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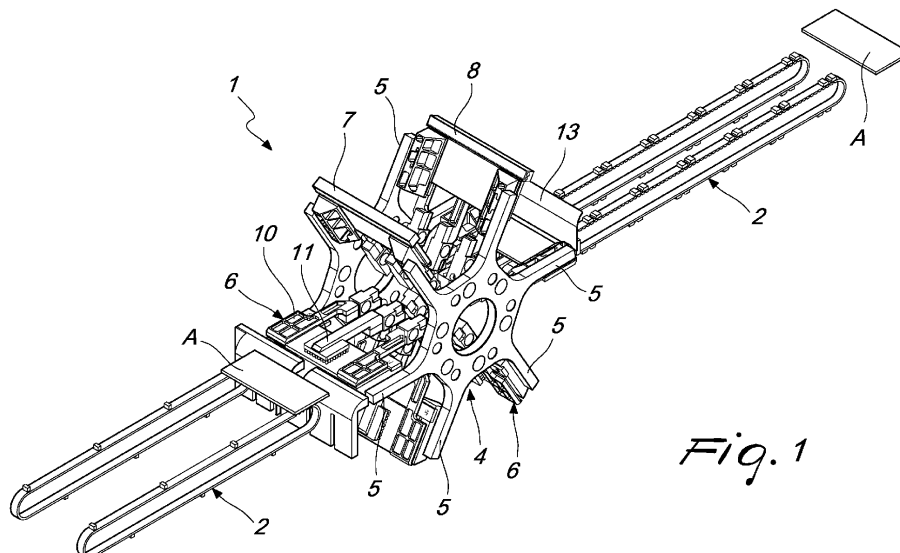
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(54) PACKAGING ASSEMBLY FOR SUBSTANTIALLY FLAT PRODUCTS

(57) A packaging assembly (1) for substantially flat products (A) of the type adapted to operate on a conveyance line (2) for products (A) and comprising an apparatus (3) for supplying wrapping sheets (B) which is arranged along the conveyance line (2) directly upstream of the assembly (1). The assembly (1) comprises a carousel (4) provided with a plurality of radial expansions (5) which are provided, at their terminal part, with grip means (6) which can move between a passive, open configuration, in which their terminal edges (9) are arranged like a hopper for the folding and juxtaposition of a wrapping sheet (B) on respective surfaces of a product (A)

that is pushed inside them by the conveyance line (2), and an active, clamping configuration, in which they clamp the product (A) which is partially covered by the sheet (B) and is arranged in a seat delimited by them. The assembly further comprises at least one heat-sealing station (7, 8), which is arranged facing and proximate to the trajectory of the terminal edges (9) of the grip means (6) arranged on the radial expansions (5), for the stable coupling of superimposed flaps (C) of the sheet (B), which is partially juxtaposed against the product (A), which protrude with respect to the terminal edges (9).



Description

[0001] The present invention relates to a packaging assembly, for substantially flat products, in particular chocolate tablets or bars, snacks, chocolates, candy, biscuits, wafers and the like.

[0002] The packaging of this type of products is generally constituted by a primary, wrapping layer (in direct contact with the surfaces of the product) and a secondary, covering layer (generally, but not exclusively, made of paper or cardboard).

[0003] The primary layer is generally made with sheets of aluminum (or sheets constituted by aluminum and other materials), although recently the increasing adoption of polymeric and/or biopolymeric sheets has been seen (more generally sheets of biodegradable and/or compostable materials and/or materials with similar characteristics).

[0004] This first, wrapping layer is juxtaposed against all the walls of the product and therefore covers it without modifying its space occupation.

[0005] By using sheets of aluminum (or sheets comprising aluminum), it is possible to take advantage of the mechanical characteristics of this material, which ensure that the sheet, once shaped, does not undergo elastic return. The tendency to maintain the shape that has been imposed on them, which is a property of sheets of aluminum (or sheets comprising aluminum), also makes it possible to manage, in a substantially simple manner, the heat-sealing operations of the flaps of such sheets in order to seal the product inside the sheet.

[0006] By contrast, by using sheets of other materials (in the group indicated above, such as for example polymeric and/or biopolymeric sheets), the risk of an elastic return determines the need to structure the packaging assemblies so as to combat this phenomenon.

[0007] Furthermore, the heat-sealing units present in the assembly must be designed (or at least adjusted/calibrated) as a function of the characteristics of the sheet used, since different materials require different operating temperatures and different compacting pressures of the flaps to be heat-sealed, and all extending over different time intervals.

[0008] Nowadays no packaging assemblies are known which are sufficiently versatile to be used indifferently (without making modifications to them or adding/removing components) with covering sheets of aluminum (or sheets comprising aluminum) and with sheets of polymeric and/or biopolymeric material.

[0009] In any case the packaging speeds required in conventional assemblies (and therefore the associated productivity) rule out the adoption of versatile assemblies, thus favoring assemblies dedicated to a specific wrapping sheet.

[0010] The aim of the present invention is to solve the above-mentioned drawbacks, by providing a packaging assembly for substantially flat products that is versatile, i.e. adapted to wrap a product in a packaging constituted

by a primary, wrapping layer made with sheets that are indifferently of aluminum (or comprise aluminum), or polymeric, paper, biopolymeric and the like.

[0011] Within this aim, an object of the invention is to provide a packaging assembly for substantially flat products that offers high productivity, independently of the type of wrapping sheets used.

[0012] Another object of the invention is to provide a packaging assembly for substantially flat products that makes it possible to effectively and stably wrap the product in the respective wrapping sheet, whatever the type and material thereof.

[0013] Another object of the invention is to provide a packaging assembly for substantially flat products that allows a manipulation of the product that is suitable to guard against any damage thereto, even at high operating speeds.

[0014] Another object of the invention is to provide a packaging assembly for substantially flat products that is of compact type and is adapted to be inserted in a line for executing, in sequence, the wrapping of a product in a packaging constituted by a primary, wrapping layer and a secondary, covering layer.

[0015] Another object of the present invention is to provide a packaging assembly for substantially flat products that is of low cost, easily and practically implemented, and safe in use.

[0016] This aim and these and other objects that will become more apparent hereinafter are achieved by a packaging assembly for substantially flat products of the type adapted to operate on a conveyance line for products and comprising an apparatus for supplying wrapping sheets which is arranged along said conveyance line directly upstream of said assembly, characterized in that it comprises:

- a carousel provided with a plurality of radial expansions which are provided, at their terminal part, with grip means which can move between a passive, open configuration, in which their terminal edges are arranged like a hopper for the folding and juxtaposition of a wrapping sheet on respective surfaces of a product that is pushed inside them by said conveyance line, and an active, clamping configuration, in which they clamp said product which is partially covered by said sheet and is arranged in a seat delimited by them;
- at least one heat-sealing station, which is arranged facing and proximate to the trajectory of said terminal edges of said grip means arranged on said radial expansions, for the stable coupling of superimposed flaps of said sheet, which is partially juxtaposed against said product, which protrude with respect to said terminal edges.

[0017] Such aim and such objects are also achieved by a packaging plant for substantially flat products of the type comprising a conveyance line for products which

arrive from an external supply device, characterized in that it comprises an assembly according to at least one of the preceding claims, arranged so as to operate on said conveyance line, there being an apparatus for supplying wrapping sheets upstream of said assembly.

[0018] Such aim and such objects are finally achieved by a method for packaging substantially flat products of the type chosen among flat products, in particular chocolate tablets or bars, snacks, chocolates, candy, biscuits, wafers and the like, which comprises:

- a first step of transferring said products from a conveyance line for said products to grip means with the interposition of a wrapping sheet, said grip means defining a hopper for the juxtaposition of said wrapping sheet on three contiguous surfaces of said product;
- a second step of folding and juxtaposition of protruding terminal flaps of said wrapping sheet by means of contoured terminal edges of said grip means;
- a third step of heat-sealing said flaps which is performed by means of at least one heat-sealing station which is designed to clamp them by means of jaws which are clamped with a predefined pressure applied for a predefined time and which have at least one surface kept at a predefined temperature;
- a fourth step of folding said flaps onto the outer surface of said product which is covered by said sheet, by means of a folding lamina which is substantially tangent to the edge of said product from which said heat-sealed flaps protrude;
- a fifth step of juxtaposing the tubular fronts of said sheet, by means of a folding unit which is tangent to the mutually opposite fronts of each product.

