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(71) Applicant *(for all designated States except US)*: **TASTYMATIC B.V.** [NL/NL]; Expeditieweg 20, NL-4501 WC Oostburg (NL).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **VAN BURG, Pieter Cornelis** [NL/NL]; Klein Brabant 40, NL-4508 NG Waterlandkerkje (NL). **LOHMAN, Ronald Alphons Cyriel** [NL/NL]; Spuiplein 47, NL-4511 AP Breskens (NL).

(74) Agent: **HYLARIDES, Paul Jacques**; Sweelinckplein 1, NL-2517 GK Den Haag (NL).

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(54) Title: DEVICE AND METHOD FOR REMOVING THE CORE AND THE FLESH FROM A FRUIT

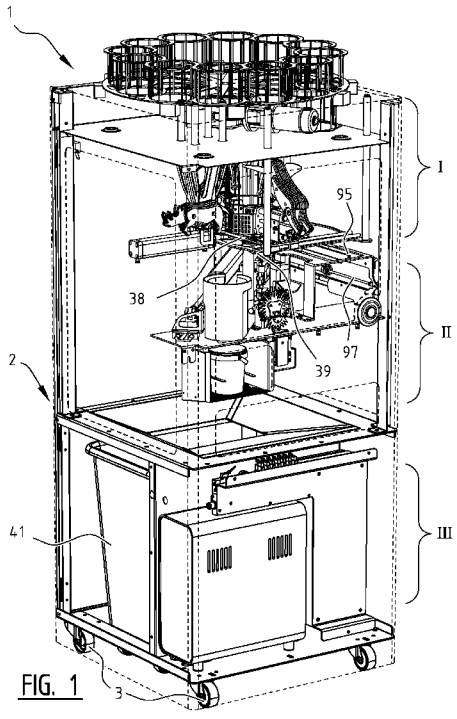


FIG. 1

(57) Abstract: The invention relates to a device for removing a core and the flesh from a fruit (A), in particular a pineapple, the device comprising: • - a supply unit (I) for supplying a fruit (A); • - a clamping unit for fixedly clamping the supplied fruit^(A); • - a cutting unit for severing an outer end from the clamped fruit (A); • - a removing unit (50) for arranging in the fruit (A) via the severed outer end for the purpose of removing the core and at least a part of the flesh of the fruit (A) from the fruit (A); • - a discharge unit (III) for discharging the removed flesh.

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DEVICE AND METHOD FOR REMOVING THE CORE AND THE FLESH FROM A FRUIT

The present invention relates to a device for removing the core and the flesh from a fruit, in particular a pineapple.

Numerous devices are known with which the flesh can be removed manually from a fruit. Known more particularly is a device which can be rotated from above into a pineapple. The device is rotated manually and results in the core being cut out of the pineapple. At the same time the flesh outside the core is cut away from the inner side of the skin and the flesh can then be pulled upward out of the pineapple. Such devices are therefore hand-operated, which makes them less suitable for successive processing of a number of pineapples. In addition, it is laborious to pull the cut-away flesh out of the pineapple and subsequently remove it from the device and/or the cut-away pieces of pineapple often do not become available as a neat stack.

It is an object of the invention to provide a device and method for removing the core and the flesh from a fruit, in particular a pineapple, wherein at least one of the above stated drawbacks is obviated.

It is a further object of the invention to provide a device and method with which flesh can in principle be removed automatically, substantially without manual operations, from the fruit.

It is a further object of the invention to provide a device and method with which the flesh can be made available in a predetermined and readily reproducible manner.

According to a first aspect of the present invention, at least one of the stated objectives is achieved in a device for removing a core and the flesh from a fruit, the device comprising:

- a supply unit for supplying a fruit;
- a clamping unit for fixedly clamping the supplied fruit;
- a cutting unit for severing an outer end from the clamped fruit;

- a removing unit for sliding into the fruit via the severed outer end for the purpose of removing the core and at least a part of the flesh of the fruit from the fruit;

- a discharge unit for discharging the removed flesh. The discharge unit can further be adapted to also discharge the juice of the fruit.

According to embodiments of the invention it is possible to remove the flesh wholly automatically from the fruit. The flesh can removed quickly and accurately from the fruit by first clamping the fruit and subsequently arranging the removing unit therein.

According to an embodiment, the device comprises a first drive for displacing the removing unit and/or the clamping unit. The first drive can for instance comprise an electric motor and is configured to arrange the removing unit in or remove it from the fruit. The device can also comprise a second drive for the purpose of rotating the removing unit.

According to embodiments of the invention, the removing unit comprises a rotatably driven cylindrical core drill. Using the core drill a part of the flesh can be cut out of the fruit. In the case of a pineapple it is the core which is less suitable for consumption and the central part of the pineapple can be easily removed using the core drill. The core drill can further be configured such that it can simultaneously cut away the flesh. In an embodiment the removing unit is adapted to cut the flesh substantially helically, for instance so as to provide substantially helical pieces of flesh.

In a further embodiment the core drill comprises:

- an elongate cylinder with an outer end provided with a cutting edge for cutting out the core of the fruit;

- a cutting element formed on the cylinder close to said outer end for cutting out the flesh. The cutting element can comprise a first cutting part which extends substantially radially relative to the cylinder and is provided with a cutting edge, and the form of which is selected such that during relative

rotation of the clamping unit and core drill a helical movement with predetermined pitch is performed. The cutting element can also comprise a second cutting part arranged on the first cutting element and provided with a cutting edge for the purpose of cutting the flesh away from the skin. When the second cutting element is for instance formed on the peripheral edge of the first cutting part and extends substantially parallel to the cylinder of the core drill, it is possible to ensure that the flesh is cut away from the wall of the fruit during rotation of the core drill.

According to an embodiment of the invention, the device comprises a tubular receiving element for positioning round the core drill of the removing unit. The cut-away flesh can be received in this receiving element for further processing thereof. In order to ensure that the piece of flesh taken from the fruit can be received in neatly stacked manner, the tubular receiving element can preferably be arranged coaxially with the core drill.

The receiving element can more particularly be positioned at a lower position than the cutting element (wherein the fruit is therefore situated above the receiving element during the cutting-away process). The flesh can in such a case drop downward under the influence of gravitational force and thus come to lie in the receiving element. In other embodiments the drive displaces the core drill itself downward (and/or the clamping unit itself is displaced upward). In the case of the one or more above mentioned annular slices of flesh, these can slide downward via the elongate cylinder and thus come to lie in neat alignment in the receiving element. This is particularly the case when the flesh extending around the cylindrical tube of the core drill drops downward, since the cylindrical tube can guide the flesh downward.

As soon as the flesh comes to lie in the receiving element, the receiving element is displaced from the receiving position, at which the flesh is received, to a discharge position from which

the flesh can be discharged. Provided for this purpose are displacing means which are for instance adapted to displace the receiving element in lateral direction. In the discharge position the receiving element (which in determined embodiments is open at both the top and bottom) can be placed by the displacing means above a (slide) hatch. Sliding open the hatch then ensures that the flesh drops downward and can be further discharged by the discharge unit.

In a further embodiment there is provided in the wall of the receiving element an opening which is formed to allow passage of the core drill during the displacement of the receiving element. This opening makes it possible to slide the (upright) tubular receiving element from the discharge position in lateral direction until the receiving element is concentric with the core drill and to slide it from the receiving position in lateral direction to the discharge position.

In the receiving position of the receiving unit it is further also possible to cut through the flesh. When for instance a helical strip of flesh has been made by the removing unit and this strip has been stacked in the receiving element, it is possible to cut through the stack of flesh on one side in the height direction so as to create a number of substantially annular slices of flesh placed one above another. In order to make this possible the device is provided in a further embodiment with a flesh cutting member adapted to cut through the helical pieces of flesh. The flesh cutting member can comprise a knife slidable via said opening in the receiving element in the direction of the cylindrical tube of the core drill. The knife is attached for this purpose to a support arranged displaceably on the frame.

In a further advantageous embodiment the flesh cutting member comprises:

- a first and a second knife part;
- operating means for placing the knife parts against each other so that they together form a cutting edge and for moving

the knife parts apart in order to open the annular slices of flesh.

In the opened position of the knife parts the slices of flesh can be easily pushed off the core drill during displacement of the receiving element from the drilling position to the discharge position.

In an embodiment of the invention the supply unit comprises a turntable for successive supply of fruits. The assembly of supply unit, clamping unit, cutting unit, removing unit and discharge unit can further be mounted on an optionally mobile frame.

According to another aspect of the invention, a method is provided for removing a core and the flesh from a fruit, in particular a pineapple, the method comprising of:

- supplying a fruit;
- fixedly clamping the supplied fruit;
- severing an outer end from the clamped fruit;
- arranging a removing unit in the fruit via the severed outer end for the purpose of removing the core and at least a part of the flesh of the fruit from the fruit;
- discharging the removed flesh;
- providing a substantially helical piece of flesh;
- cutting through the helical piece of flesh in order to provide a number of substantially annular slices of flesh.

According to a determined embodiment wherein the removing unit comprises a core drill for drilling out flesh, the arranging of the removing unit in the fruit comprises of displacing the core drill through the fruit and simultaneously rotating the core drill using a drive, in particular an electrical drive.

According to a determined embodiment, the method comprises of pushing apart the outer ends of each of the annular slices of flesh. This can for instance take place by having the flesh cutting member cut into the slices of flesh from the side. It is preferably ensured, simultaneously or after cutting has taken place, that the opposite outer ends of each of the annular slices

of flesh are pressed apart. This makes it possible to slide the slices of flesh laterally away from the core drill. In a determined embodiment the method thus comprises of forming an elongate opening between opposite outer ends of the annular slices of flesh, wherein the opening extends substantially parallel to the core drill, and displacing the fruit and/or the core drill such that the core drill passes through said opening.

Further advantages, features and details of the present invention will be elucidated on the basis of the following description of several embodiments thereof. Reference is made in the description to the accompanying figures, in which:

Fig. 1 is a partially cut-away perspective view of a first embodiment of a device according to the invention;

Fig. 2 is a partially cut-away view of the supply part (I) of the device shown in fig. 1;

Fig. 3 is a partially cut-away perspective view of the processing part (II) of the device of fig. 1;

Fig. 4 is a cut-away detail view of the processing part (II) of the device according to fig. 1;

Fig. 5 is a detail view of the sliding tube for displacing the cut-away slices of flesh to the discharge position;

Fig. 6A-6F are schematic views showing the respective stages at which the device removes the core and the flesh from a supplied pineapple;

Fig. 7 is a detail view of an embodiment of the flesh removing member;

Fig. 8A and 8B are detail views of the flesh removing member of fig. 7 in respective positions;

Fig. 9 is a partially cut-away perspective view of a second embodiment of a device according to the invention;

Fig. 10 is a partially cut-away view of the supply part (I) and a part of the processing part (II) of the second embodiment;

Fig. 11-13 are partially cut-away perspective views of the supply part (I) and the processing part (II) of the second embodiment at different stages in the processing of a pineapple;

Fig. 14 is a cut-away detail view of a further embodiment of the processing part (II) of the device according to fig. 9;

Fig. 15A and 15C are schematic views of a further embodiment of the flesh cutting member according to the second involvement of the device; and

Fig. 15B is a detail view of one of the knife parts of the flesh cutting member.

Fig. 1 shows an embodiment of the device according to the invention. Device 1 comprises a frame 2 arranged on swivel wheels 3 so that the device can travel over a ground surface. The device is constructed roughly in three parts (from the top down): a supply part (I), a processing part (II) and a discharge part (III). A number of fruits such as pineapples, in the shown embodiments twelve pineapples, are stored in supply part (I) and supplied successively in the direction of the processing part. The removal of the core and the flesh from the pineapple takes place in the processing part. The core and the skin of the fruit are then guided to the discharge part (III) and discharged as waste. The removed flesh is received in the processing part (II) in a receiving unit (as will be set forth below) and can be discharged manually or (in an embodiment which is not shown) via a conveyor belt.

Supply part (I) is shown in more detail in fig. 2. The figure shows a magazine 10 for fruits (A) such as pineapples, consisting of a turntable 11 on which are placed a number of receiving baskets 12 (in the shown embodiment twelve) suitable for holding the fruit therein in a determined orientation, for instance standing upright. Turntable 11 is supported on a number of bearings 14 and can be set into rotation via an upright rotation shaft 13 (direction R_1, fig. 2). Driving of the turntable takes place by means of electric drive motor 16 arranged under the turntable.

Each of the receiving baskets 12 is open on the underside. A plate 17 present under the turntable ensures however that the fruits do not drop downward. An opening is however arranged in

plate 17. When a receiving baskets 12 passes through this opening, the fruit drops downward through the opening and is further guided via a guide cage 20 in the direction of processing part (II).

Referring to fig. 2 and 4, guide cage 20 connects to a further guide cage 21. Cages 20 and 21 are for instance arranged concentrically relative to each other. The fruit drops further downward until it is blocked by a stop 23 (fig. 5). The fruit is now situated in a so-called clamping jaw 25 (fig. 4). The clamping jaw forms part of clamping unit with which the fruit can be clamped firmly relative to frame 2.

Clamping jaw 25 is constructed from four clamping parts 26-29. Clamping parts 26 and 28 are mounted on a displaceable support 30, while clamping parts 27 and 29 are mounted on a displaceable support 31. Supports 30, 31 are connected respectively to extending cylinders 32 and 33 which ensure that supports 30, 31 can be moved toward or away from each other in order to enable clamping of the pineapple by means of clamping parts 26, 29.

