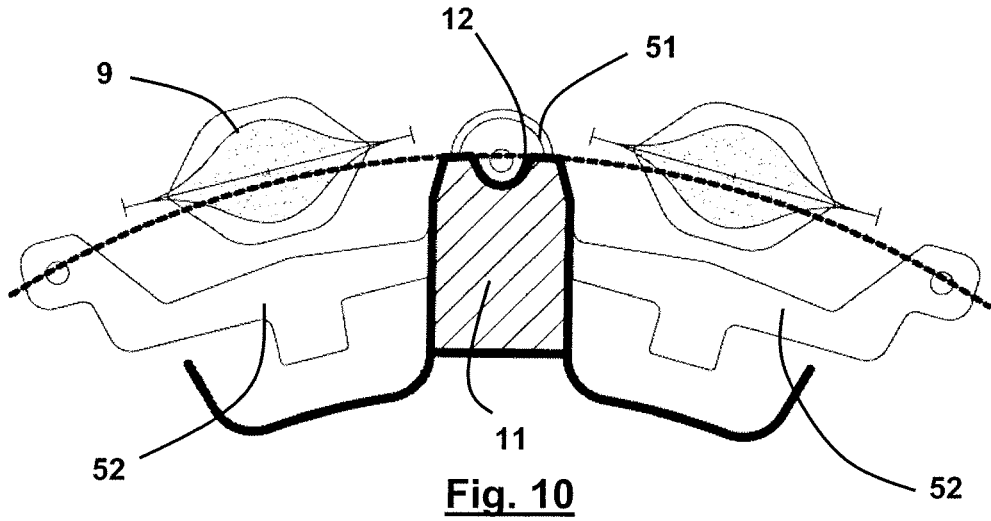
**Fig. 5**

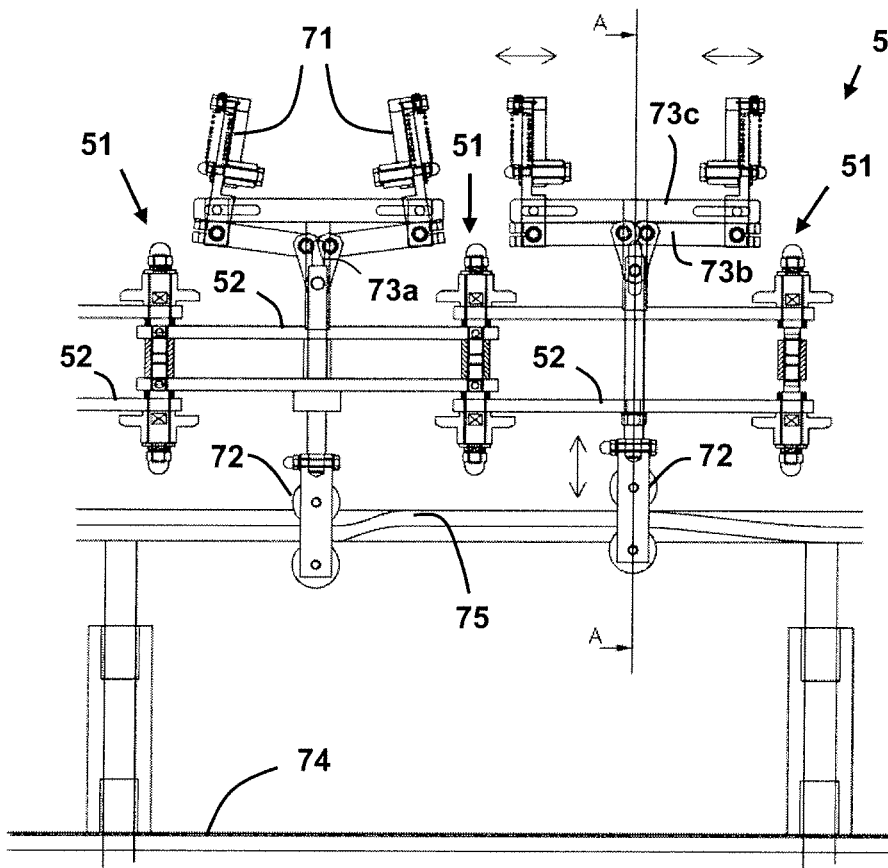
**Fig. 6**



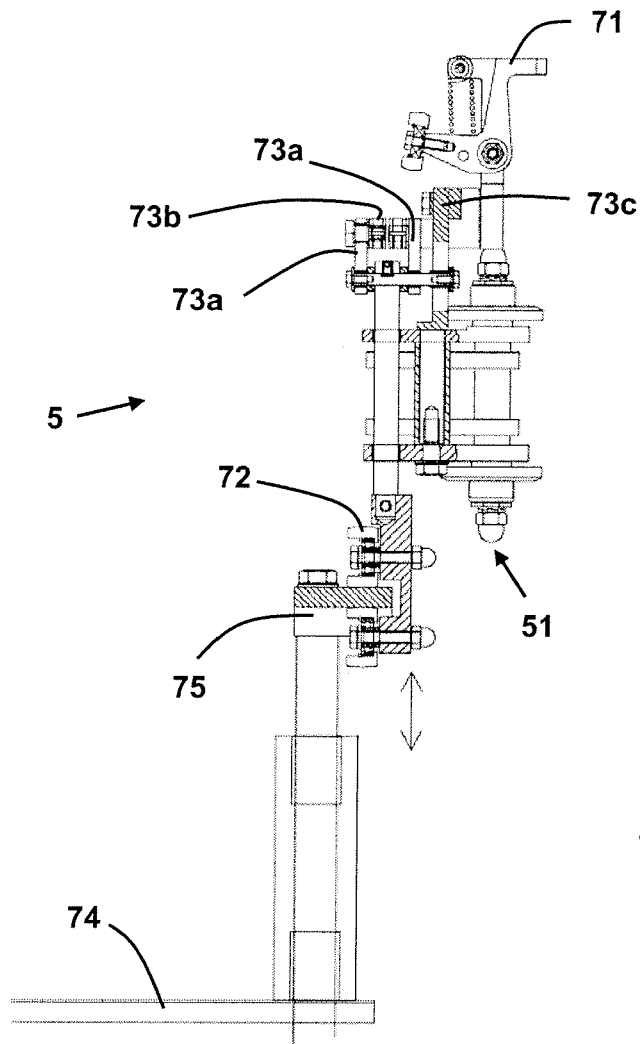
**Fig. 7**



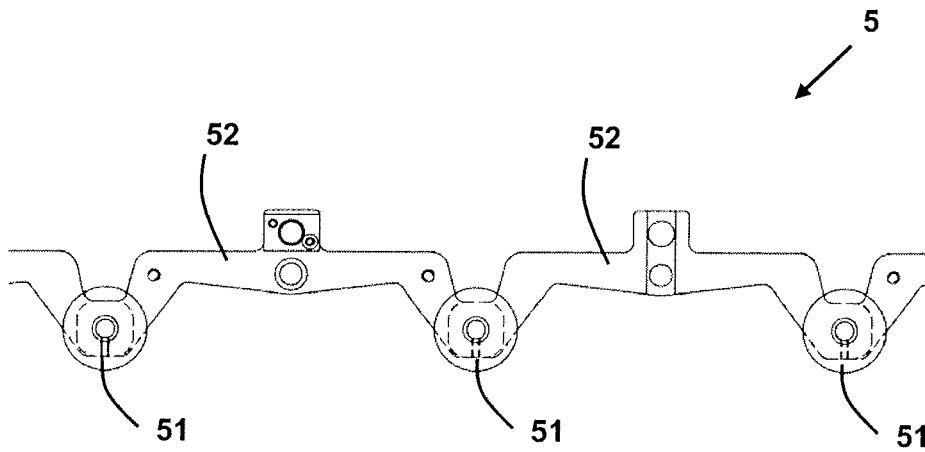




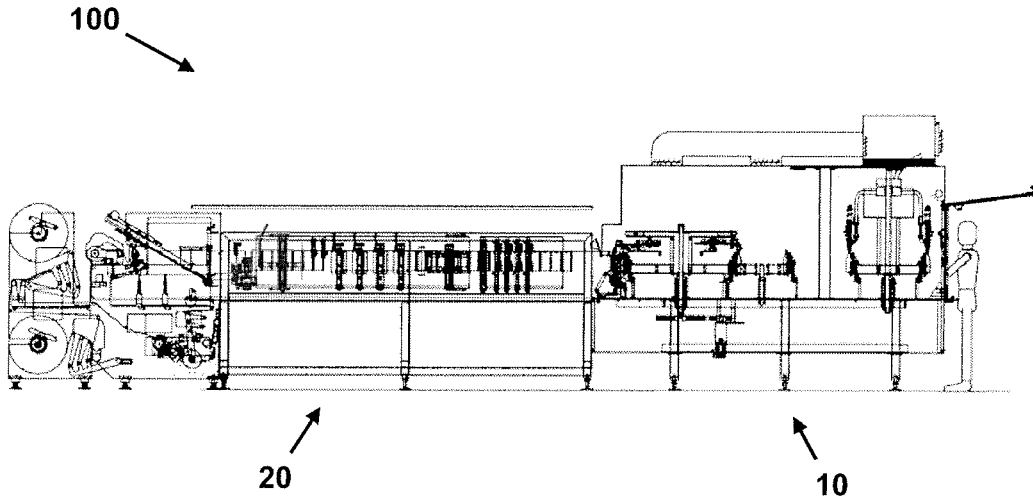
**Fig. 13**



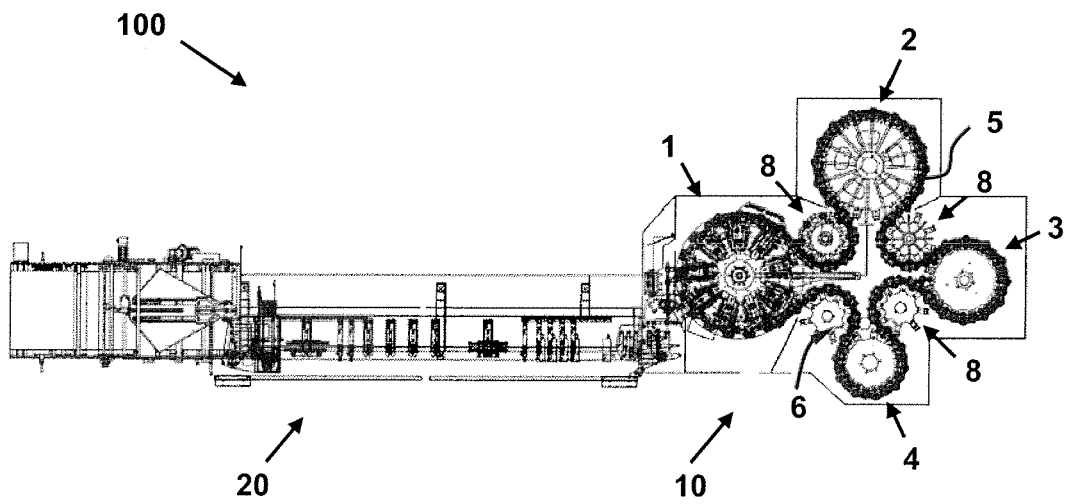
**Fig. 14**



**Fig. 15**



**Fig. 16**



**Fig. 17**



EUROPEAN SEARCH REPORT

Application Number  
EP 11 38 2096

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 043 233 A1 (SEIKO CORP [JP]) 11 October 2000 (2000-10-11)	1,4,5,8, 10,12,13	INV. B65B43/46
Y	* paragraphs [0011] - [0035]; figures 1,2a,2b *	2,3,11	B65B43/52 B65B65/00