[0019] Further characteristics and advantages of the invention will become better apparent from the detailed description that follows of a preferred, but not exclusive, embodiment of the packaging assembly for substantially flat products, which is illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a schematic perspective view of an embodiment of a plant provided with a packaging assembly for substantially flat products according to the invention;

Figure 2 is a schematic front elevation view of the assembly of Figure 1;

Figure 3 is a schematic perspective view of a portion of the assembly of Figure 1;

Figure 4 is a schematic front elevation view of the assembly of Figure 1;

Figure 5 is a partially cross-sectional schematic perspective view of a plant provided with the assembly of Figure 1;

Figure 6 is an enlarged perspective view of the detail VI indicated in Figure 5;

Figure 7 is an enlarged perspective view of the detail

VII indicated in Figure 5;

Figure 8 is an enlarged perspective view of the detail VIII indicated in Figure 5;

Figure 9 is an enlarged front elevation view of the detail of Figure 8;

Figure 10 is an enlarged perspective view of movable folding plates and the respective heat-sealing units for closure, in a first step prior to folding the tubular fronts of the wrapping sheet, corresponding to the detail X indicated in Figure 5;

Figure 11 is an enlarged perspective view of the plates and the heat-sealing units of Figure 10 in a second step of folding the tubular fronts of the wrapping sheet;

Figure 12 is an enlarged perspective view of the plates and the heat-sealing units of Figure 10 in a third step of heat-sealing portions of the folded tubular fronts of the wrapping sheet;

Figure 13 is an enlarged perspective view of the tubular fronts of the wrapping sheet, which have been folded and heat-sealed by the plates and by the heat-sealing units.

[0020] With reference to the figures, the reference numeral 1 generally designates a packaging assembly for substantially flat products A.

[0021] The packaging assembly 1 according to the invention is adapted to be installed to operate on a conveyance line 2 for products A: this line will receive the products from a magazine or from the machine that makes them.

[0022] The packaging assembly 1 comprises an apparatus for supplying wrapping sheets B which is arranged along the conveyance line directly upstream of the assembly 1.

[0023] The assembly 1 according to the invention comprises a carousel 4 provided with a plurality of radial expansions 5 which are provided, at their terminal part, with grip means 6 which can move between a passive, open configuration, in which their terminal edges are arranged like a hopper for the folding and juxtaposition of a wrapping sheet on respective surfaces of a product A that is pushed inside them by the conveyance line 2 (as can be seen for the purposes of non-limiting example in Figures 5 and 6), and an active, clamping configuration, in which they clamp the product A which is partially covered by the sheet B and is arranged in a seat delimited by them.

[0024] In more detail, it should be noted that the product A, in its transfer path from the conveyance line 2 to the grip means 6, will encounter the sheet B, pulling it inside the grip means 6. The particular open configuration of the grip means 6 allows the entry of the product A, on the surfaces of which (in particular its edge directed toward the seat inside the grip means 6 and the two mutually opposite faces of the product that are contiguous with that edge) the sheet B is extended and juxtaposed, because the grip means 6, in this configuration, define an opening that is slightly larger than the thickness of the

product A, so forcing the sheet B to follow its shape.

[0025] The assembly 1 further comprises at least one heat-sealing station 7, 8, which is arranged facing and proximate to the trajectory of the terminal edges 9 of the grip means 6 arranged on the radial expansions 5.

[0026] The at least one heat-sealing station 7, 8 is designed for the stable coupling of superimposed flaps C of the sheet B, which is partially juxtaposed against the product A, which protrude with respect to these terminal edges 9 (this stable coupling by heat-sealing the flaps C is illustrated by way of non-limiting example in the accompanying Figures 5 and 7).

[0027] With particular reference to the embodiment shown in the accompanying figures, it should be noted that the assembly 1 according to the invention can conveniently comprise two heat-sealing stations 7, 8 which are arranged at a mutual angular distance that is equal to an angle defined between distinct expansions 5 of the carousel 4.

[0028] By virtue of the presence of the two heat-sealing stations 7, 8 it is possible to ensure an extremely high operating speed of the assembly 1 (it is envisaged that the assembly would be able to package about 250 products A per minute, although the possibility is not ruled out, in the future, of further increasing this parameter): in fact each heat-sealing station 7, 8 will clamp the respective superimposed flaps C of the sheet B, transferring a predefined quantity of heat to them; even if the clamping time ensured by the first station 7 were insufficient to ensure a perfect and stable bonding of the flaps C (owing to the high operating speed of the assembly 1), such flaps C would subsequently be clamped by the second station 8, which could complete the welding process thereof. In practice, by virtue of the presence of the two consecutive stations 7, 8, they are subjected to a thermo-mechanical treatment for the mutual heat-sealing thereof that lasts for the sum of the clamping times thereof in the first station 7 and in the second station 8 (to ensure that an optimal mutual heat-sealing thereof is safely achieved).

[0029] In order to identify the characteristics of the assembly 1 according to the invention with greater precision, it should be noted that the grip means 6 can advantageously comprise respective abutment units 10, 11 of a type chosen among folding units 10 and at least partially deformable elements 11 for the elastic forcing of the sheet B onto at least one surface of the product A.

[0030] The folding units 10 will be shaped like the jaws of a clamp that, in the clamped configuration, delimit a seat with shape and dimensions complementary to those of the product A. The transition from the open configuration to the clamped condition will cause the folding of one of the protruding flaps C of the sheet B until it is superimposed on the other, by virtue of a tooth 12 protruding from the external end (looking along a radial direction, in the operational mounting arrangement) of the folding unit 10, which will be superimposed on the outer lateral surface (again, along the same radial reference, referring to the carousel 4) of the product A (in so doing folding there-

on the flap of the sheet B, until it is juxtaposed against the other flap).

[0031] The at least partially deformable elements 11 are constituted by brushes, the bristles of which are directed toward the inside of the seat (with shape and dimensions complementary to those of the product A) delimited by the grip means 6.

[0032] The possibility is not ruled out of adopting, in place of the brushes, other deformable elements such as shapes made of expanded or elastomeric material, or rigid components kept in position by way of elastic elements such as springs, magnets, compressed air devices and/or air jets and the like.

[0033] It should further be noted that the heat-sealing stations 7, 8 can profitably comprise mutually opposite pairs of jaws (respectively 7a, 7b and 8a, 8b), of which at least one can move, which are provided at a corresponding terminal end thereof with complementary platelets which are associated with respective heaters.

[0034] The jaws 7a, 7b; 8a, 8b can advantageously, for a predefined length of time, clamp the superimposed flaps C of the sheet B that protrude from the terminal edges of the grip means 6 by applying a predefined pressure: such clamping will be performed while at least one of the end platelets of one of the jaws 7a, 7b; 8a, 8b is conveniently kept at a predefined temperature by the respective heater. In this manner it will be possible to ensure the correct heat-sealing of the superimposed flaps C of the sheet B (by virtue of the succession of the two steps of heat-sealing thereof which are performed in the first station 7 and in the second station 8).

[0035] With particular reference to an embodiment of undoubted practical and applicative interest, the radial expansions 5 are six in number, arranged substantially at 60° from each other.

[0036] During operation, a first expansion 5 will conveniently be aligned with the conveyance line 2 at the apparatus 3 for supplying wrapping sheets B, a second expansion 5, contiguous and successive to the first one, will be positively aligned with a first heat-sealing station 7, a third expansion 5, contiguous and successive to the second one, will be usefully aligned with a second heat-sealing station 8, and a fourth expansion 5 will be aligned with the conveyance line 2 for the dispensing, and delivery thereon, of the packaged product A. The further two expansions 5 will be on an opposite side of the assembly 1 according to the invention, along which no operations will be performed on the products A (the possibility is not ruled out of adopting services for cleaning, for example by way of air jets, the two expansions 5 that are located in this inactive zone of the assembly 1).

[0037] It should further be noted that the assembly 1 according to the invention can comprise, downstream of the carousel 4, at least one folding unit for respective portions of the wrapping sheet B of a type chosen among a fixed folding lamina 13 (shown for the purposes of non-limiting example in the accompanying Figures 1, 2, 5, 8 and 9), which faces and is proximate to the trajectory of

the outer edge of the products A (held by the grip means 6) for the folding of the superimposed and heat-sealed (in the stations 7, 8) flaps of the sheet B, and movable folding plates 14 which face and are proximate to mutually opposite tubular fronts D of the sheet B which is folded around the product (shown for the purposes of non-limiting example in the accompanying Figures 5, 10, 11, 12 and 13).

[0038] Such movable folding plates 14 will be configured to juxtapose the mutually opposite tubular fronts D of the sheet B which is folded around the product A (for example by sliding parallel and proximate to the surface of the product A that is delimited within such tubular front, so as to fold such tubular front along it); these movable folding plates 14 can profitably be associated with respective heat-sealing units 15 which, abutting against such mutually opposite and juxtaposed tubular fronts D of the sheet B, will heat-seal them together, thus completing the closure of the packaging around the product A (isolating it from the outside environment).

[0039] The protection of the present invention also extends to a packaging plant for substantially flat products A that comprises a conveyance line 2 for products A which arrive from an external supply device, and an assembly 1 of the type described up to this point which is arranged so as to operate on the conveyance line 2.

[0040] It should be noted that the packaging assembly 1 according to the invention of the plant will comprise, upstream, an apparatus 3 for supplying wrapping sheets B.

[0041] Such plant will be adapted to package products A of the flat type, in particular chocolate tablets or bars, snacks, chocolates, candy, biscuits, wafers and the like.

[0042] The wrapping sheets B used in this plant will be made of a material chosen among aluminum sheets, sheets comprising aluminum, sheets comprising biopolymeric material, sheets comprising polymeric material, sheets comprising paper, sheets comprising biodegradable material and sheets comprising compostable material.