The entity of guide cage 21 and clamping unit (assembled from clamping jaw 25, supports 30, 31, cylinders 32, 33 and other parts) is mounted on a displaceable carriage 38. Carriage 38 is slidable in transverse direction (direction P_2, fig. 4) over two parallel rails 39. The carriage (including a fruit placed therein, which for the sake of simplicity is omitted from the drawing) can more particularly be displaced from the starting position shown in fig. 4 and 6A to the drilling position shown in fig. 6B so that the underside of the fruit is guided along a cutting knife 40. Cutting knife 40 here severs the bottom outer end from the fruit. This bottom outer end then drops downward under the influence of gravitational force, for instance into waste bucket 41.

Referring to fig. 5, the above-mentioned stop 23 is attached to a carrier 98 which can slide reciprocally (in direction P_7) over a support 101 provided on the frame. The sliding is driven

by a hydraulic or electrical slide-out cylinder 99 connected on one side to the carrier and on the other side via a cylinder rod 100 to the support 101. When the clamping unit has clamped the fruit in guide cage 21, stop 23 can be pushed aside (e.g. from the position shown in figure 5 in direction P_7 to an end position).

Once carriage 38 has been displaced from the starting position shown in fig. 4 and 6A to the drilling position (as shown in fig. 2 and 6B), the fruit (A) is positioned precisely above a removing unit 50. Referring to fig. 6C, removing unit 50 is assembled in the shown embodiment from a rotatably driven core drill 51 which is configured such that, not only can the core be removed from the pineapple, the rest of the flesh can also be cut into substantially helical pieces and be removed from the pineapple. Core drill 51 comprises an upright cylindrical tube 52, on the upper outer end of which is provided an end edge 53. End edge 53 functions as cutting edge and can be provided for this purpose with a number of serrations. Cylindrical tube 52 can be rotated by means of drive means (not shown) in the form of an electric drive motor (fig. 6C, R_3). Cylindrical tube 52 can moreover be displaced in upward and downward direction (fig. 6C, P_3) by the drive means. Cylindrical tube 52 is hollow and, when it is displaced upward and simultaneously rotated, an elongate cylindrical cut-out can be made in the pineapple by means of the serrated edge 53. The core of the pineapple can in this way be cut out. The skin of the pineapple, including the core of the flesh, can then be discharged.

Provided close to the upper outer end of core drill 51 is a further cutting element 55 with which the flesh adjacently of the core can be cut off. Cutting element 55 comprises a cutting part 56 extending radially on cylindrical tube 52 and provided with at least one cutting edge. The form of this cutting part is configured such that, when the core drill rotates, a helical movement with a predetermined pitch is performed. When core drill 51 is for instance rotated in the direction R_3, the core drill will work its way upward through the interior of the pineapple

as a result of the rotation of the core drill supported by an upward driving of cylindrical tube 52. Because cutting part 56 is configured as a helical plane and forms a single full circle, it cuts through the flesh helically until the top of the pineapple is reached. However, because cutting part 56 is moreover provided at an end thereof with an upright second cutting part 55, which is likewise provided with a cutting edge, not only is the flesh in the interior of the fruit cut through, the flesh is also cut free of the skin of the fruit.

Once core drill 51 has drilled through the fruit from bottom to top, it stops rotating. Under the influence of gravitational force and/or retraction (downward displacement in the shown embodiment) of core drill 51, the helical piece of flesh is now displaced downward along cylindrical tube 52 and the flesh comes to lie in a tubular receiving element 60.

Receiving element 60 is displaceable in lateral direction relative to the upright core drill 51. The construction with which receiving element 60 is supported is shown in more detail in fig. 5. Fig. 5 shows an advantageous embodiment of the tubular receiving element 60. The receiving element is fixed to a support 61. This support 61 can be displaced in lateral direction over a rail 63 using guide elements 62. The displacement is driven by a slide-out cylinder 64, an outer end 65 of which is connected to support 61. Receiving element 60 is displaceable in the direction (P_4) and in opposite direction by operating the cylinder 64.

Arranged in the wall of receiving element 60 is an elongate passage 67 (fig. 5). This passage 67 is configured just a little wider than the width of cylindrical tube 52 so that it is possible to displace receiving element 60 from the drilling position (see fig. 6E), in which receiving element 60 is arranged substantially coaxially with cylindrical tube 52, and the discharge position shown in fig. 5 and 6F in which receiving element 60 is positioned above a discharge unit. Receiving element 60 is displaceable at high speed between the two positions in order to displace a

quantity of flesh removed from the pineapple quickly and efficiently from the core drill to the discharge unit.

A flesh cutting member 70 is further shown in fig. 5, 6E, 7, 8A and 8B. The flesh cutting member comprises two knife parts 74 and 75 which can together function as knife for the purpose of cutting flesh or as spacer for the purpose of creating an intermediate distance between cut outer ends of the flesh. The flesh cutting member further comprises operating means with which knife parts can be operated such that they can fulfil both functions.

The flesh cutting member 70 comprises a support 71 which is displaceable in lateral direction (P_5, fig. 5) via an extending cylinder construction 73 arranged on the frame. Support 71 is connected rotatably via shaft 92 to two left-hand plates 93 placed one above the other and two right-hand plates 94 placed one above the other. Further provided are two knife parts 74 and 75. Knife part 74 is attached to plates 93, while knife part 75 is attached to plates 94. Knife parts 74, 75 can be placed against each other and then form a cutting edge 76 (fig. 6E). Knife parts 74, 75 can also be placed apart so that they can form a wedge. In other words, in a position where the knife parts are arranged flat against each other (knife position, see fig. 8B) they function as cutting means for cutting the flesh. When the two knife parts are displaced relative to each other and an intermediate space is formed between the knife parts, as shown in fig. 8A, the two knife parts form a wedge for pressing apart pieces of flesh (wedging position).

In order to enable displacement of the knife parts relative to each other the frame comprises two lower support parts 90,91 and two upper support parts 95,96. Two upper slots 78, 79 and two lower slots 80 and 81 are arranged in the support parts. Pins 82 and 83 can be guided along these slots (in directions P_6). Pins 82 and 83 are attached to the above-mentioned plates 93,94. Displacement of the pins along said slots 78, 79, 80, 81 enables the mutual distance of knife parts 74, 75 to be set as desired

between the cutting position and the wedging position. During cutting of the flesh the knife parts more particularly make a movement in the direction of cylindrical tube 52 of core drill 51. Simultaneously the knife parts will also begin to move increasingly further apart as a result of the shape of slots 80,81 so that the outer ends of the cut flesh are pushed apart.

During operation a fruit, for instance the pineapple (A), is arranged from above in guide cage 21 (fig. 6A, direction P_5) until it is blocked by the stop. Carriage 38 with guide cage 21 arranged thereon is then displaced over rail 39 (P_2, see fig. 4 and 6B), whereby the lower outer end of the pineapple is forced along cutting edge 80 of knife 40 so that the bottom part of the pineapple is severed from the rest. As noted above, this bottom part drops downward and comes to lie in waste bucket 41.

As shown in fig. 6C, core drill 51 is positioned directly below the cut-open outer end of pineapple A. Core drill 51 is preferably arranged concentrically with the pineapple, although the core drill can also be arranged at another position. Core drill 51, or at least the cylindrical part 52 thereof, is then set into rotation (R_3) and displaced upward (P_3). During the displacement cutting part 56 and cutting part 55 arranged thereon cut their way through the interior of the pineapple (fig. 6D) and thus form a substantially helical slice of flesh. The skin here remains in place and the core of the pineapple is discharged downward via the interior of cylindrical tube 52 (fig. 6E). When core drill 52 is subsequently displaced downward (in a direction opposite to direction P_3), the upper side of the core drill pulls the flesh downward (P_8) so that it slides downward along cylindrical tube 52 until it comes to lie in receiving element 60. Once the flesh has been arranged in receiving element 60, knife parts 74, 75 are pushed via passage 67 into the wall of receiving element 60 and the knife parts cut through the rings of flesh.

The mutual distance between the knife parts is subsequently increased so that a wedge shape is created and the rings of flesh

are pushed apart. In this wedging position the pieces of flesh are pressed apart to some extent. When receiving element 60 is now displaced from the drilling position (as shown in fig. 6E) to the discharge position shown in fig. 5 and 6F, the flesh can hereby easily pass the core drill and the body of pieces of flesh stacked on each other remains resting in neat alignment in the receiving element.

Having arrived at the discharge position, a slide 84 under receiving element 60 is slid open (P_{10}) so that the flesh can drop downward, for instance into a bucket 85 as shown in fig. 6F or other packaging material. This bucket can subsequently be removed by hand while receiving element 60 is once again being returned from the discharge position to the drilling position and the process of cutting and discharge of a pineapple is repeated.

Fig. 9-15 show a second embodiment of the device according to the invention. This embodiment is largely similar to the embodiments described with reference to fig. 1-8 and, to the extent the operation of the second embodiment corresponds to that of the first embodiment, a description thereof is dispensed with. Three parts can once again be distinguished (from the top down) in the device: a supply part (I), a processing part (II) and a discharge part (III).

In supply part (I) of fig. 9 the magazine for supplying a number of fruits, for instance pineapples, is replaced by a single supply cage 111 along which a single pineapple can be arranged successively in the device. The pineapple is for instance pushed from above into opening 112 by the user, wherein supply cage 111 serves as guide.

Once placed in the processing part (II), the pineapple is guided (direction 107, fig. 10) along a guide cage 121. The pineapple comes to lie between a clamping unit 125. As shown in figure 10, the pineapple is here blocked by a stop 123.

Clamping unit 125 comprises a clamping jaw with which the fruit can be clamped firmly relative to the frame. Clamping unit

125 comprises two clamping parts 126 and 127. Clamping part 126 is mounted on a displaceable support 130, while clamping part 127 is mounted on a displaceable support 131. Supports 130 and 131 are connected via a linkage (with pivotable arms 133 and 134) to a single extending cylinder 132. Retracting and extending the extending cylinder 132 (direction 129) causes both clamping parts 126 and 127 to be respectively displaced outward and inward simultaneously. The shown construction has a number of advantages compared to the construction according to the first embodiment described above with reference to fig. 4. A first advantage is that use need only be made of a single cylinder, which makes the device simpler and cheaper. The stroke of each of the extending cylinders in the first embodiment can further change to some extent in the course of time. In the design of the first embodiment this could result in the fruit no longer being properly centred in the clamping unit. This can have the consequence that the pineapple is less well aligned with the core drill, which can be disadvantageous for the further processing. This problem can be obviated by making use of a single extending cylinder, since both clamping parts are always displaced simultaneously and over the same distance during opening and closing of the clamping unit.

Once clamping parts 130,131 have clamped the pineapple through operation of cylinder 129, a guide carriage 145 on which the entity of guide cage 121 and clamping unit 125 is arranged is displaced laterally from the position shown in fig. 10 to the position shown in fig. 11 (direction 135_1). The displacement takes place through operation of displacing mechanism 136. The underside of the pineapple held fixedly by clamping unit 125 is hereby guided along cutting knife 140. The severed part 141 of the pineapple is discharged downward. Drilling out of the remaining part 142 of the pineapple then takes place by means of a core drill 151 positioned under the pineapple. Drilling out takes place in similar manner as described with reference to fig. 6A-6C.

Referring to fig. 11, removing unit 150 is constructed in the shown embodiment from a rotatably driven core drill 151 configured such that, not only can the core be removed from the pineapple, the rest of the flesh can also be cut into substantially helical pieces and removed from the pineapple. In fig. 14 the pineapple without skin is shown schematically in broken lines.

Core drill 151 is the same as the above described core drill 51 and comprises an upright cylindrical tube 152 on the upper outer end of which is provided an end edge 153. In the manner described above with reference to fig. 6 the core of the pineapple can be cut out and discharged.

Once the helical piece of flesh has now been displaced downward along cylindrical tube 152 and has come to lie in the tubular receiving element 60, receiving element 60 is displaced in lateral direction relative to the upright core drill 151.

The above described elongate passage 67 (fig. 5) is arranged in the wall of receiving element 60. This passage 67 on the one hand provides space for the flesh cutting member to be described below and on the other makes it possible to displace receiving element 60 with content (i.e. the pineapple, once it has been drilled out by removing unit 150 and cut by flesh cutting member 170) from the drilling position shown in fig. 11 to the discharge position shown in fig. 12 (direction 135_2). In the discharge position the receiving element 60 is positioned above a discharge unit.

Fig. 14 and 15 show a second embodiment of a flesh cutting member 170. The flesh cutting member comprises two knife parts 174 and 175 which can together function as knife for the purpose of cutting flesh or as spacer for the purpose of creating an intermediate distance between outer ends of the flesh that have been cut through. The flesh cutting member further comprises operating means with which knife parts can be operated such that they can fulfil both functions.

Flesh cutting member 170 comprises a support 166 (fig. 15C) which is displaceable in lateral direction (direction 169, fig. 15A, 15C) via an extending cylinder construction arranged on the frame. The outer end of support 166 is connected rotatably to a shaft 172 which can be moved reciprocally in transverse direction through a central slot 173 in an essentially stationary support block 167. At the upper and lower outer end the shaft 172 is connected in each case to two lateral rods 176,177 and 178,179. These are displaceable with shafts 180 and 181 in respective slots 182 and 183.