Y	----- US 4 531 926 A (REEVES JR JAMES B [US]) 30 July 1985 (1985-07-30) * figures *	2	
Y	----- FR 1 195 550 A (MATERIEL D ALIMENTATION SA CON) 18 November 1959 (1959-11-18) * page 2, lines 28-33; figure 1 *	3	
Y	----- US 3 982 376 A (IKEDA MASAOMI) 28 September 1976 (1976-09-28) * figure 5 *	11	
A	----- DE 40 35 815 A1 (BREITNER ABFUELLANLAGEN GMBH [DE]) 14 May 1992 (1992-05-14) * the whole document *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B B65G F16H
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>11 November 2011</b>	Examiner <b>Lawder, M</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			

2  
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 38 2096

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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11-11-2011

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1043233	A1	11-10-2000	EP 1043233 A1	11-10-2000
			JP 2000281004 A	10-10-2000
-----				
US 4531926	A	30-07-1985	NONE	
-----				
FR 1195550	A	18-11-1959	NONE	
-----				
US 3982376	A	28-09-1976	AU 470650 B2	25-03-1976
			AU 8245575 A	25-03-1976
			CA 1026720 A1	21-02-1978
			GB 1487645 A	05-10-1977
			JP 1041809 C	23-04-1981
			JP 51030083 A	13-03-1976
			JP 55035281 B	12-09-1980
			US 3982376 A	28-09-1976
-----				
DE 4035815	A1	14-05-1992	NONE	
-----				

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- ES 2226518 [0004]
- ES 2257180 [0007]