[0043] The present invention also extends its protection to include a method for packaging substantially flat products A of the type chosen among flat products, in particular chocolate tablets or bars, snacks, chocolates, candy, biscuits, wafers and the like, which entails the execution of a series of steps in sequence.

[0044] First of all there is a first step of transferring the products A from a conveyance line 2 for said products to grip means 6 with the interposition of a wrapping sheet A: such grip means 6 will be configured to define a hopper, and by passing through the latter the product A will be partially wrapped by the sheet B with the juxtaposition of the wrapping sheet B on three contiguous surfaces of the product A.

[0045] Then comes a second step of folding and juxtaposition of protruding terminal flaps C of the wrapping sheet B by means of contoured terminal edges (in more detail, these are provided with a folding tooth 12) of the

grip means 6.

[0046] In a third step the method continues by heat-sealing the flaps C, which is performed by means of at least one heat-sealing station 7, 8 which is designed to clamp these flaps C by means of jaws, respectively 7a, 7b; 8a, 8b, which are clamped with a predefined pressure applied for a predefined time and which have at least one surface kept at a predefined temperature.

[0047] The presence of two heat-sealing stations makes it possible to execute this third step in two consecutive sub-steps.

[0048] In a fourth step the method continues by folding the heat-sealed flaps C onto the outer surface of the product A which is covered by the sheet B, by means of a folding lamina 13 which is substantially tangent to the edge of the product A from which these heat-sealed flaps C protrude.

[0049] A fifth step comprises the juxtaposition of the tubular fronts D of the sheet B (which is wrapped around the product A), by means of a folding unit which is tangent to the mutually opposite fronts D of each product A.

[0050] It should be noted that the method can further comprise a sixth step of mutually heat-sealing the tubular fronts D of the sheet B which were previously juxtaposed.

[0051] The operation of the invention is the following: the assembly 1 receives the product A (for example a bar of chocolate) in the seat defined inside the grip means 6 of the first radial expansion 5, facing the conveyance line 2, said product A has already encountered the wrapping sheet B (which was previously cut to size by the corresponding apparatus 3). The product A, thus wrapped, is brought by the carousel 4 (via its successive rotations along predefined angles) into the two successive heat-sealing stations 7, 8, in which the heat-sealing of the juxtaposed flaps C of the sheet B occurs (the stations 7, 8, with reference to a geometric arrangement corresponding to a clock face, will be located at 11 o'clock and at 1 o'clock). The superimposed flaps C of the heat-sealed sheet B will then be folded onto the base of the product B by means of the fixed folding lamina 13.

[0052] By overturning the product A from its entry to its exit, the transfer carousel 4 results in a change of the fixed line of the product A, going from its top, or "high fixed line" (which in a bar of chocolate corresponds to the shaped part of the bar), to its bottom, or "low fixed line" (which in a bar of chocolate corresponds to the smooth part of the bar).

[0053] With respect to the solutions currently used for transferring a product A (the bar of chocolate) on a line, adopting the carousel 4 has the following advantages:

- It makes it possible to easily adopt two heat-sealing stations 7, 8 (in conventional plants it is impossible to insert two heat-sealing stations);
- During the transfer (after the carousel), the product A (for example the bar of chocolate), which presents the fold of the juxtaposed doubly heat-sealed flaps C on the base (the base facing upward), proceeds

with the fold, without sliding on any fixed surface. In conventional technical solutions, the base of the product A (for example the bar of chocolate) slides on a fixed surface, going against the fold, and as a consequence potential tears in the internal packaging, especially when the product A has significant projections on its base (as occurs in bars of chocolate that incorporate whole hazelnuts) are drastically reduced.

[0054] With respect to the prior art, the advantages offered by the presence of two consecutive heat-sealing stations 7, 8 are the following:

- For the same conditions, the solution according to the known art (which can have just one single heat-sealing station) can halve the values of the pressure exerted by the jaws 7a, 7b; 8a, 8b and of their temperature, thus subjecting the material that constitutes the sheet B to a lower thermo-mechanical stress;
- At the maximum operating speed currently envisaged (250 products A packaged per minute), the conditions are suitable for heat-sealing even the material that presents the greatest problems, without resorting to excessive temperatures and/or pressures.

[0055] The present invention furthermore ensures an optimal management of thermal inertia: via the introduction of parametrized cams (the activation of the heat-sealing stations 7, 8, the rotation of the carousel 4, and the actuation of the grip means 6 are obtained by virtue of actuators constituted by controlled motors, generally brushless motors), it is possible to keep the parameters constant for ideal heat-sealing (constant length of time and constant temperature) as the speed of the plant and of the assembly 1 varies.

[0056] In traditional machines that use mechanical cams (or in general exclusively mechanical actuation contrivances), maintaining the same heat-sealing conditions as the operating speed varies represents a difficult management problem.

[0057] In a traditional (exclusively mechanical) machine, by adjusting the temperature of the heat-sealing units to a given value (for example 100°C) that ensures an optimal heat-sealing at a certain machine speed (for example 200 products A packaged per minute), when the machine is then operated at a lower speed (for example 100 products A packaged per minute) the heat-sealing time doubles and, as a consequence, in order to maintain the same optimal heat-sealing conditions, it is necessary to reduce the temperature of the heat-sealing units with a non-negligible temporal transient owing to thermal inertia (in the meantime the plant continues to package products at the start of the cycle), or physically remove the units from the product, by introducing an additional mechanical apparatus (so as to decrease the

length of time during which the heat-sealing is performed).

[0058] By virtue of the brushless architecture used and the two independent stations 7, 8, the present invention allows to keep the optimal heat-sealing conditions constant, with no transients when changing from one speed to another (transients that are, incidentally, extremely short; in the order of 1 to 1.5 seconds).

[0059] In this manner the present invention makes it possible to considerably reduce the number of blister packs A that are potentially to be rejected.

[0060] Advantageously, the present invention solves the drawbacks described previously, by providing a packaging assembly 1 for substantially flat products A that is of versatile type, i.e. adapted to wrap a product in a packaging constituted by a primary, wrapping layer made with sheets B that are indifferently of aluminum (or comprise aluminum), or polymeric, paper, biopolymeric and the like.

[0061] Conveniently, the assembly 1 according to the invention is highly productive (with operating speeds of the order of 250 products A packaged per minute, although the possibility is not ruled out of raising this value), independently of the type of wrapping sheets B used.

[0062] Profitably, the assembly 1 according to the invention makes it possible to effectively and stably wrap the product A in the respective wrapping sheet B, whatever the type and material thereof.

[0063] Advantageously, the assembly 1 according to the invention allows a manipulation of the product A that is suitable to guard against any damage thereto, even at high operating speeds.

[0064] Positively, the assembly 1 according to the invention is of compact type and is adapted to be inserted in a line 2 for executing, in sequence, the wrapping of a product in a packaging constituted by a primary, wrapping layer and a secondary, covering layer.

[0065] Positively the assembly 1 according to the invention is easily and practically implemented and is of low cost: the assembly 1, the plant and the method according to the invention therefore constitute innovations that are certain to be safe in use.

[0066] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

[0067] In the embodiments illustrated, individual characteristics shown in relation to specific examples may in reality be interchanged with other, different characteristics, existing in other embodiments.

[0068] In practice, the materials employed, as well as the dimensions, may be any according to requirements and to the state of the art.

[0069] The disclosures in Italian Patent Application No. 102022000016485 from which this application claims priority are incorporated herein by reference.

[0070] 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 packaging assembly for substantially flat products (A) of the type adapted to operate on a conveyance line (2) for products (A) and comprising an apparatus (3) for supplying wrapping sheets (B) which is arranged along said conveyance line (2) directly upstream of said assembly (1), **characterized in that** it comprises:

- a carousel (4) provided with a plurality of radial expansions (5) which are provided, at their terminal part, with grip means (6) which can move between a passive, open configuration, in which their terminal edges (9) are arranged like a hopper for the folding and juxtaposition of a wrapping sheet (B) on respective surfaces of a product (A) that is pushed inside them by said conveyance line (2), and an active, clamping configuration, in which they clamp said product (A) which is partially covered by said sheet (B) and is arranged in a seat delimited by them;
- at least one heat-sealing station (7, 8), which is arranged facing and proximate to the trajectory of said terminal edges (9) of said grip means (6) arranged on said radial expansions (5), for the stable coupling of superimposed flaps (C) of said sheet (B), which is partially juxtaposed against said product (A), which protrude with respect to said terminal edges (9).

2. The packaging assembly according to claim 1, **characterized in that** it comprises two heat-sealing stations (7, 8) which are arranged at a mutual angular distance apart that is equal to an angle defined between distinct expansions (5) of said carousel (4).
3. The packaging assembly according to one or more of the preceding claims, **characterized in that** said grip means (6) comprise abutment units of type chosen among folding units (10) and at least partially deformable elements (11) for the elastic forcing of said sheet (B) onto at least one surface of said product (A).
4. The packaging assembly according to claim 3, **characterized in that** said at least partially deformable elements (11) are constituted by brushes the bristles of which are directed toward the inside of said seat delimited by said grip means (6).