Shafts 180 and 181 are mounted rotatably on respective lying profile parts 187,188 of the first and second knife parts 174,175. At some distance behind shaft 180,181 an upright guide 185,186 is mounted on the associated lying profile part 187,188. This construction ensures that the lying profile parts of knife parts 174,175 are reciprocally slidable substantially parallel to each other in lateral direction.

The shape of slots 182 and 183 differs from the shape of the above described slots 80 and 81 of the first embodiment. In the first embodiment knife parts 74,75 are displaced not only in longitudinal direction to the pineapple (direction P_5) but simultaneously also in transverse direction in order to form a wedge with knife parts 74,75. In the second embodiment knife parts 174,175 are likewise displaced in longitudinal direction and transverse direction, but these displacements do not take place simultaneously. In this embodiment the pineapple is first cut with the cutting edge of knife parts 174,175 (fig. 15A), and the cut pineapple is then pushed open by moving the knife parts away from each other in transverse direction (fig. 15C).

The present invention is not limited to the embodiments thereof described herein. The rights sought are rather determined by the following claims, within the scope of which numerous modifications and adjustments can be envisaged.

CLAIMS

1. Device for removing a core and the flesh from a fruit, in particular a pineapple, the device comprising:

- a supply unit for supplying a fruit;
- a clamping unit for fixedly clamping the supplied fruit;
- a cutting unit for severing an outer end from the clamped fruit;
- a removing unit for arranging in the fruit via the severed outer end for the purpose of removing the core and at least a part of the flesh of the fruit from the fruit, wherein the removing unit comprises a rotatably driven cylindrical core drill configured to provide substantially helical pieces of flesh;
- a discharge unit for discharging the removed flesh.

2. Device as claimed in claim 1, comprising a drive for displacing the removing unit and/or the clamping unit in order to arrange the removing unit in or remove it from the fruit.

3. Device as claimed in claim 1 or 2, comprising a drive for the purpose of rotating the removing unit, in particular an electric drive motor connected to the core drill.

4. Device as claimed in any of the foregoing claims, wherein the core drill comprises:

- an elongate cylinder with an outer end provided with a cutting edge for cutting out the core of the fruit;
- a cutting element formed on the cylinder close to said outer end for cutting out the flesh.

5. Device as claimed in claim 4, wherein the cutting element comprises:

- a first cutting part which extends substantially radially relative to the cylinder and is provided with a cutting edge,

and the form of which is selected such that during relative rotation of the clamping unit and core drill a helical movement with predetermined pitch is performed;

- a second cutting part arranged on the first cutting element and provided with a cutting edge for the purpose of cutting the flesh away from the skin.

6. Device as claimed in any of the foregoing claims, comprising a tubular receiving element for positioning round the core drill of the removing unit for receiving the cut-away flesh, wherein the receiving element can preferably be arranged coaxially with the core drill.

7. Device as claimed in claim 6, comprising displacing means for displacing the tubular receiving element laterally between a receiving position, in which the flesh can be received, and a discharge position in which the flesh can be discharged.

8. Device as claimed in any of the foregoing claims, wherein there is provided in the wall of the receiving element an opening which is formed to allow passage of the core drill during the displacement of the receiving element.

9. Device as claimed in any of the foregoing claims, comprising a flesh cutting member adapted to cut through the helical pieces of flesh.

10. Device as claimed in claim 9, wherein the flesh cutting member comprises a knife configured slidably via said opening in the receiving element in the direction of the cylindrical tube of the core drill.

11. Device as claimed in claim 9 or 10, wherein the flesh cutting member comprises:

- a first and a second knife part;

- operating means for placing the knife parts against each other so that they together form a cutting edge and for moving the knife parts apart in order to open the annular slices of flesh.

12. Device as claimed in any of the foregoing claims, wherein the supply unit comprises a turntable for successive supply of fruits and/or a supply opening for manual supply of a single fruit.

13. Device as claimed in any of the foregoing claims, wherein the device is configured to process more than 5 fruits per minute.

14. Method for removing a core and the flesh from a fruit, in particular a pineapple, the method comprising of:
- supplying a fruit;
- fixedly clamping the supplied fruit;
- severing an outer end from the clamped fruit;
- arranging a removing unit in the fruit via the severed outer end for the purpose of removing the core and at least a part of the flesh of the fruit from the fruit;
- discharging the removed flesh;
- providing a substantially helical piece of flesh;
- cutting through the helical piece of flesh in order to provide a number of substantially annular slices of flesh.

15. Method as claimed in claim 14, wherein the removing unit comprises a core drill for drilling out flesh, and wherein the arranging of the removing unit in the fruit comprises of displacing the core drill through the fruit and simultaneously rotating the core drill using a drive, in particular an electrical drive.

16. Method as claimed in claim 14 or 15, comprising of:

- pushing apart the outer ends of each of the annular slices of flesh.

17. Method as claimed in claim 16, comprising of forming an elongate opening between opposite outer ends of the annular slices of flesh, wherein the opening extends substantially parallel to the core drill, and displacing the fruit and/or the core drill such that the core drill passes through said opening.

18. Method as claimed in any of the foregoing claims, wherein the method is performed by the device according to any of the claims 1-13.

