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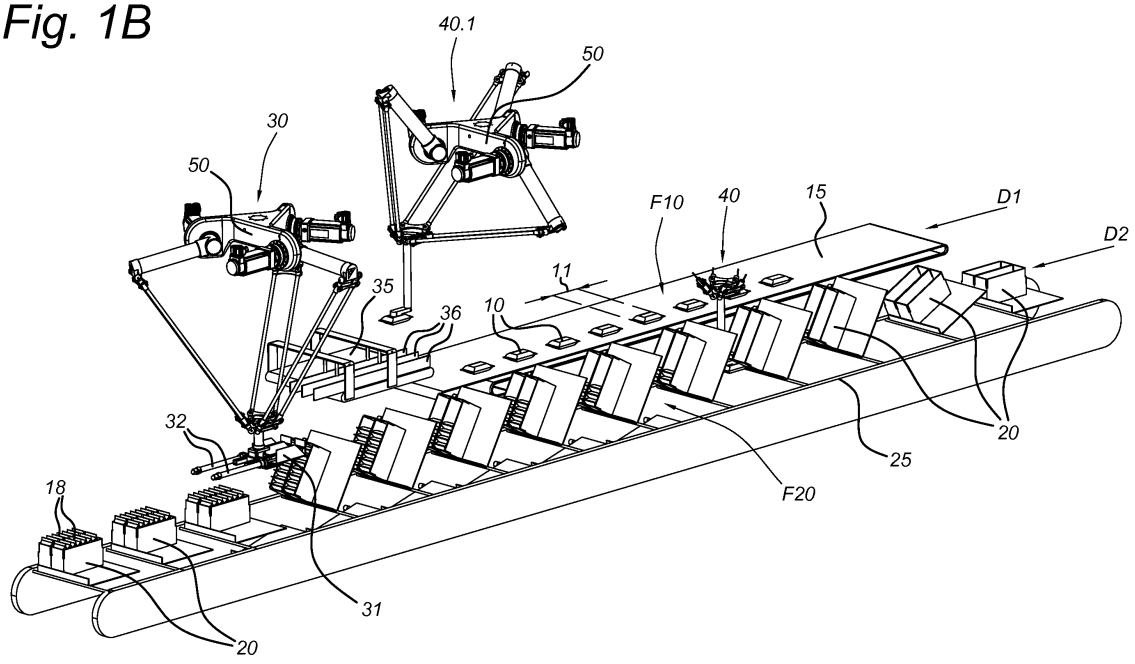
(54) **A METHOD OF PACKING ARTICLES INTO A PACKING BOX, AND CORRESPONDING PACKING DEVICE**

(57) A method of and device for packing articles (10) into a packing box (20) provide for a flow (F10) of articles in a first direction (D1) and a flow (F20) of packing boxes in a second direction (D2) parallel to the first direction. The packing boxes are put in a slanted position such that of each packing box the bottom (21) is slanted with respect to a horizontal plane (H). Articles are gripped from the flow of articles and placed into the packing box such that the articles are placed in a vertical orientation into the packing box so as to provide a row (18) of articles bearing against the bottom and a first side wall (22.1) that is lower with respect to the other side walls. At least one article from the flow of articles is collected and provided into a holder (31), and placed from the holder in vertical orientation into the packing box such as to complete the row of articles in the packing box between the first side wall and an opposing second side wall (22.2) of the packing box.

Fig. 1B



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Description

FIELD OF THE INVENTION

[0001] The invention relates to a method of packing articles into a packing box having a bottom and side walls arranged perpendicular to the bottom, comprising providing a flow of articles; providing a flow of packing boxes; and taking articles from the flow of articles and placing the articles into the packing box. The invention further relates to a packing device for packing articles into a packing box having a bottom and side walls arranged perpendicular to the bottom, comprising an article conveyer configured for providing a flow of articles; a packing box conveyer configured for providing a flow of packing boxes; and at least one arrangement configured for taking articles from the flow of articles and placing the articles into the packing box.

BACKGROUND OF THE INVENTION

[0002] Such packing methods and devices are generally known. They are inter alia used for packing articles in either horizontal or vertical orientation into the packing box. The articles may have various forms, such as, for instance, bags filled with products or a liquid or cartons filled with a liquid. The articles have a length, a width and a thickness, the length of an article being longer than, or equal to, the width and the width of the article being longer than the thickness.

[0003] In a horizontal orientation the articles are positioned such in the packing box that the length and width of the articles are parallel and the thickness is perpendicular to the bottom of the packing box. This can be achieved by picking up an article from the flow of articles and placing and stacking the articles on their back sides on the bottom in a packing box in the flow of packing boxes. Such packing lines are not suited for packaging of products in a vertical orientation.