5. The packaging assembly according to one or more of the preceding claims, **characterized in that** said heat-sealing stations (7, 8) comprise mutually opposite pairs of jaws (7a, 7b; 8a, 8b), of which at least one is movable, which are provided at a corresponding terminal end thereof with complementary platelets which are associated with respective heaters, said jaws (7a, 7b; 8a, 8b) clamping for a predefined time and with a predefined pressure the superimposed flaps (C) of said sheet (B) which protrude from said edges (9) of said grip means (6), while at least one of said platelets is kept at a predefined temperature by said heater.
6. The packaging assembly according to claim 5, **characterized in that** said radial expansions (5) are six in number, arranged substantially at 60° from each other, during operation a first expansion (5) being aligned with said conveyance line (2) at said apparatus (3) for supplying wrapping sheets (B), a second expansion (5), contiguous and successive to the first one, being aligned with a first heat-sealing station (7), a third expansion (5), contiguous and successive to the second one, being aligned with a second heat-sealing station (8), a fourth expansion (5) being aligned with said conveyance line (2) for the dispensing and delivery of the packaged product (A).
7. The packaging assembly according to one or more of the preceding claims, **characterized in that** it comprises, downstream of said carousel (4), at least one folding unit for respective portions of said wrapping sheet (B), of a type chosen among a fixed folding lamina (13), which faces and is proximate to the trajectory of the outer edge of said products (A) for the folding of said superimposed and heat-sealed flaps (C) of said sheet (B), and movable folding plates (14), which face and are proximate to mutually opposite tubular fronts (D) of said sheet (B) which is folded around said product (A) for the juxtaposition thereof, said plates (14) being associable with respective heat-sealing units for said mutually opposite and juxtaposed tubular fronts (D) of said sheet (B).
8. A packaging plant for substantially flat products of the type comprising a conveyance line (2) for products (A) which arrive from an external supply device, **characterized in that** it comprises an assembly (1) according to at least one of the preceding claims, arranged so as to operate on said conveyance line (2), there being an apparatus (3) for supplying wrapping sheets (B) upstream of said assembly (1).
9. The packaging plant according to claim 8, **characterized in that** said products (A) are of the type chosen among flat products, in particular chocolate tablets or bars, snacks, chocolates, candy, biscuits, wafers and the like, and said wrapping sheets (B) are

made of a material chosen among aluminum sheets, sheets comprising aluminum, sheets comprising biopolymeric material, sheets comprising polymeric material, sheets comprising paper, sheets comprising biodegradable material and sheets comprising compostable material. 5

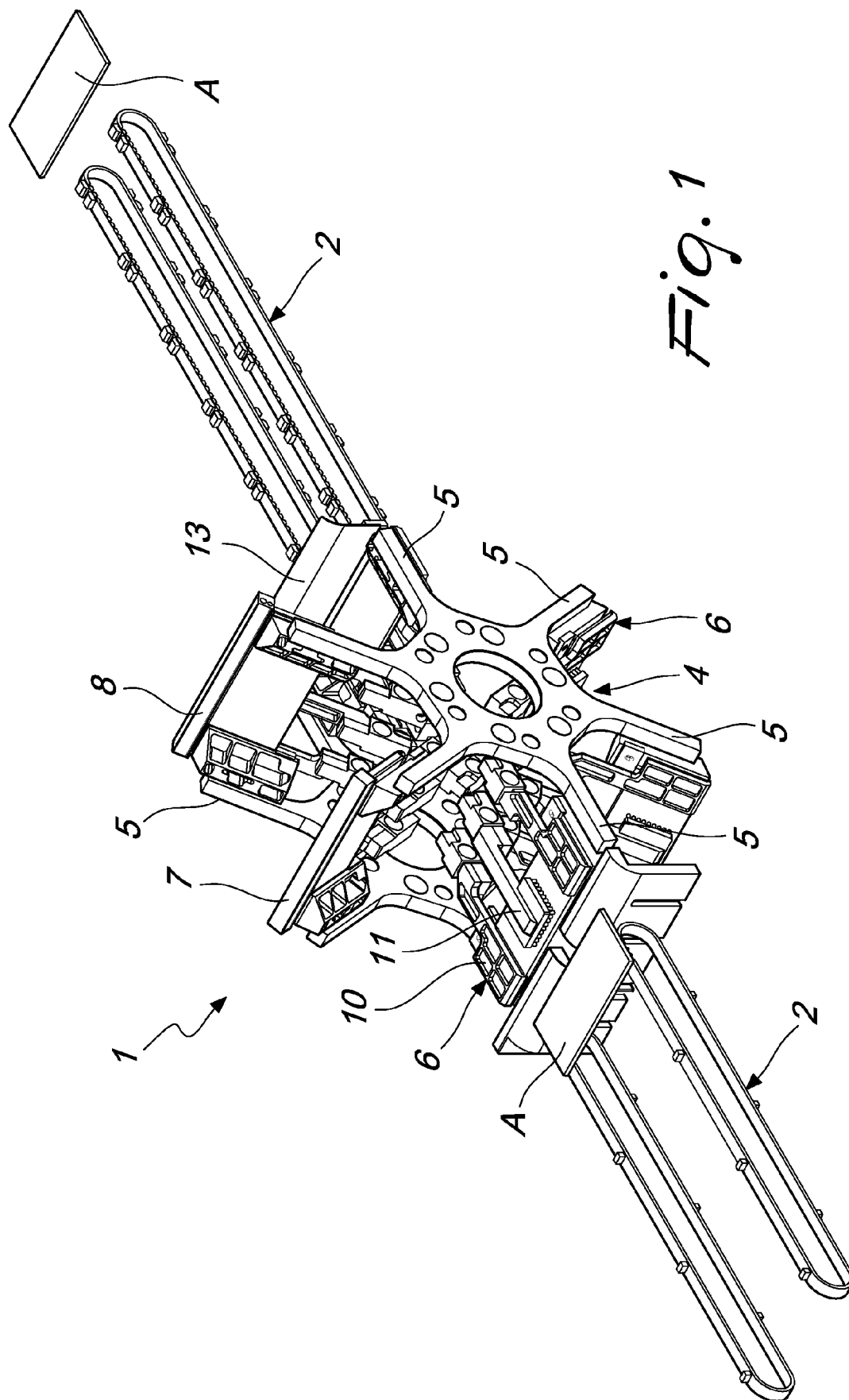
10. A method for packaging substantially flat products (A) of the type chosen among flat products, in particular chocolate tablets or bars, snacks, chocolates, candy, biscuits, wafers and the like, which comprises: 10

- a first step of transferring said products (A) from a conveyance line (2) for said products to grip means (6) with the interposition of a wrapping sheet (B), said grip means (6) defining a hopper for the juxtaposition of said wrapping sheet (B) on three contiguous surfaces of said product (A); 15
- a second step of folding and juxtaposition of protruding terminal flaps (C) of said wrapping sheet (B) by means of contoured terminal edges (12) of said grip means (6); 20
- a third step of heat-sealing said flaps (C) which is performed by means of at least one heat-sealing station (7, 8) which is designed to clamp them by means of jaws (7a, 7b; 8a, 8b) which are tightened with a predefined pressure applied for a predefined time and which have at least one surface kept at a predefined temperature; 25 30
- a fourth step of folding said heat-sealed flaps (C) onto the outer surface of said product (A) which is covered by said sheet (B), by means of a folding lamina (13) which is substantially tangent to the edge of said product (A) from which said heat-sealed flaps (C) protrude; 35
- a fifth step of juxtaposing the tubular fronts (C) of said sheet (B), by means of a folding unit which is tangent to the mutually opposite fronts (D) of each product (A). 40

11. A method for packaging according to claim 10, **characterized in that** it comprises a sixth step of mutually heat-sealing said tubular fronts (D) of said sheet (B) which are juxtaposed. 45