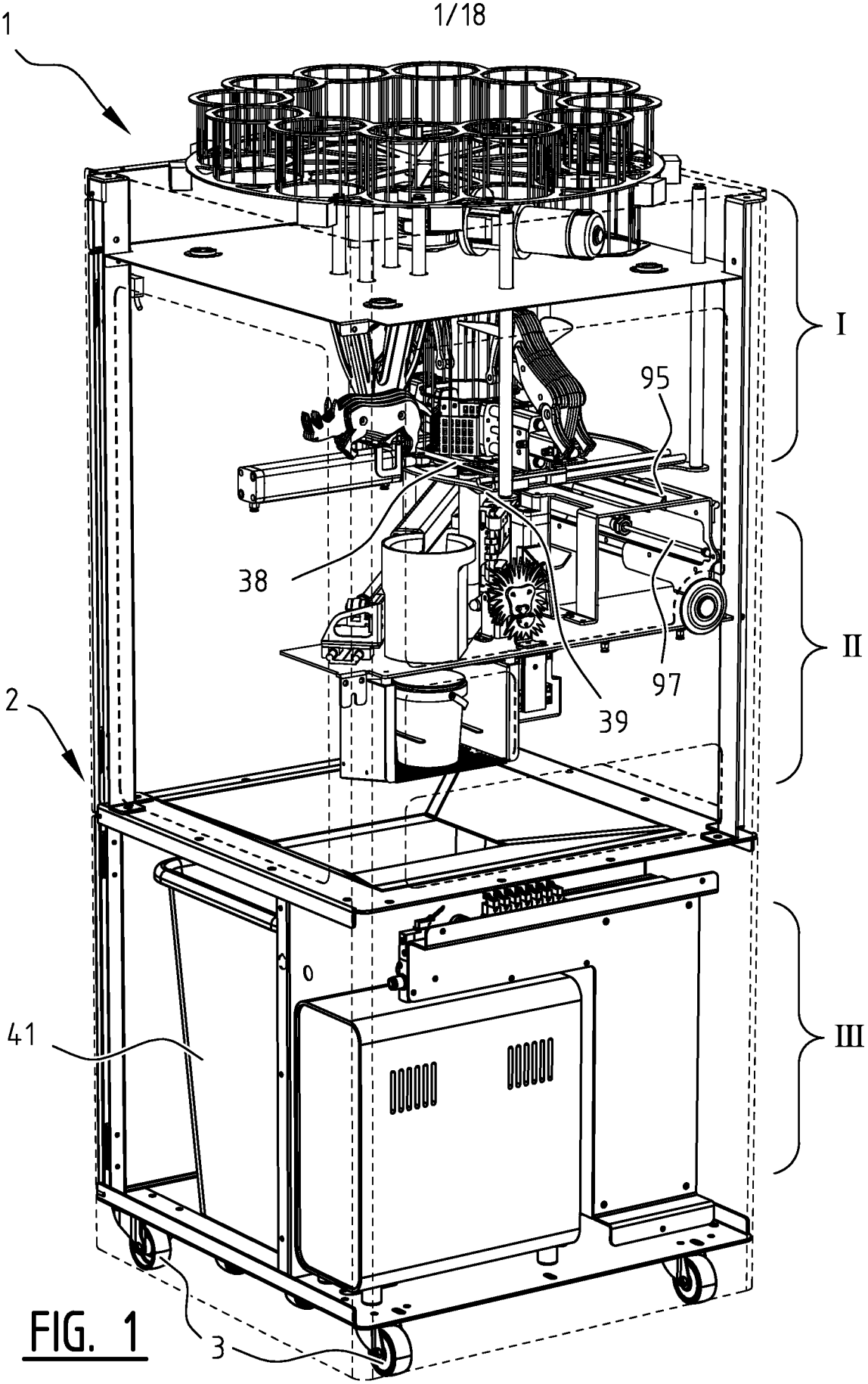


FIG. 1

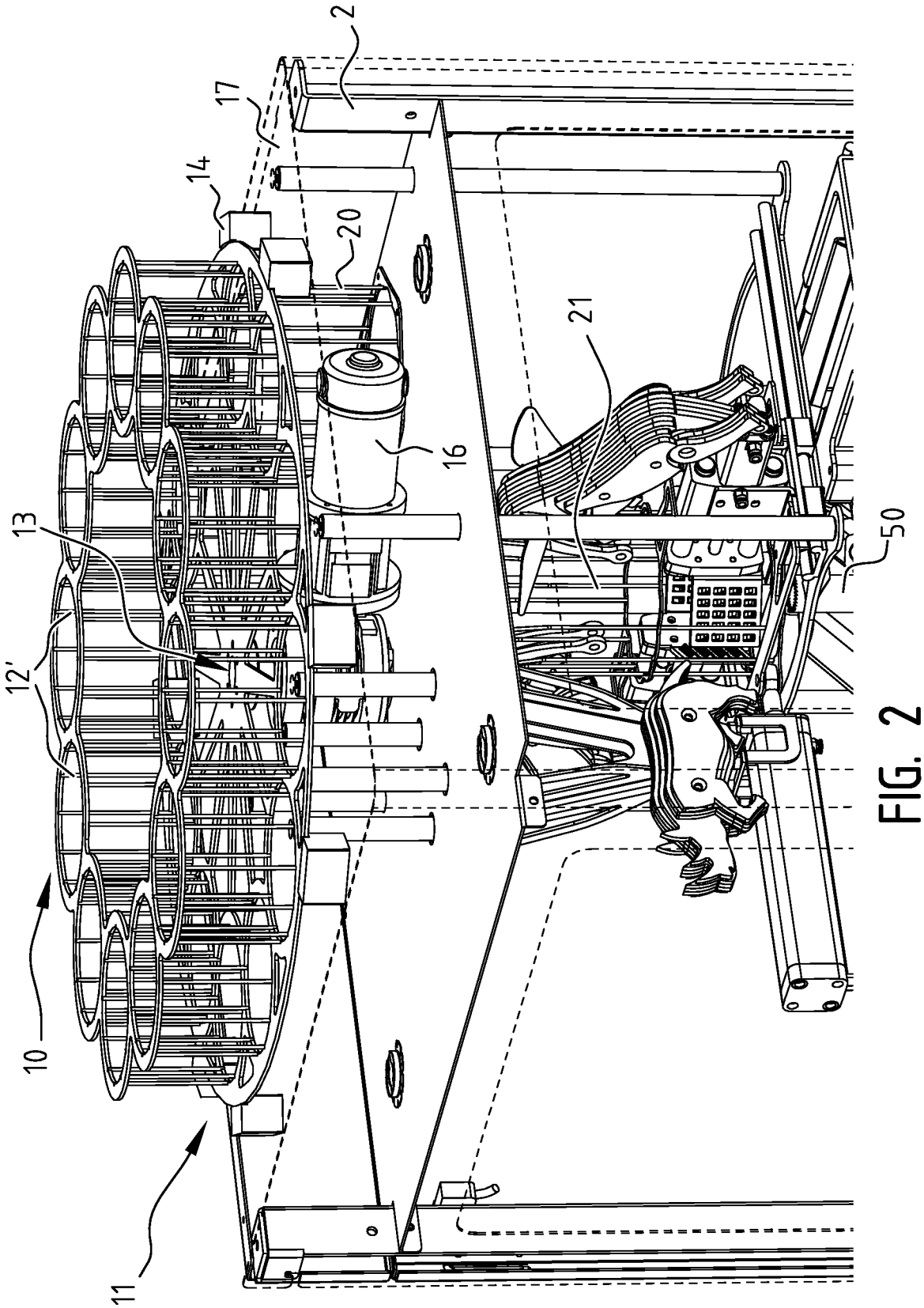


FIG. 2

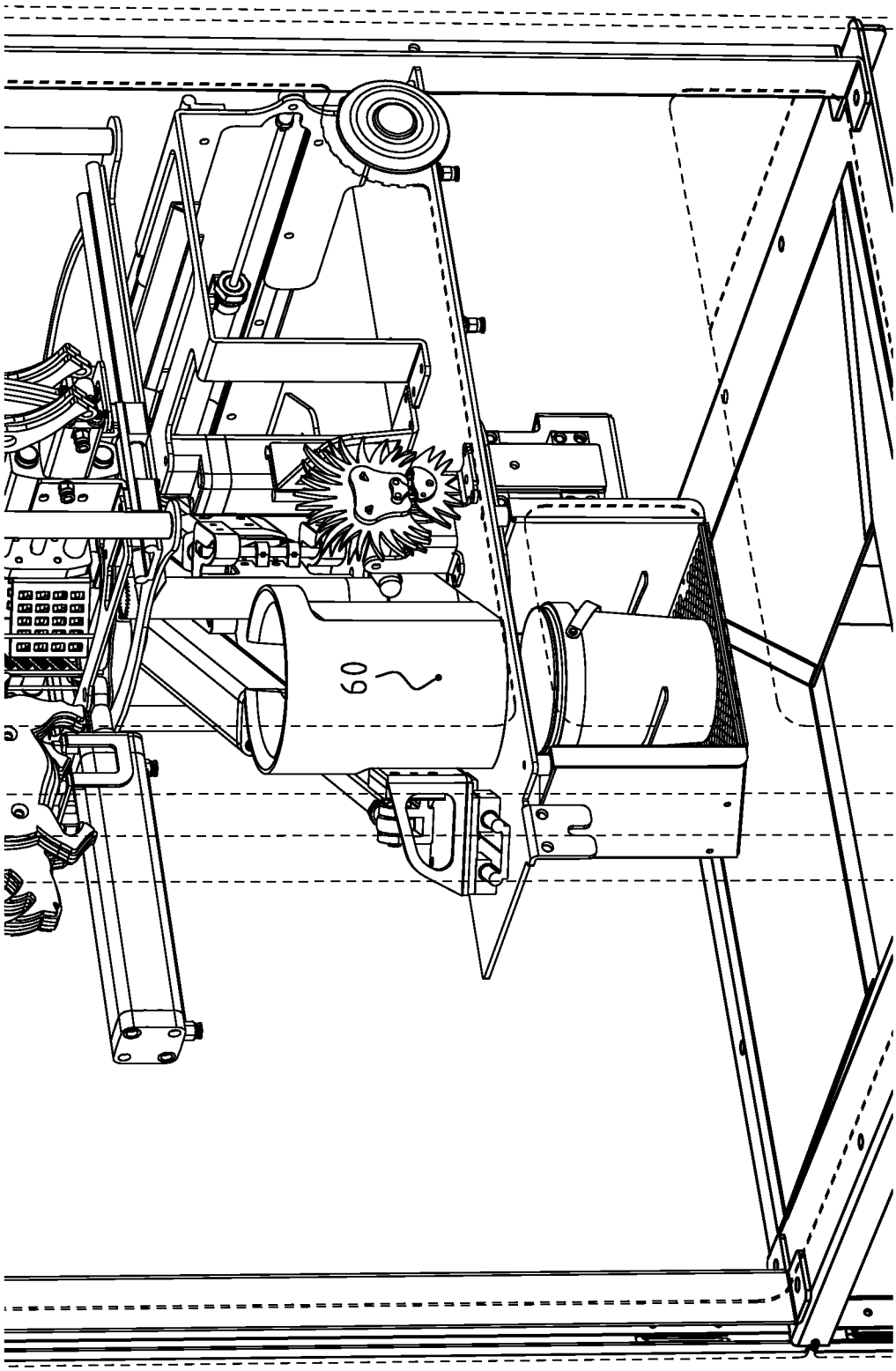


FIG. 3

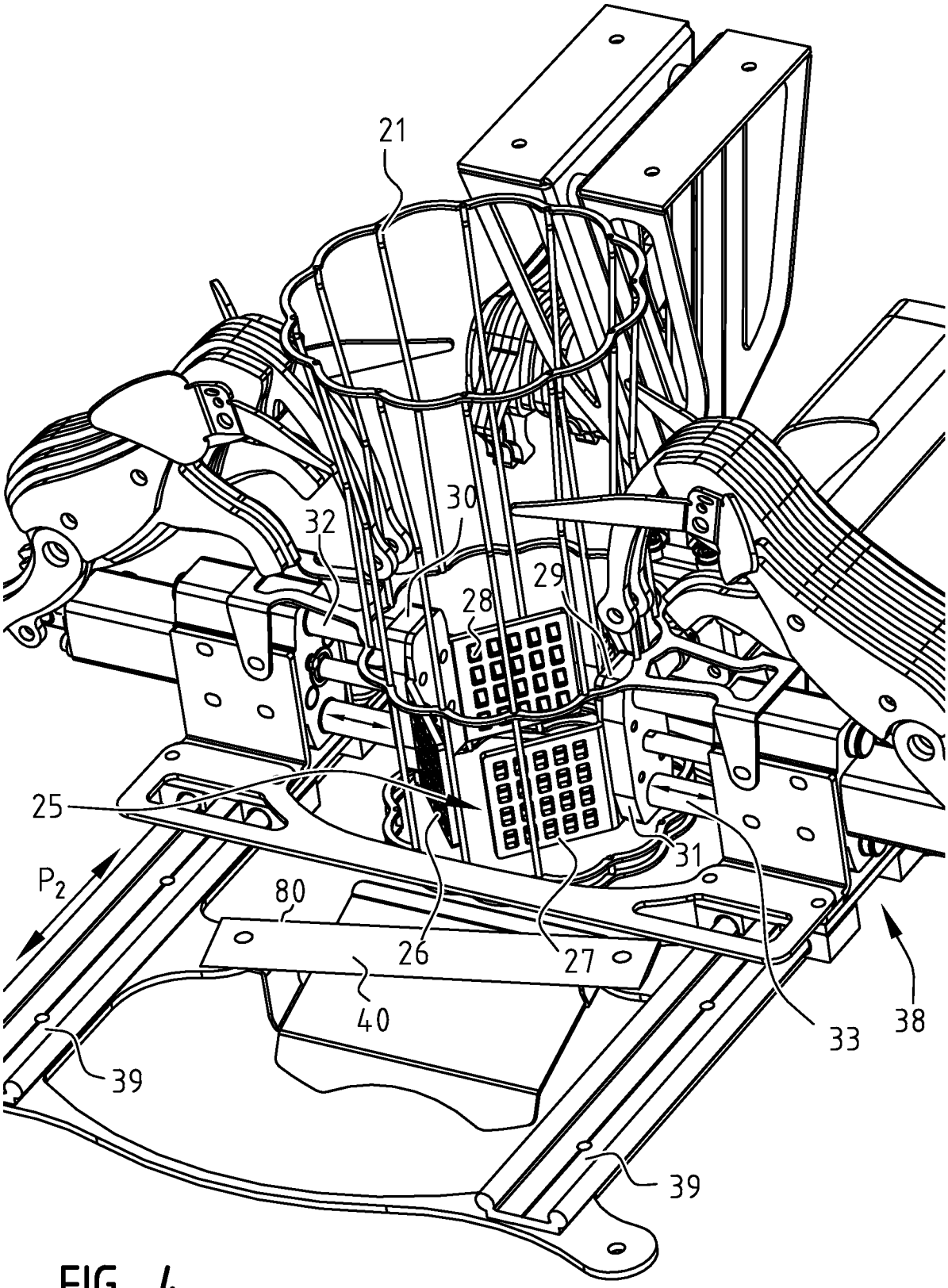


FIG. 4

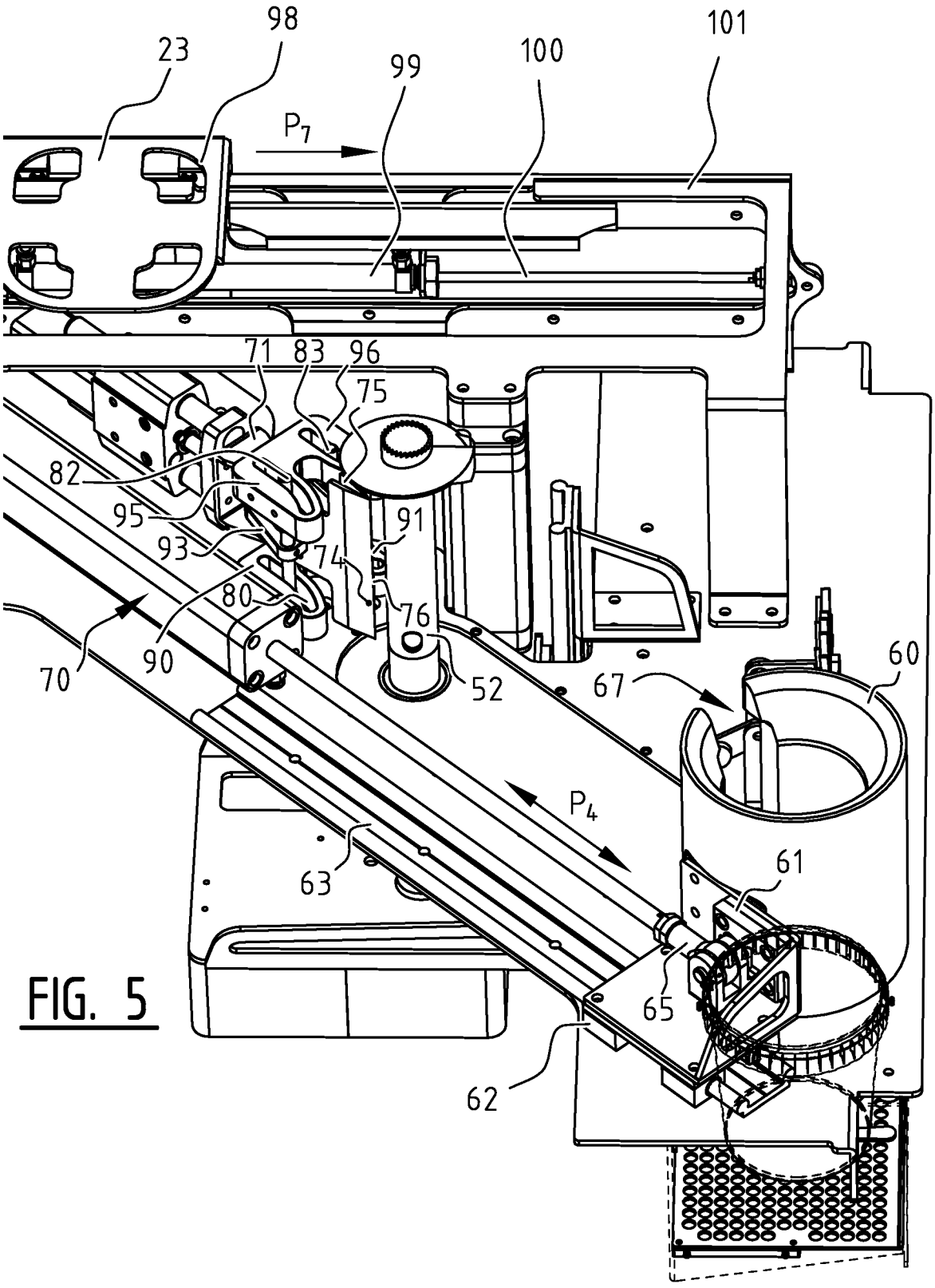

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FIG. 5

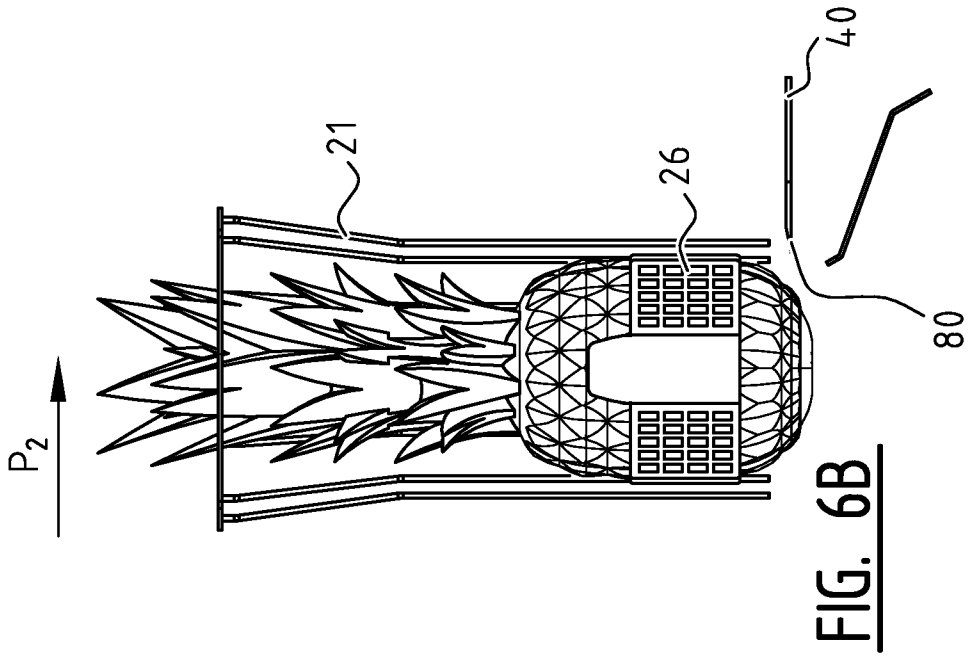


FIG. 6B

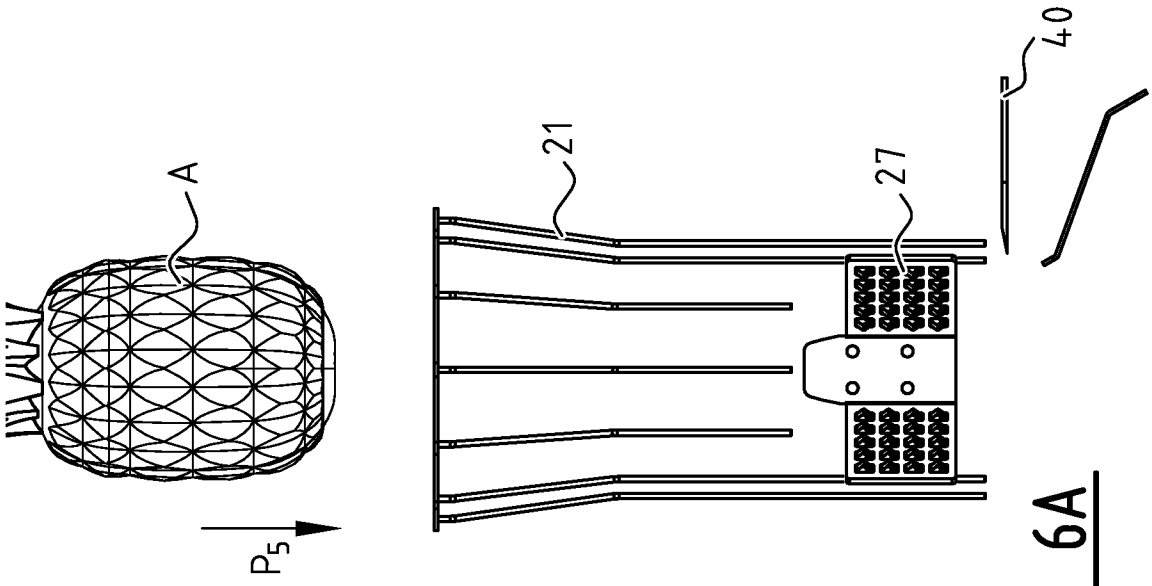


FIG. 6A

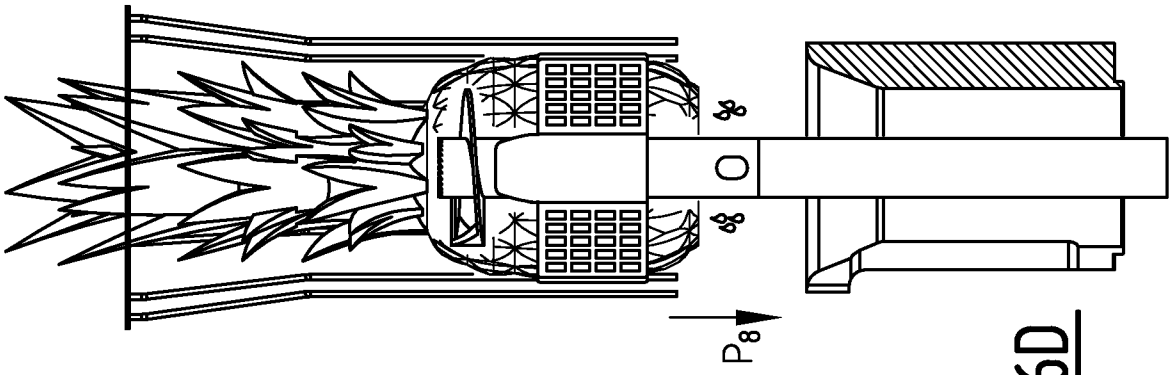


FIG. 6D

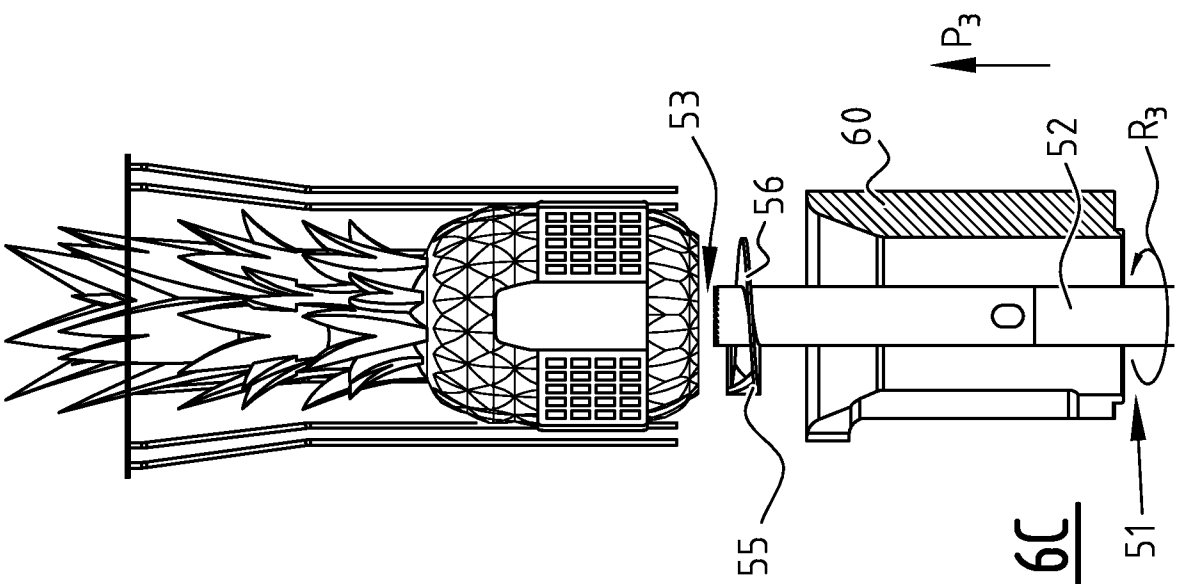