[0004] In a vertical orientation (or standup orientation) the articles are positioned such in the packing box that the length and width of the articles are parallel to one of the side walls, and one of the length and width thus perpendicular to the bottom of the packing box. The thickness is parallel to the bottom. In portrait orientation the length is perpendicular to the bottom, and in landscape orientation the width is perpendicular to the bottom. This requires another type of packing method and packing line. It is known to stack the articles first in a cassette and subsequently provide the articles from the cassette into the packing box such that the articles are oriented vertically within the packing box. Such lines for vertical packaging of articles require higher investments and take a relatively large floor space. Increasing the packaging capacity requires the addition of another station with cassette loading, which requires considerable investment and floor space. Especially, to allow packing boxes of various sizes with various kinds of articles one needs to keep dedicated parts in stockthat need to be exchanged when another type of packing box and/or another type of articles is to be packed. The parts to be kept in stock are quite large and therefore require a lot of space, and their exchange is tedious.

SUMMARY OF THE INVENTION

[0005] It is an objective of the invention to provide a method of and device for packing articles into a packing box that is very flexible and allows both horizontal and vertical packing of articles in a packing box.

[0006] It is another or alternative objective to provide a method and a device for packing articles into a packing box that requires a minimum of (small) parts or no parts to be exchanged and kept in stock to allow packing of packing boxes and/or articles of different types.

[0007] It is another or alternative objective of the invention to provide a method of and device for packing articles into a packing box that requires relatively low investment and is therefore economic.

[0008] It is yet another or alternative objective of the invention to provide a method of and device for packing articles into a packing boxthat requires a minimum of floor space for the capacity delivered of packing articles into packing boxes.

[0009] It is yet another or alternative objective of the invention to provide a method of and device for packing articles into a packing box that can be easily and economically be scaled to a larger capacity, if required.

[0010] At least one of the above objectives is achieved by a method of packing articles into a packing box having a bottom and side walls connected to the bottom, the articles having a length, a width and a thickness, the length being longer than or equal to the width and the width being longer than the thickness, the method comprising

- providing a flow of articles in a first direction;
- providing a flow of packing boxes in a second direction substantially parallel to the first direction;
- providing the packing boxes in the flow (F20) of packing boxes (20) in a slanted position, for packing of articles into the packing boxes, such that the bottom of each packing box is slanted with respect to a horizontal plane, a first side wall is in a lower position with respect to other side walls of the packing box, and articles provided in the packing box will bear against the bottom and the first side wall;
- gripping articles from the flow of articles and placing the articles, optionally individually gripping articles from the flow of articles and placing the articles individually, into one or more packing boxes that are provided in the slanted position in the flow of packing boxes such that the articles are placed in a vertical orientation into each packing box with the length and the width of the articles parallel to the first side wall to provide a row of articles bearing against the bottom

and the first side wall, optionally while both the flow of articles and the flow of packing boxes are continuously progressing; and

- subsequently collecting and providing at least one article from the flow of articles in a holder, and placing the at least one article from the holder in vertical orientation into a packing box that is provided in the slanted position in the flow of packing boxes to complete a row of articles in the packing box between the first side wall and an opposing second side wall of the packing box.

The article and packing box flows can be either in co-flow in which the articles and packing boxes are conveyed in the same direction, and in counter-flow in which the articles and packing boxes are conveyed in opposite directions. This provides flexibility in adapting the method and corresponding device to an optimal routing of the flows in the specific circumstances where it is employed. The method and corresponding device is not only suited for vertical packing of articles, and can also be used for horizontal packing by just putting in the articles horizontally in the packing box. In the latter case it is not required to put the packing box in the slanted position, which is easily left out. Further, less floor space is required with respect to known methods and devices, less costs are involved and the device can be easily expanded to provide an increased capacity.

[0011] In an efficient, cost-effective and reliable embodiment placing the at least one article from the holder into the packing box comprises at least one of sliding and pushing the at least one article from the holder into the packing box.

[0012] In an embodiment collecting at least one article from the flow of articles comprises collecting at least two articles with sides comprising the length and the width on top of one another. This can be applied in situations in which a space corresponding to more than one article is required at the end of a yet incomplete row of articles for providing access of a gripper into the packing box. Dependent on the specific circumstances this can also provide an optimum between individual article packaging and collective article placement in a packing box.

[0013] In an embodiment collecting and providing at least one article from the flow of articles in a holder comprises in a first step collecting the at least one and in a subsequent step providing the at least one article into the holder. Articles provided into the holder can then be placed into a packing box while collecting next articles in the cassette, which is very time efficient.

[0014] In an embodiment collecting and providing at least one article from the flow of articles in a holder is carried out at an end of the flow of artides. The last articles for completing a row of articles in a packing box are conveniently collected at the end of a flow. The collecting station can be provided in-line with the flow for efficient use of floor space.