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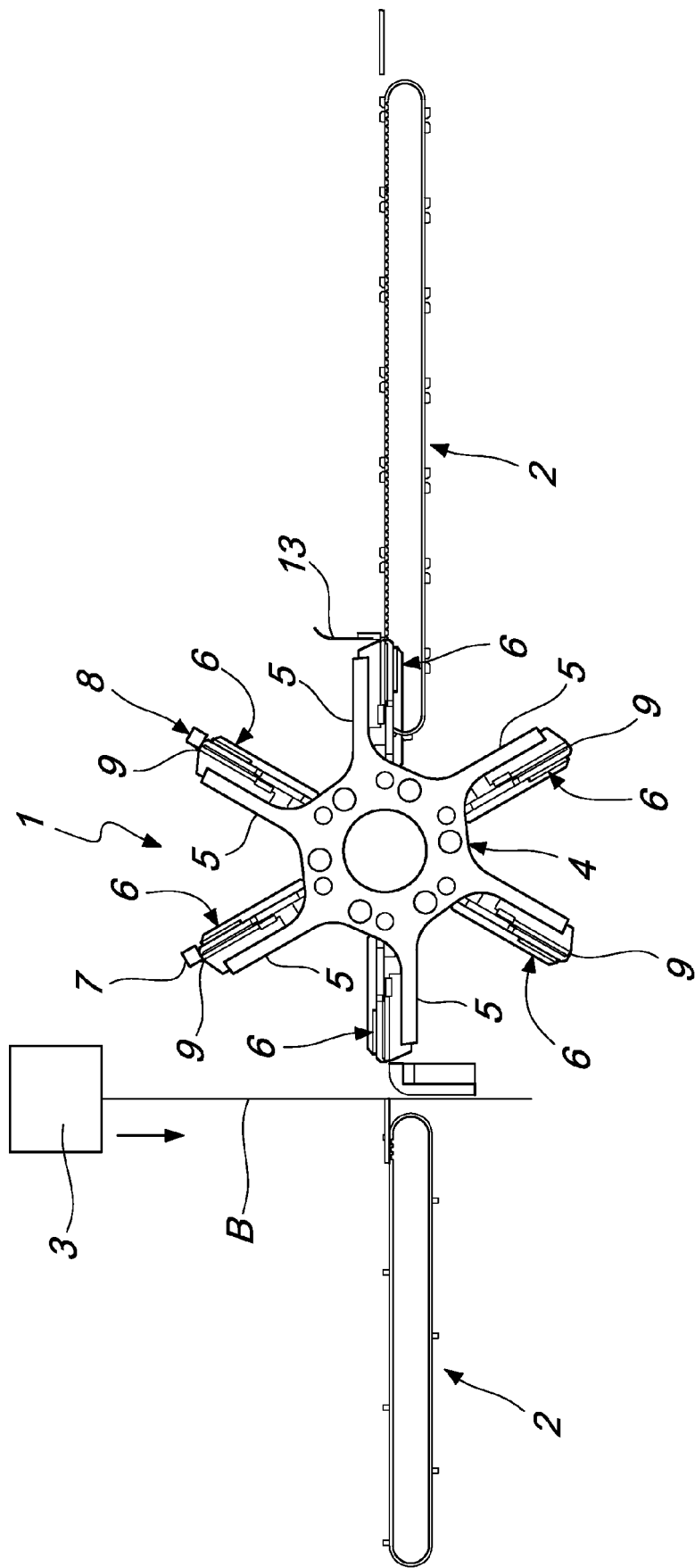
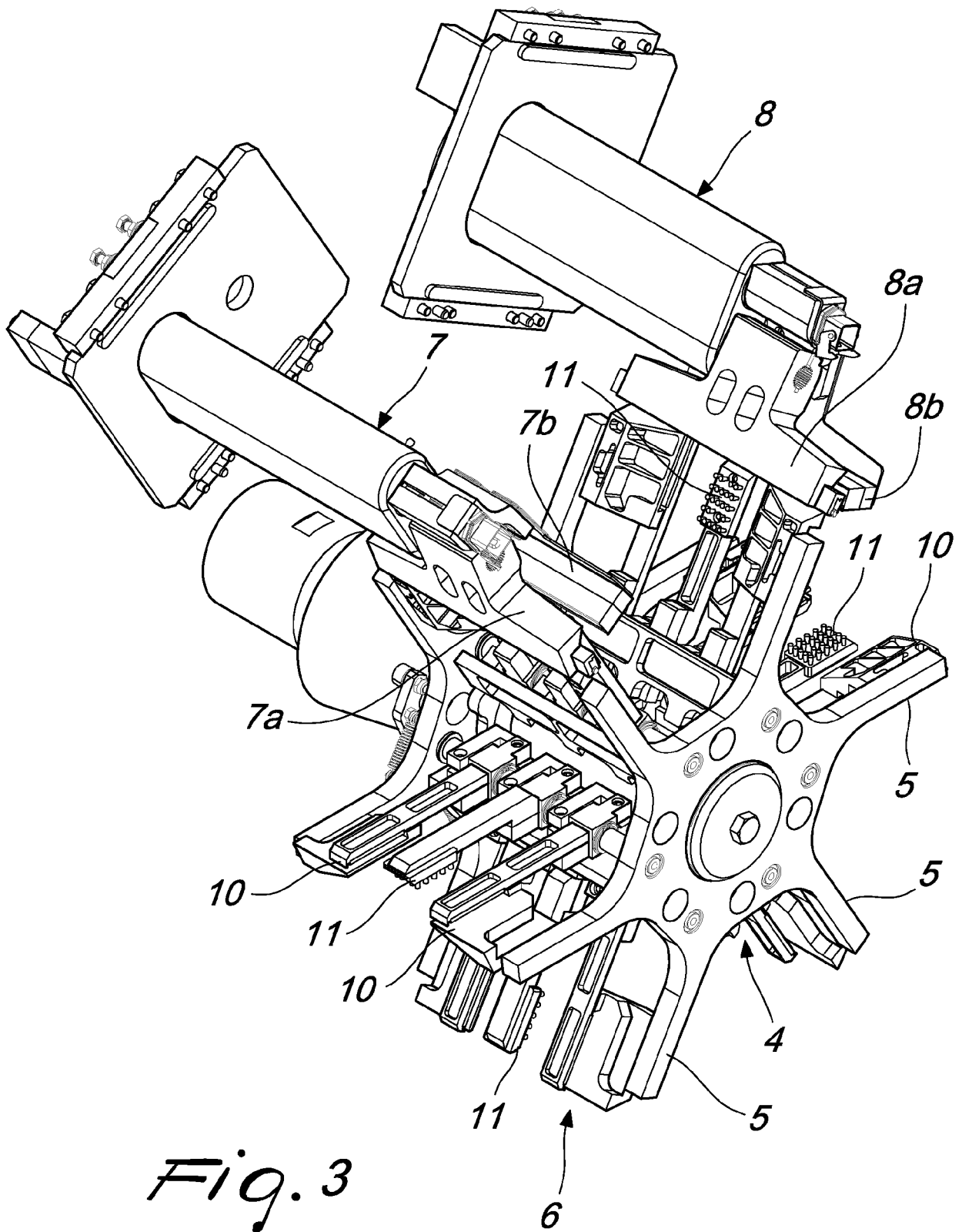