FIG. 6C

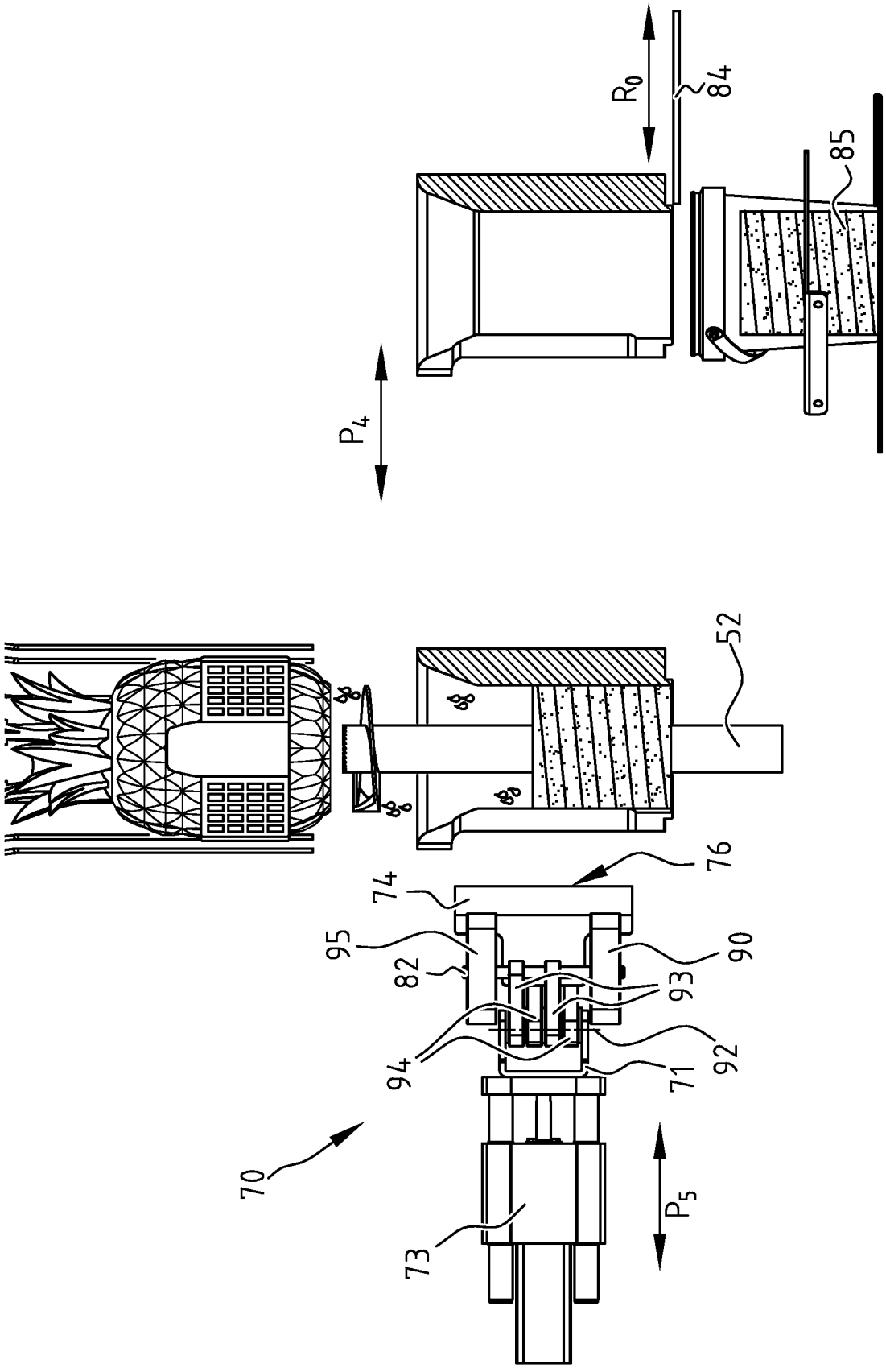


FIG. 6F

FIG. 6E

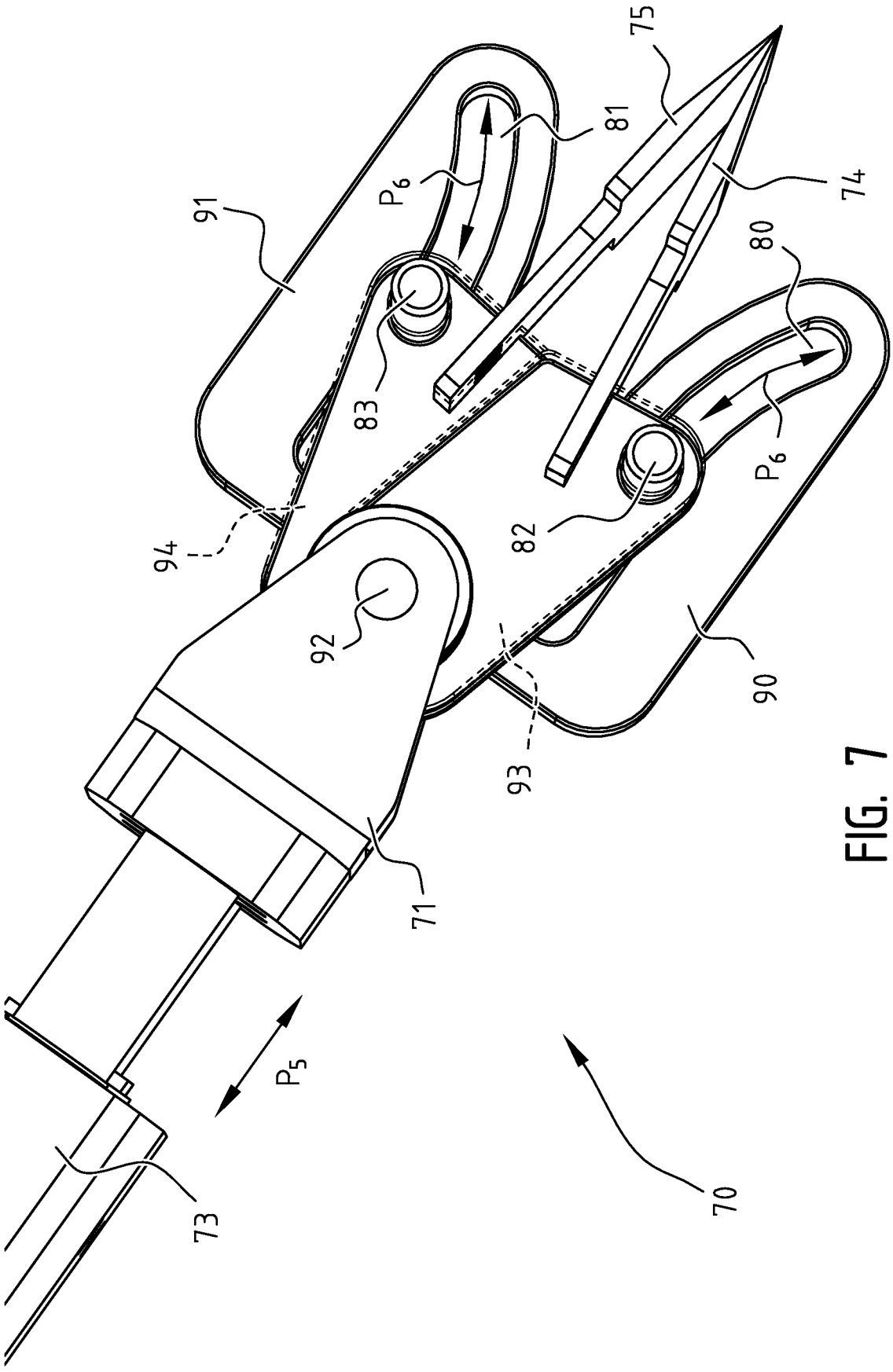


FIG. 7

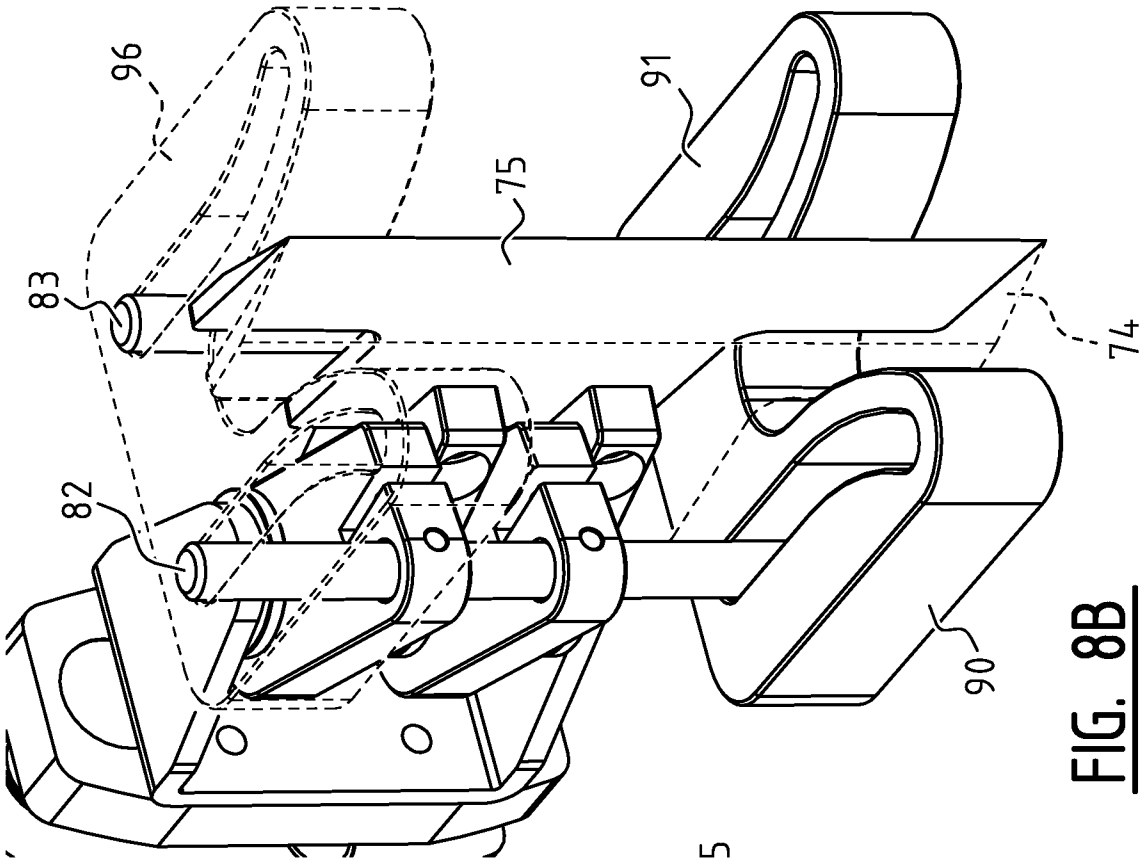


FIG. 8B

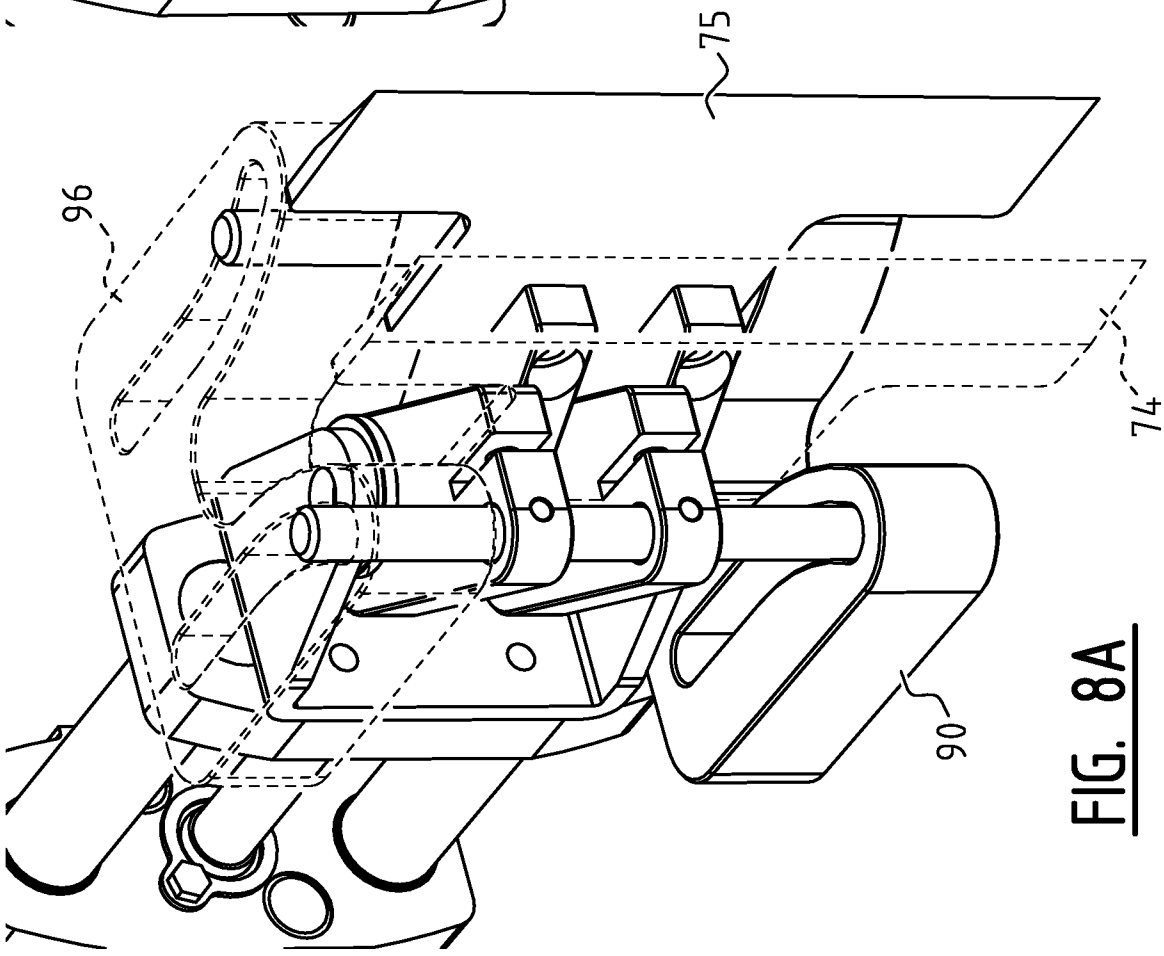


FIG. 8A

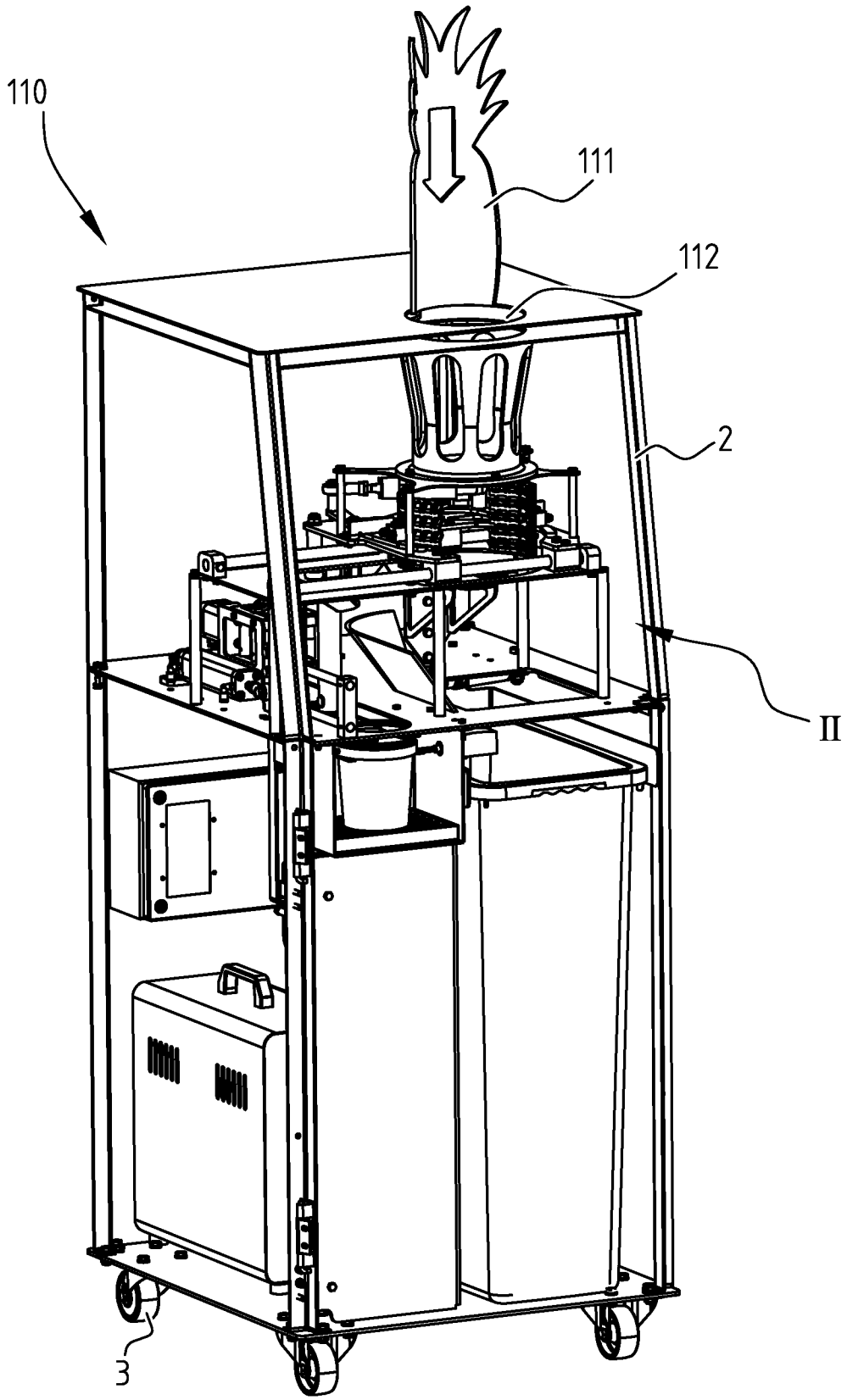


FIG. 9

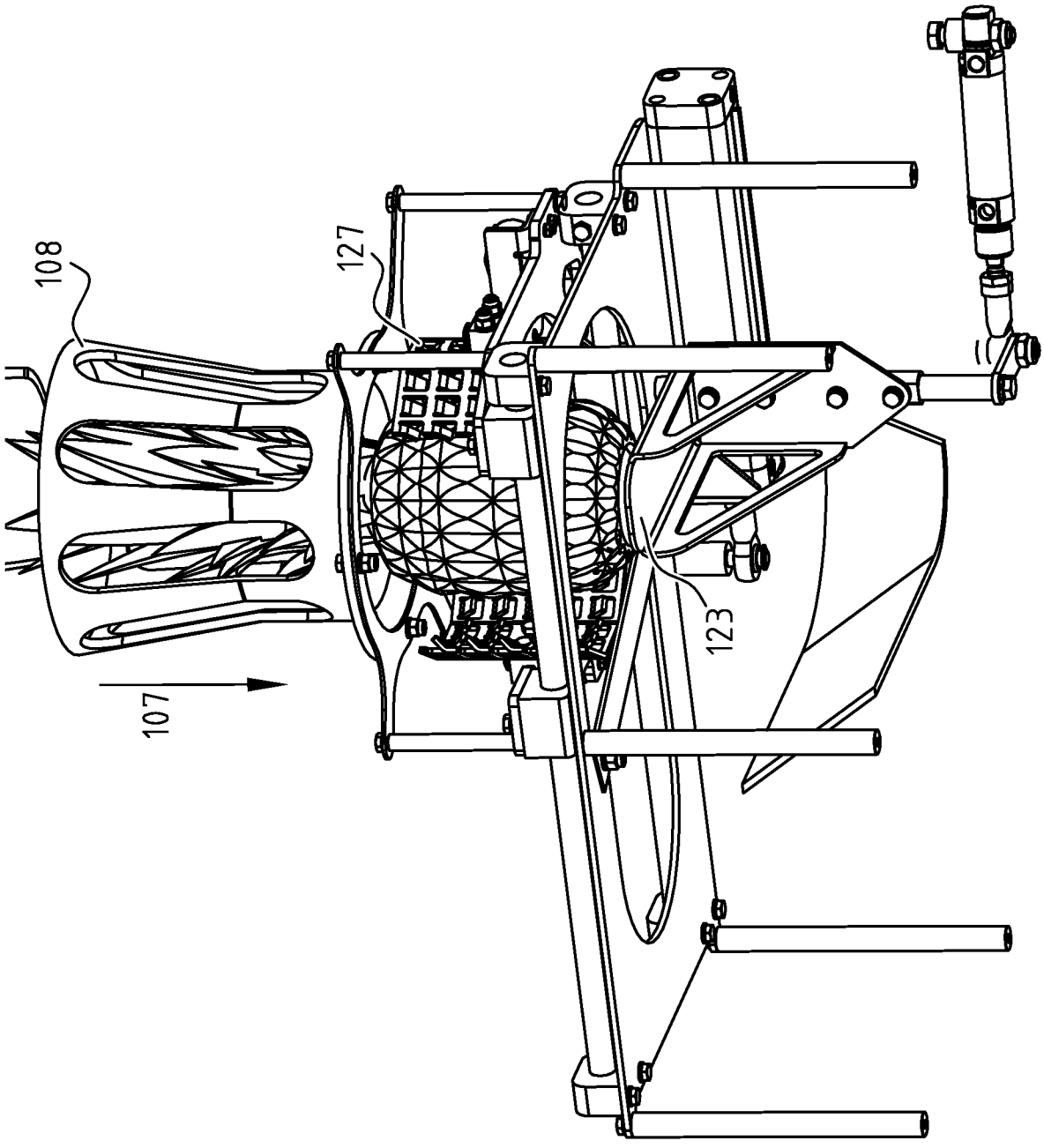


FIG. 10

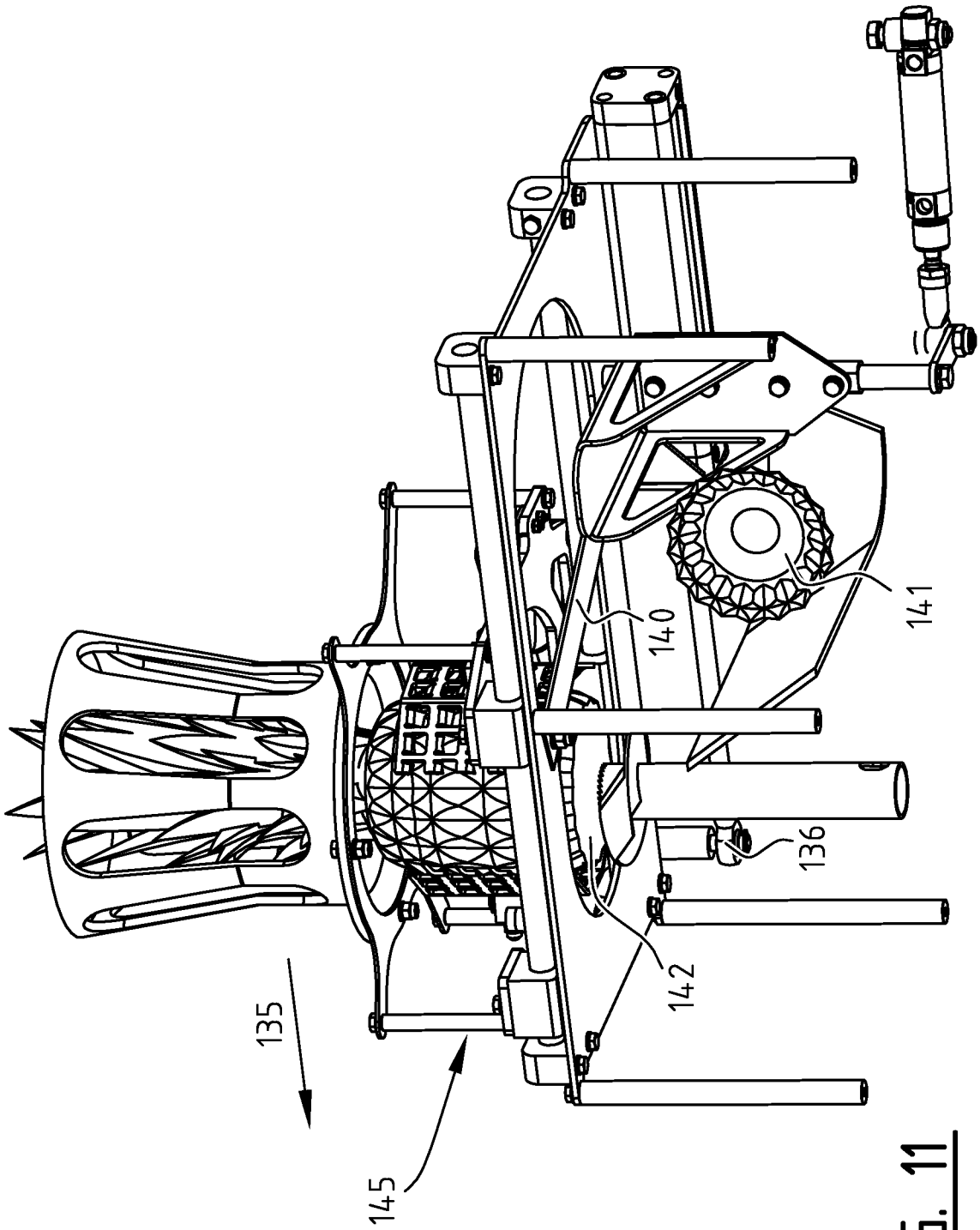


FIG. 11

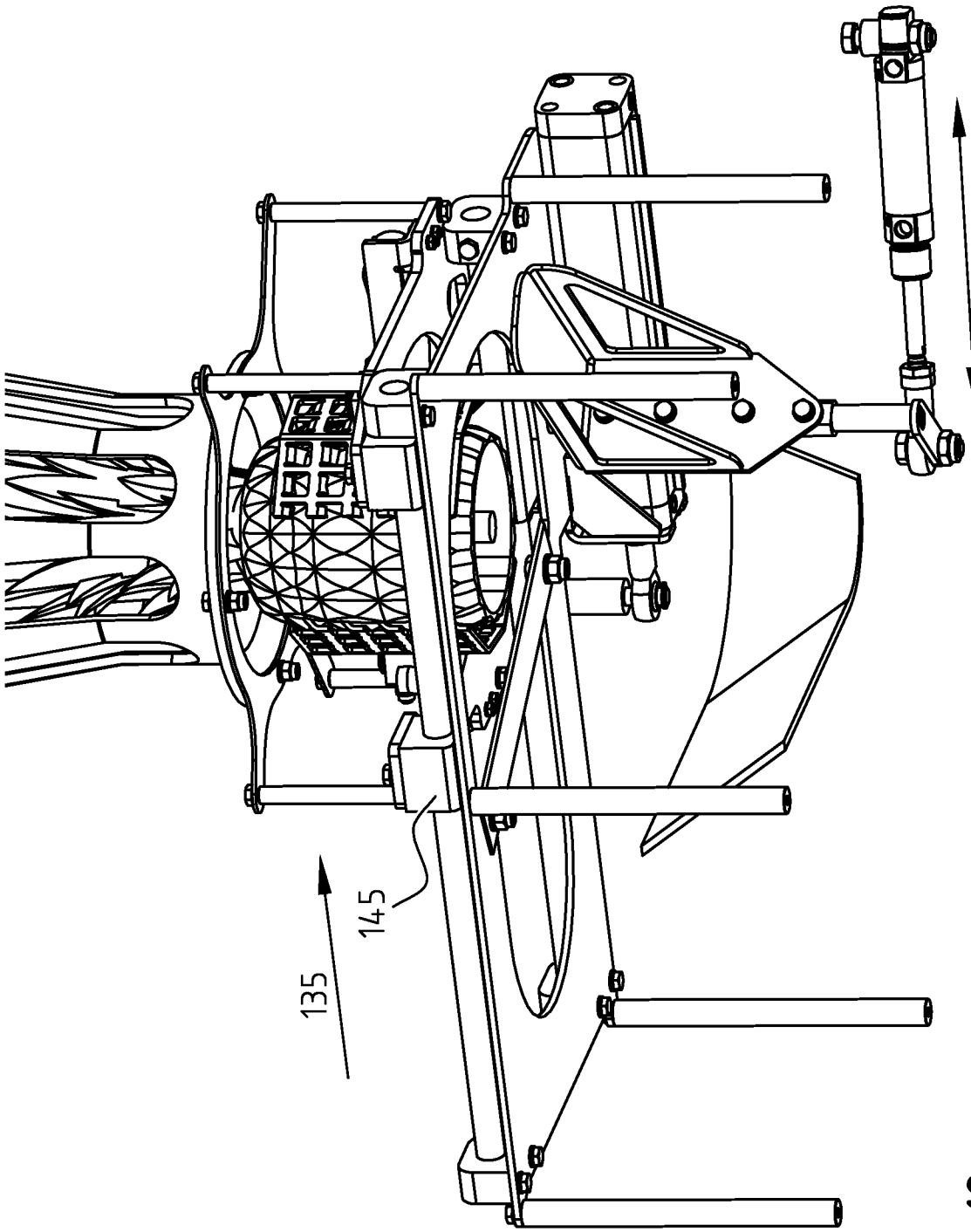


FIG. 12

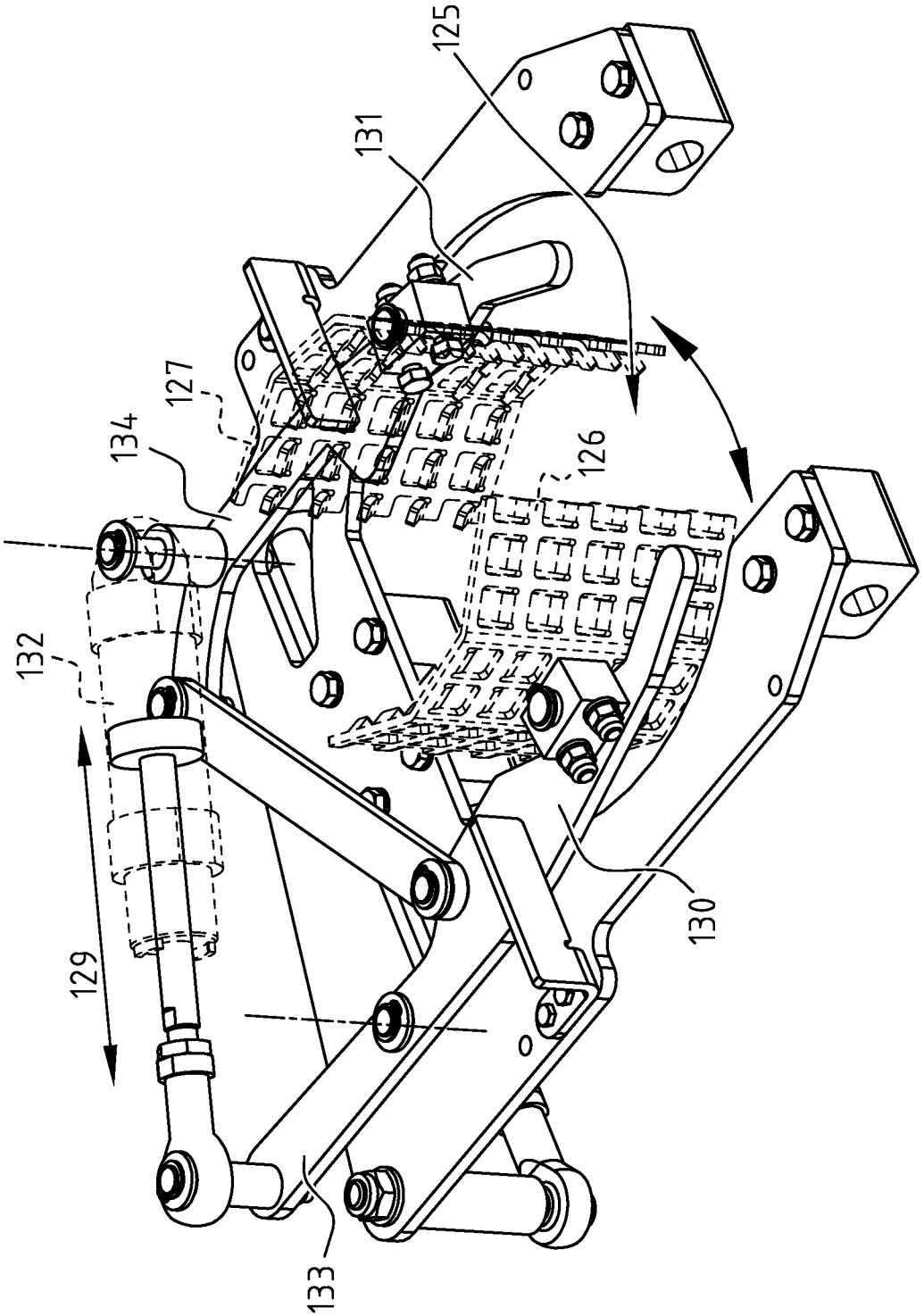