Fig. 2



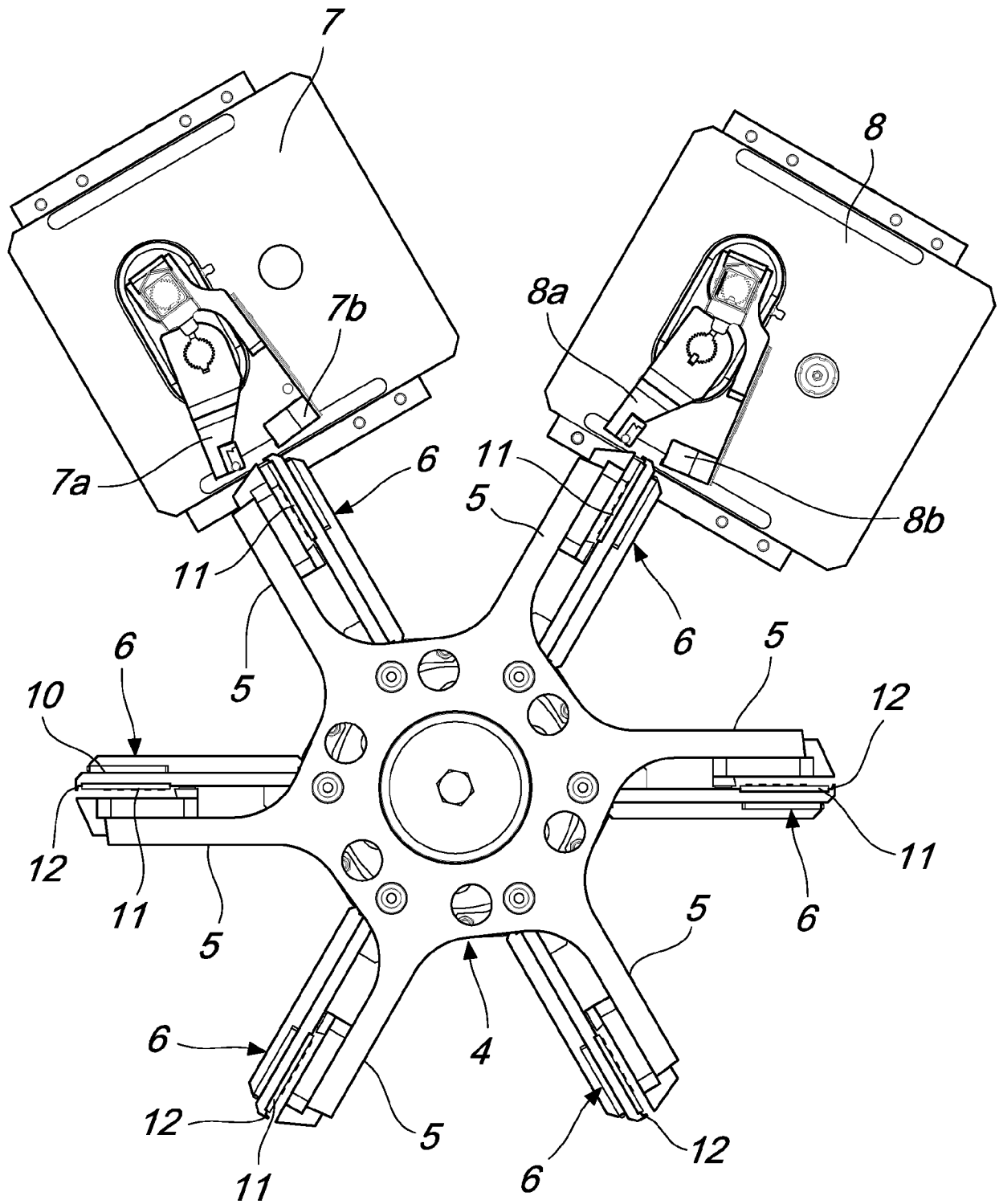


Fig. 4

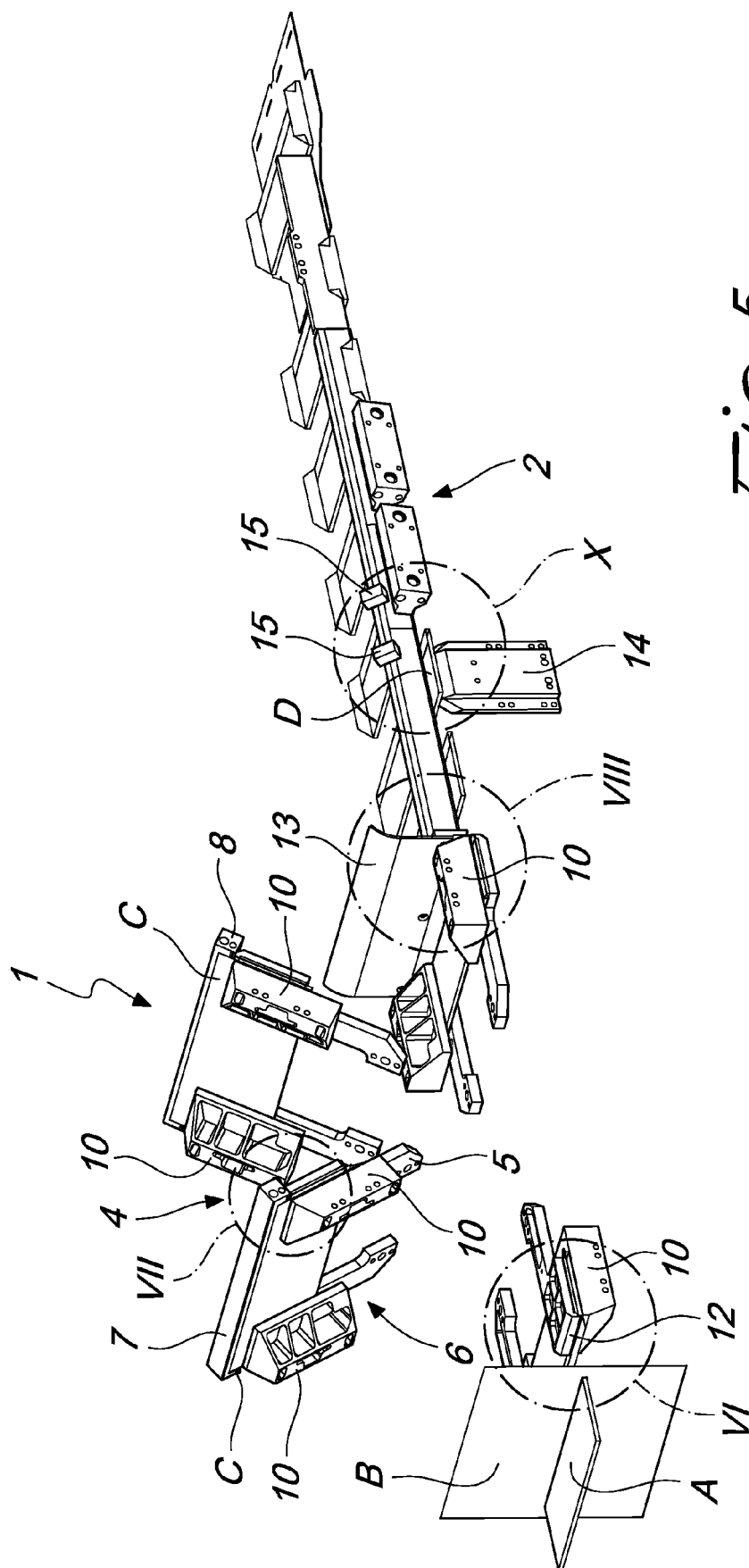
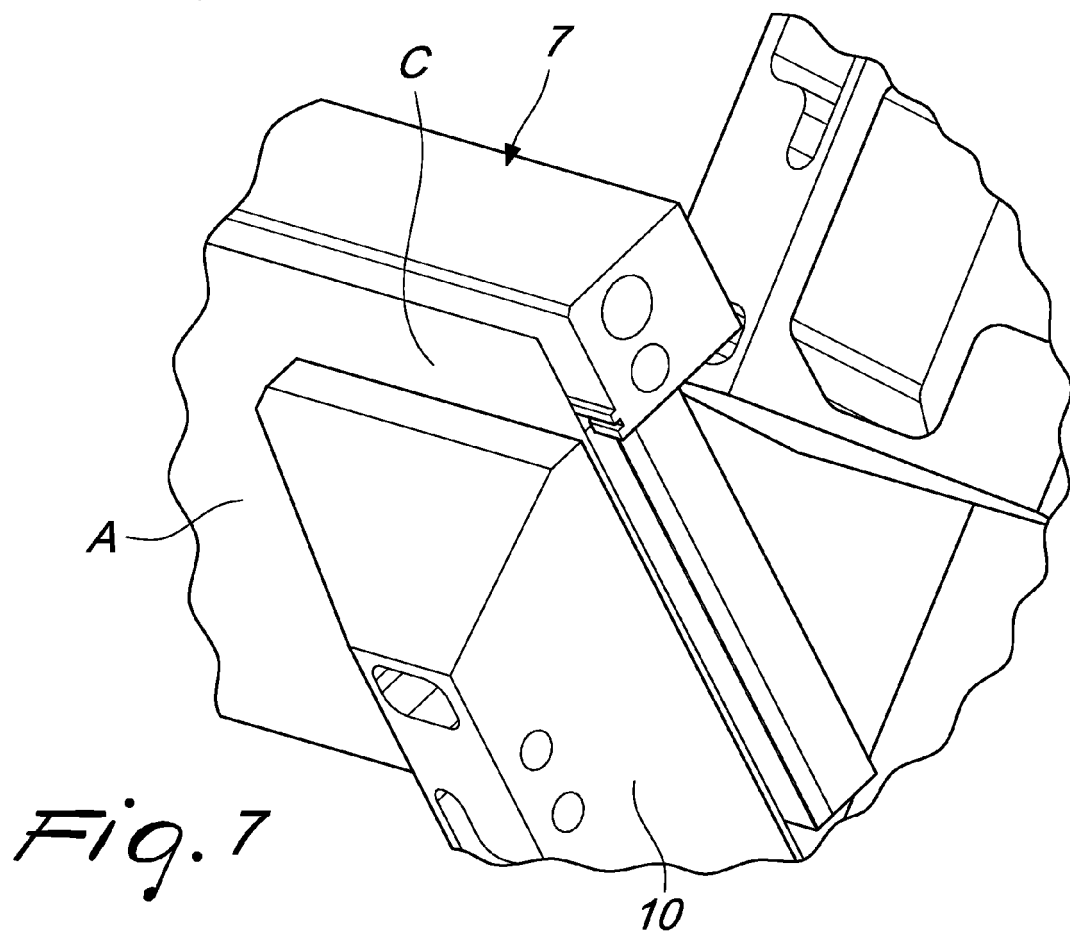
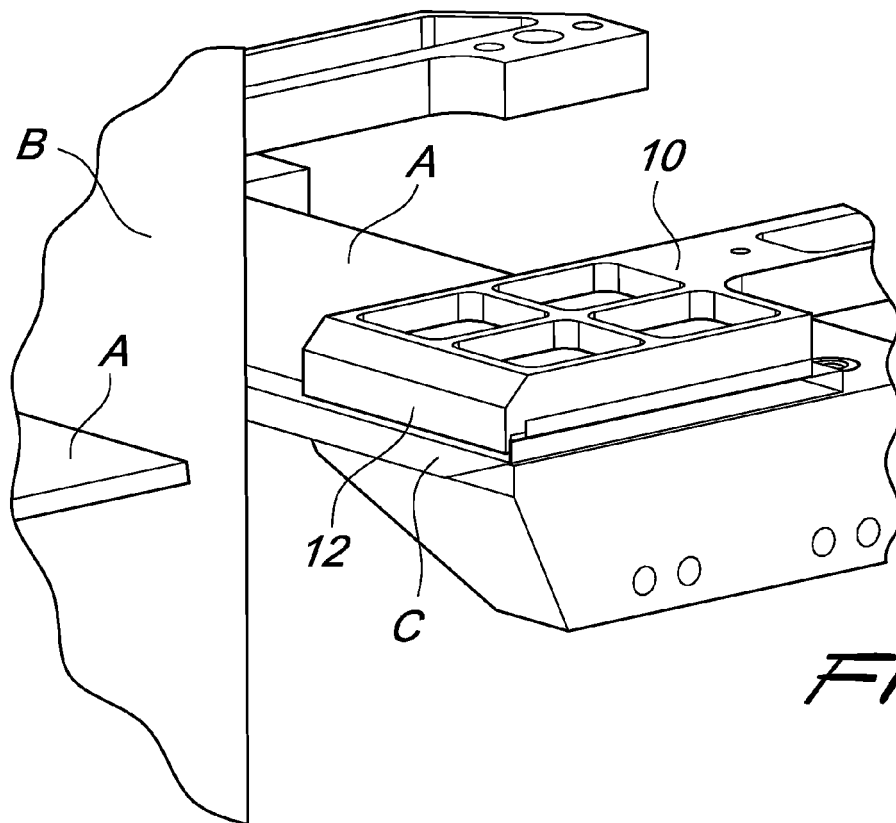
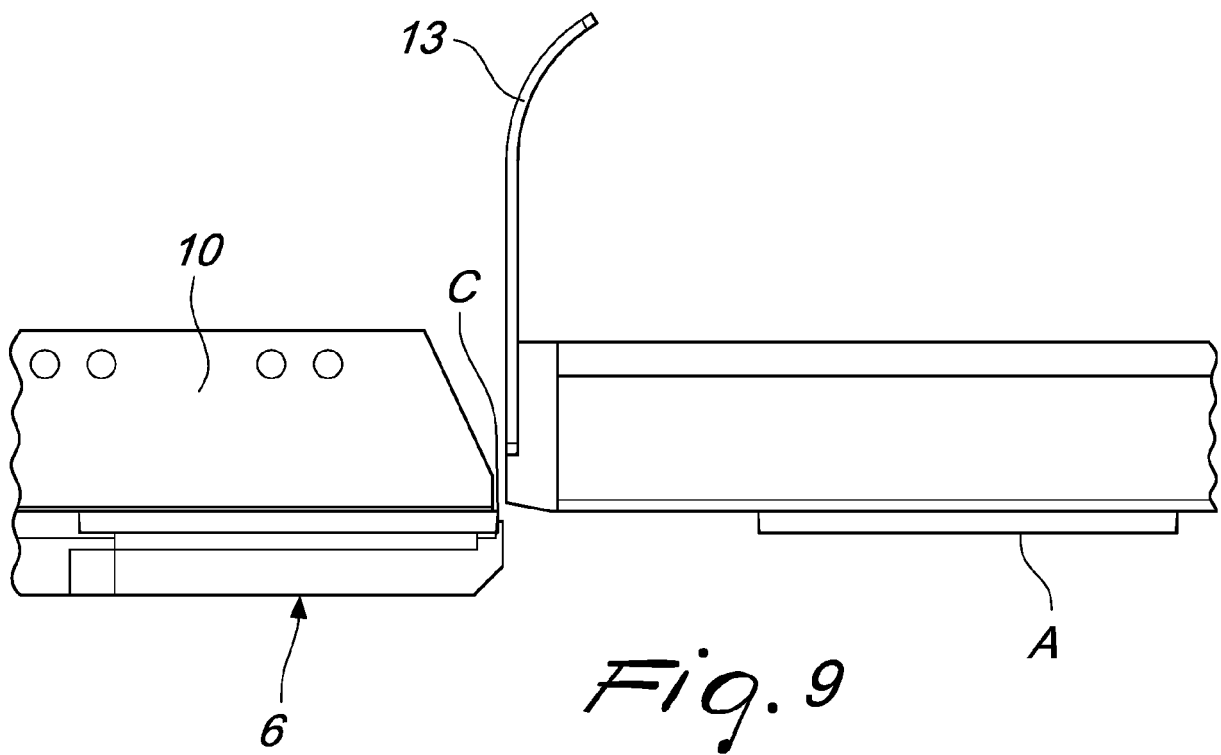
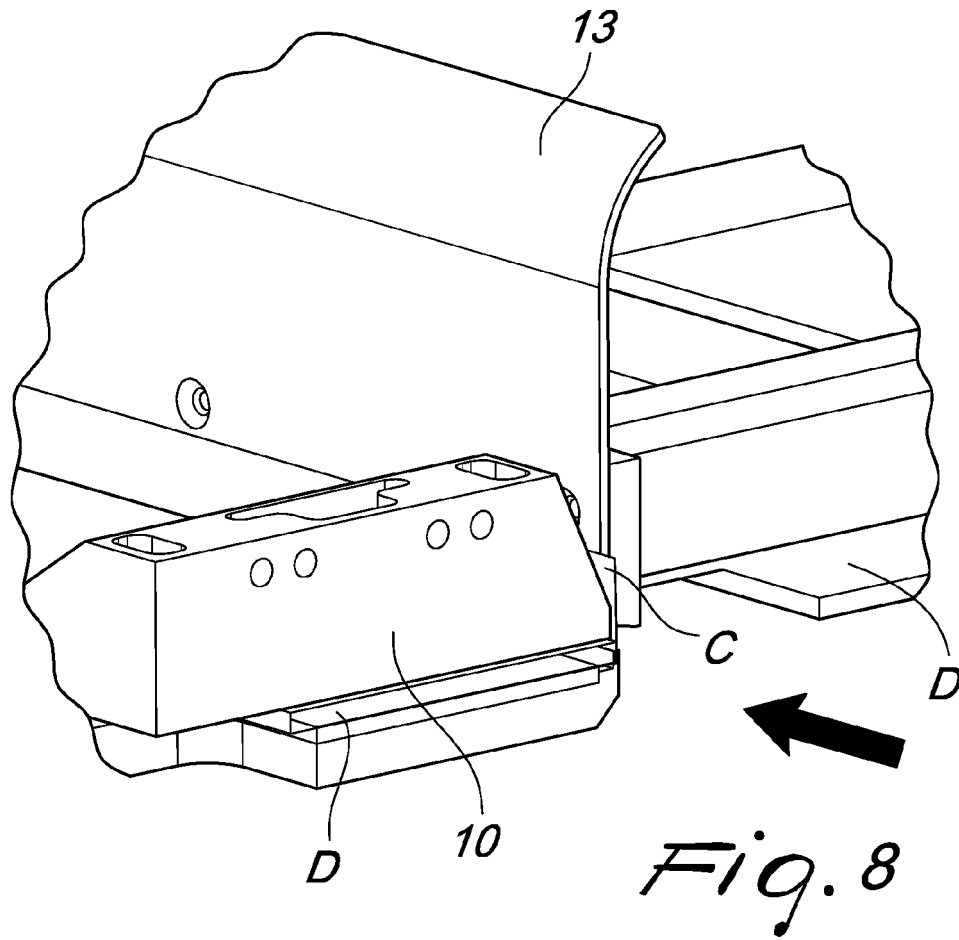
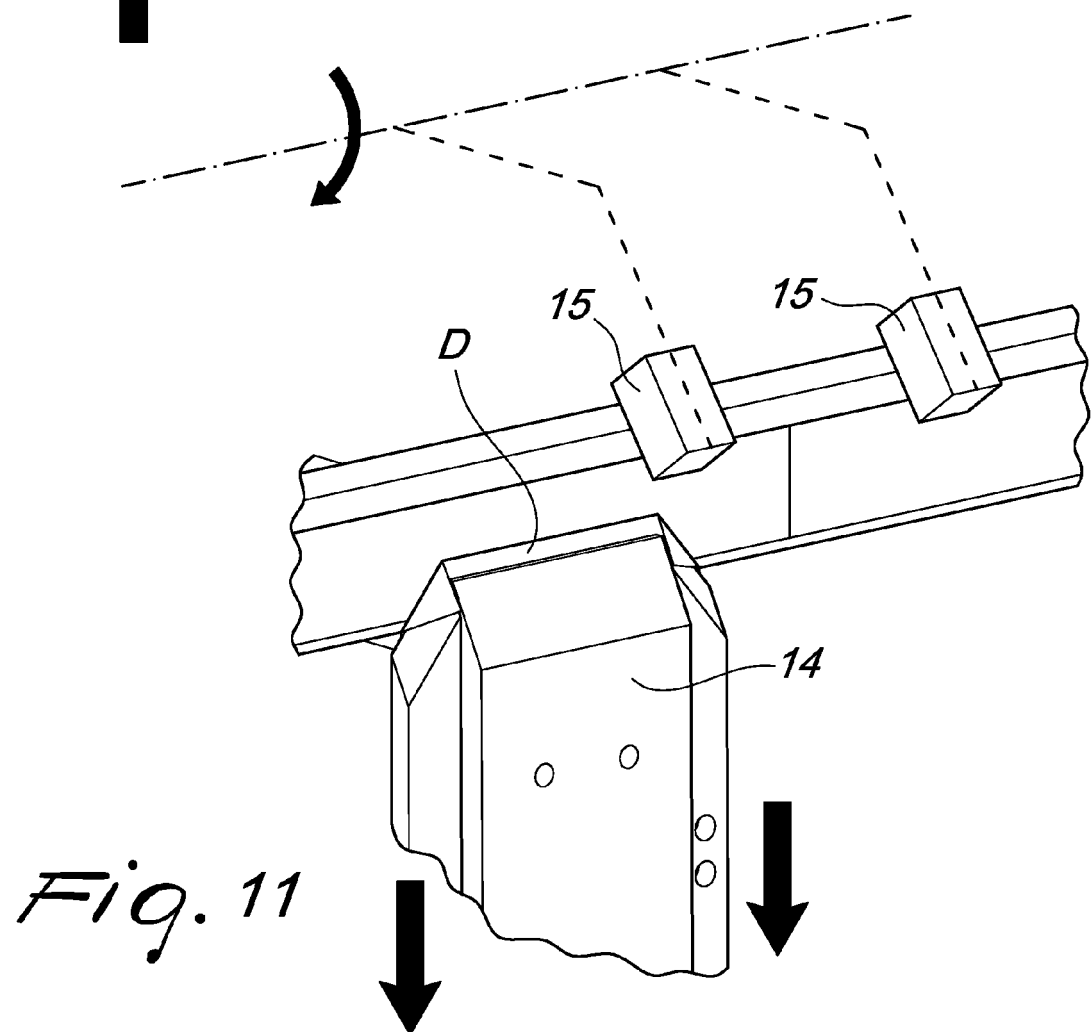
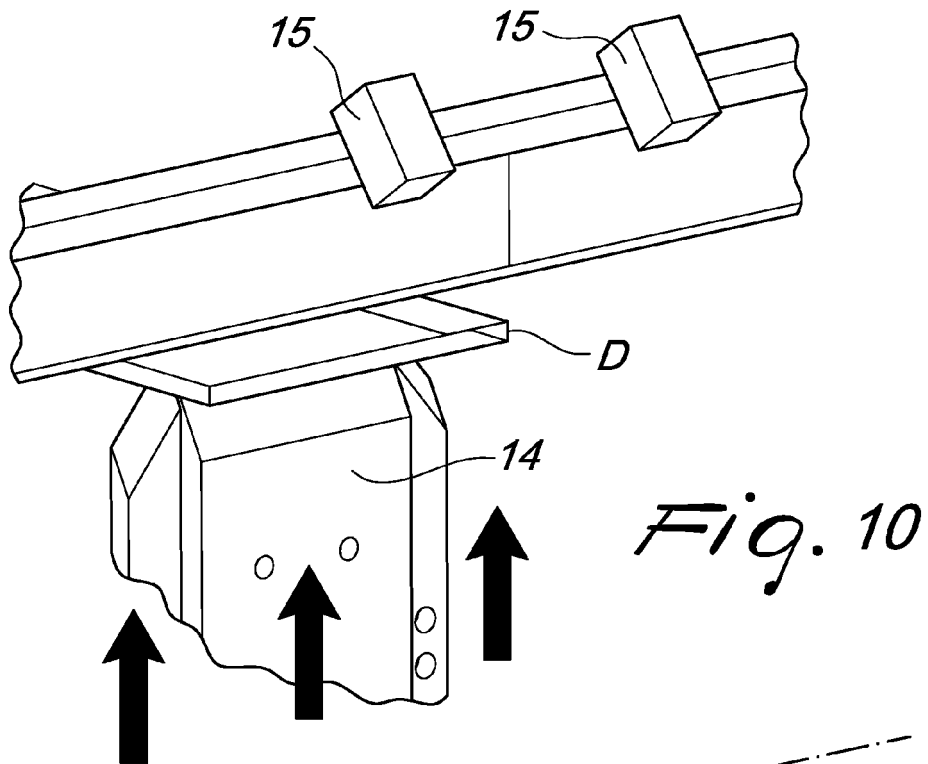