FIG. 13

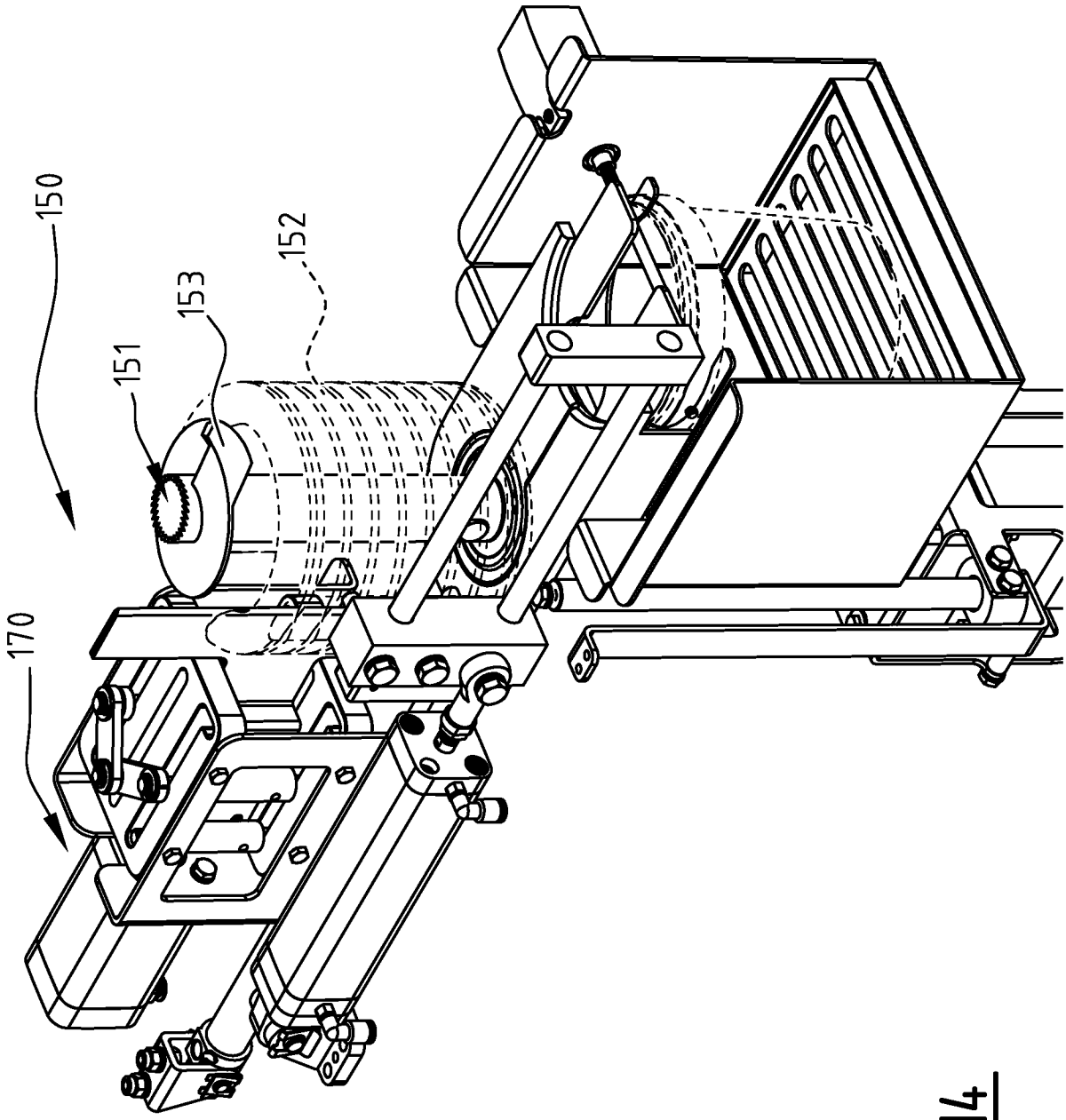


FIG. 14

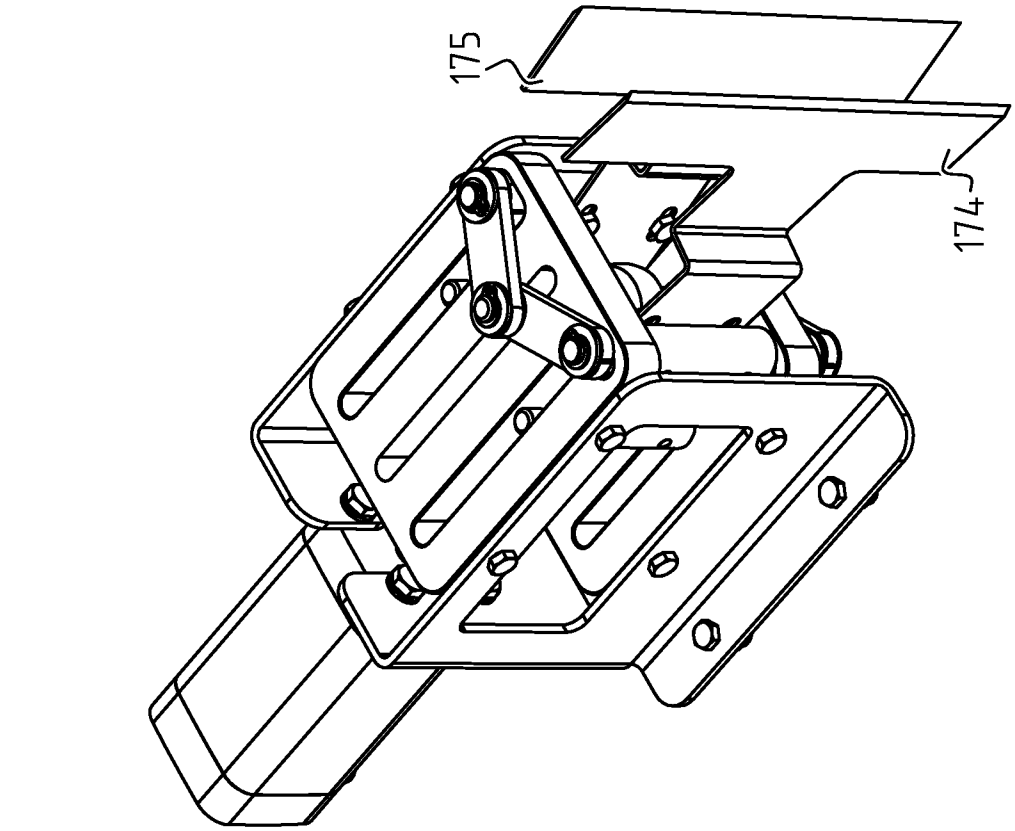


FIG. 15B

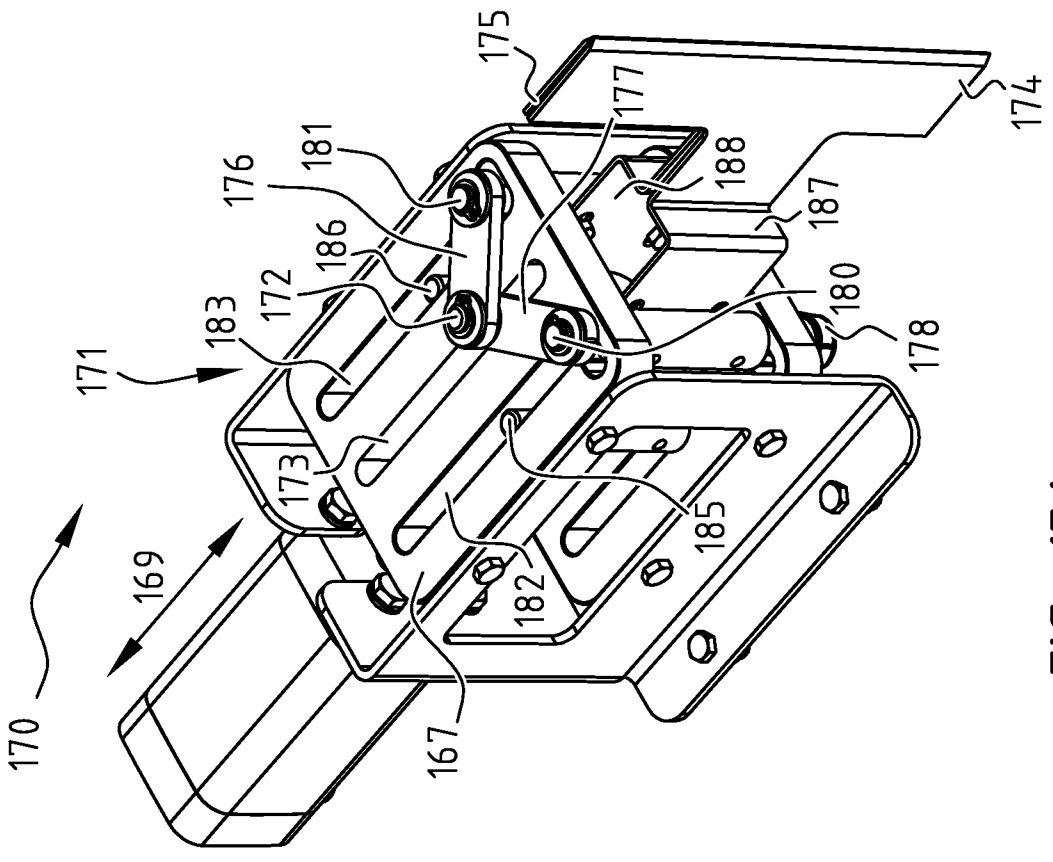


FIG. 15A

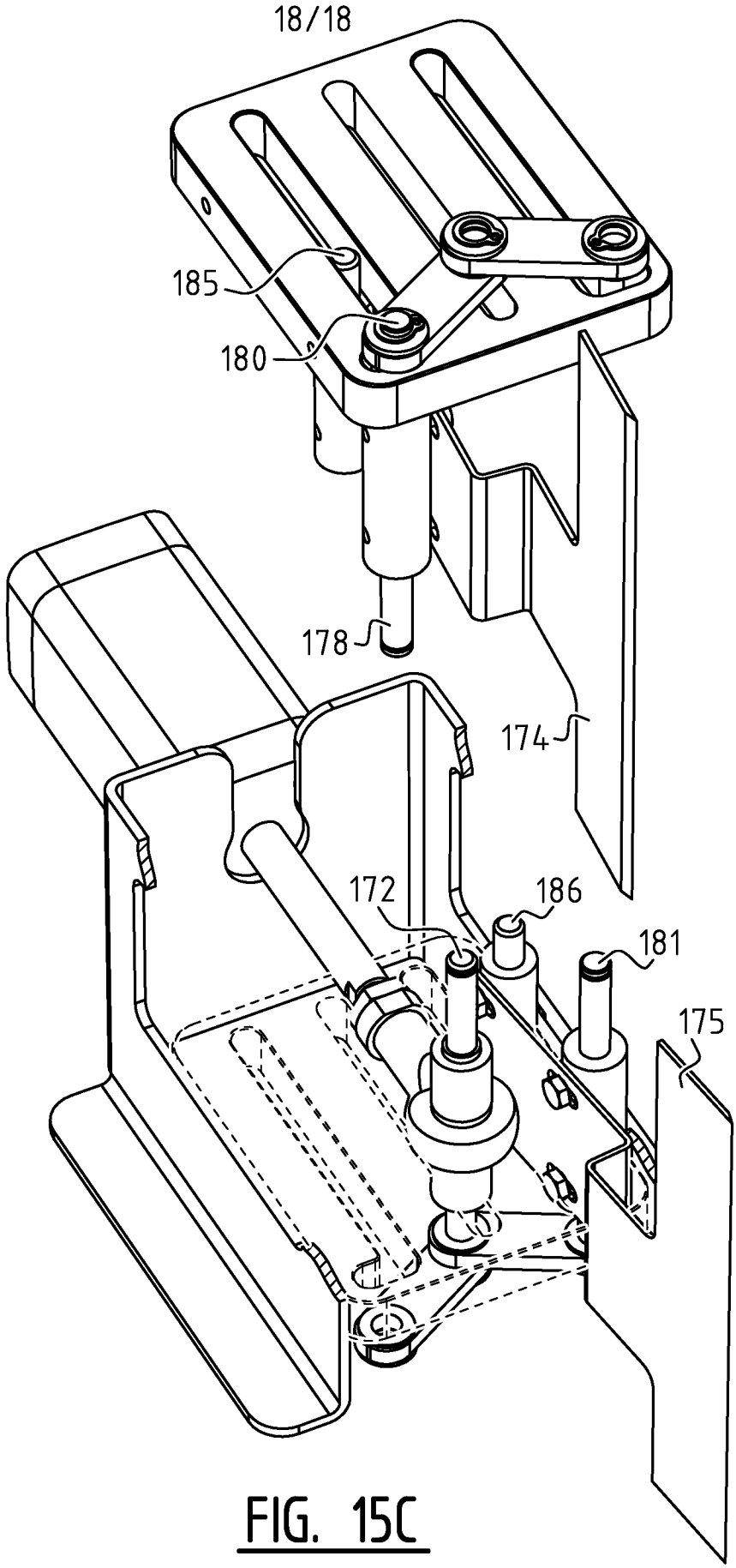


FIG. 15C

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2012/050611

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23N4/20
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 373 432 A (TSUTSUMI MASATO) 15 February 1983 (1983-02-15) abstract; figures 1,8-18 column 3, line 7 - line 25 column 3, line 26 - line 39 column 3, line 40 - line 64 column 4, line 3 - line 20 column 4, line 21 - line 30 column 8, line 35 - line 50 column 7, line 9 - line 21 column 10, line 25 - column 11, line 14 column 8, line 51 - column 11, line 14 ----- -/--	1-7,9, 12-15,18

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 November 2012	12/12/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Balzar, Maarten

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2012/050611

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0 483 930 A1 (CHIQUITA TROPICAL FRUIT CO [NL] VACU PROD BV [NL]) 6 May 1992 (1992-05-06) abstract; figures 1-4 column 1, line 34 - line 46 column 2, line 46 - line 57 column 1, line 57 - column 2, line 3	1-7,9, 12-15,18
A	FR 2 742 326 A1 (BURDINO SERGE [FR]) 20 June 1997 (1997-06-20) abstract; figures 1-4	1-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/NL2012/050611

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