Fig. 5







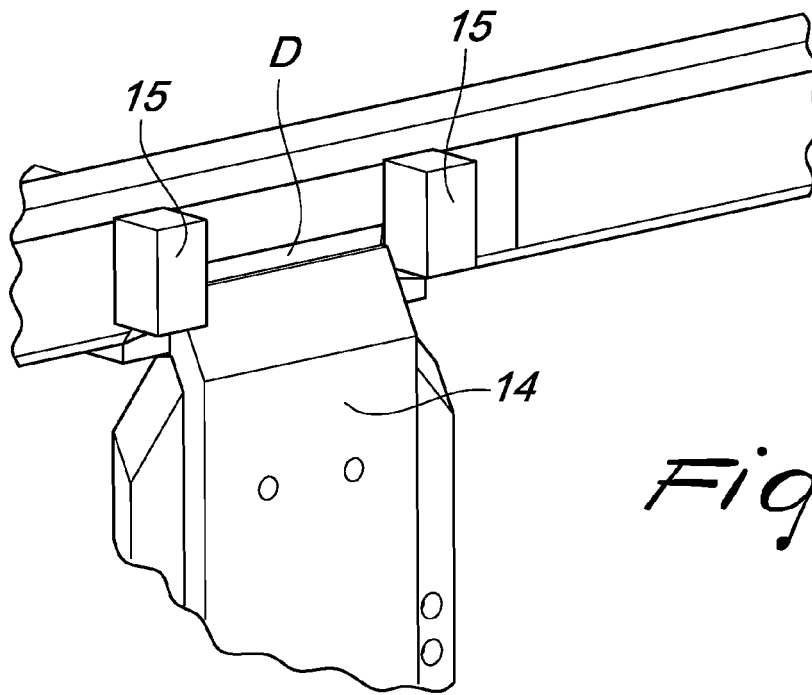


Fig. 12

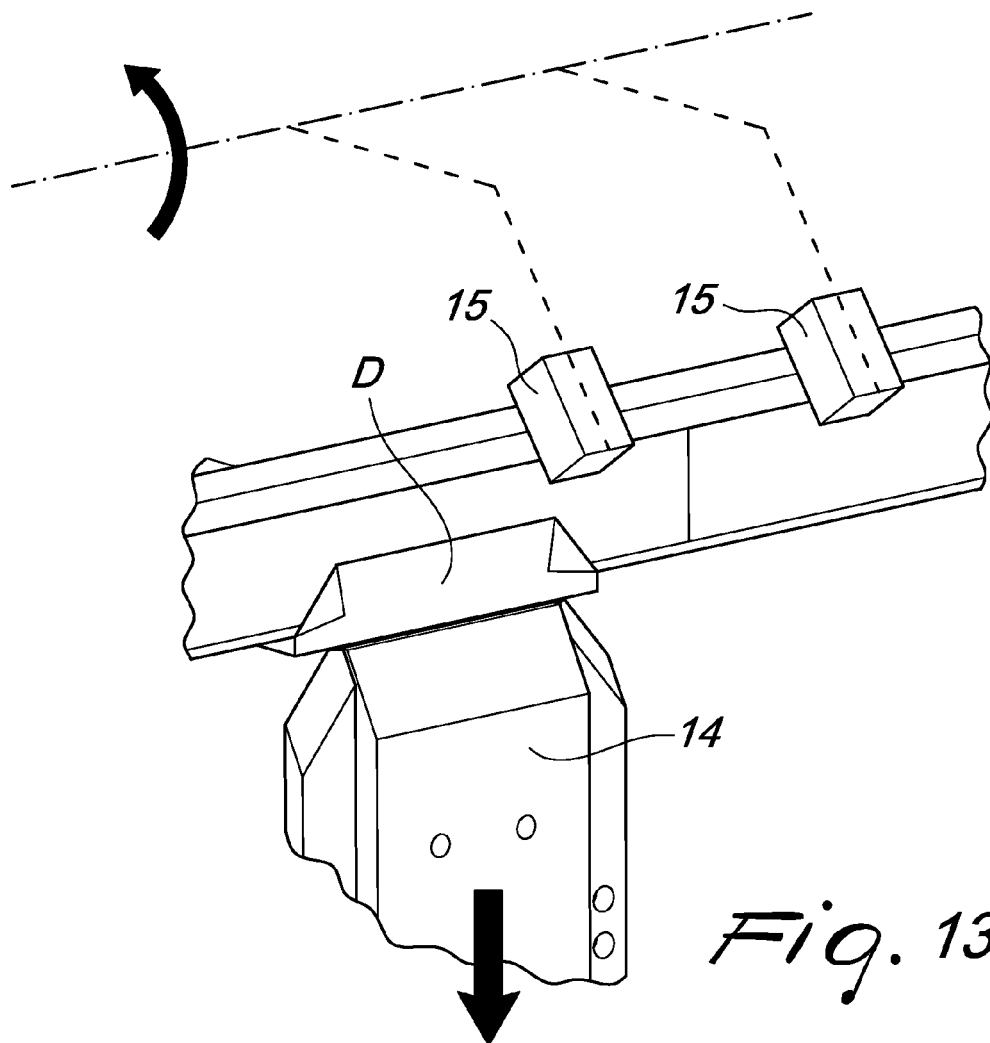


Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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