[0015] In an embodiment the articles are provided with one of the length and the width along the first direction in the flow of articles, and subsequently are provided with said one of the length and the width perpendicular to the bottom into the packing box. Such orientation of the articles proves to be very convenient and efficient in picking up and placing the articles in the packing box.

[0016] In an embodiment the packing boxes are provided in the flow of packing boxes with the first side wall perpendicular to the second direction as seen when the packing boxes are not in the slanted position. Such orientation of the packing boxes proves very convenient and efficient in placing articles into a packing box.

[0017] In an embodiment gripping articles from the flow of articles and providing the articles into the packing box comprises gripping the articles and providing the articles into the box using a delta robot.

[0018] In another aspect the invention provides for a packing device for packing articles into a packing box having a bottom and side walls arranged perpendicular to the bottom, the articles having a length, a width and a thickness, the length being longer than or equal to the width and the width being longer than the thickness, the packing device comprising

- an article conveyer configured for providing a flow of articles in a first direction;
- a packing box conveyer configured for providing a flow of packing boxes in a second direction parallel to the first direction;
- at least one slanting arrangement associated with the packing box conveyer and configured for providing the packing boxes in the flow of packing boxes in a slanted position for packing of articles into the packing boxes such that the bottom of each packing box is slanted with respect to a horizontal plane, a first side wall is in a lower position with respect to other side walls of the packing box, and articles provided in the packing box will bear against the bottom and the first side wall;
- at least one gripping and placing arrangement configured for gripping articles from the flow of articles and placing the articles, optionally individually gripping articles (10) from the flow (10) of articles and placing the articles individually, into one or more packing boxes that are provided in the slanted position in the flow of packing boxes such that the articles are placed in a vertical orientation into each packing box with the length and the width of the articles parallel to the first side wall to provide a row of articles bearing against the bottom and the first side wall, optionally while both the flow of articles and the flow of packing boxes are continuously progressing; and
- a collecting and placing arrangement configured and arranged for

subsequently collecting and providing at least one article from the flow of articles in a holder, and for placing the at least one article from the holder in vertical orientation

into a packing box that is provided in the slanted position in the flow of packing boxes to complete a row of articles in the packing box between the first side wall and an opposing second side wall of the packing box.

[0019] In an embodiment the collecting and placing arrangement is configured for at least one of sliding and pushing the at least one article from the holder into the packing box.

[0020] In an embodiment the collecting and placing arrangement is configured for collecting at least two articles with sides comprising the length and the width on top of one another.

[0021] In an embodiment the collecting and placing arrangement comprises a collecting arrangement, optionally a collecting conveyer, for collecting the at least one article, and a placing arrangement with the holder and configured for providing the at least one article from the cassette into the holder.

[0022] In an embodiment the collecting and placing arrangement is provided at an end of the article conveyer.

[0023] In an embodiment the slanting arrangement is configured to rotate a packing box around a rotation axis perpendicular to the second direction in the slanted position, optionally the rotation axis being perpendicular to the horizontal plane.

[0024] In an embodiment the slanting arrangement comprises at least one of a driven rotation axle and a driven cam to provide the packing box in the slanted position, and optionally comprises a supporting plate configured for bearing the packing box and to be rotated to a slanted position.

[0025] In an embodiment one or both of the at least one gripping and placing arrangement and the collecting and placing arrangement comprises a delta robot

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Further features and advantages of the invention will become apparent from the description of the invention by way of non-limiting and non-exclusive embodiments. These embodiments are not to be construed as limiting the scope of protection. The person skilled in the art will realize that other alternatives and equivalent embodiments of the invention can be conceived and reduced to practice without departing from the scope of the present invention. Embodiments of the invention will be described with reference to the accompanying drawings, in which like or same reference symbols denote like, same or corresponding parts, and in which

Figures 1 a and 1 b show a device for packing articles into a packing box according to the invention, figure 1a showing the device with device frame and figure 1 b showing the device without device frame;

Figure 2 shows the device from another perspective while an article is collected on a collecting conveyer;

Figure 3 shows the device from yet another perspective while articles are loaded from the collecting conveyer into a holder;

Figure 4 shows the device from yet another perspective while the holder with articles moves from the collector conveyer towards a packing box;

Figure 5 shows the device while articles are provided from the holder into a packing box;

Figure 6 shows a packing box in a slanted position in a slanting arrangement; and

Figure 7 shows an example of an article to be packed in a packing box.

DETAILED DESCRIPTION OF EMBODIMENTS

[0027] A device 1 for packing articles into a packing box comprises an article conveyer 15 and a packing box conveyer 25, and is shown in figures 1 a, 1 b, 2, 3, 4 and 5. The article conveyer 15 is configured to provide a flow F10 of articles 10 in a first direction D1. The articles 10 may take various forms, such as bags containing a liquid product, bags containing individual smaller products like sweets, cartons, etc. The packing box conveyer 25 is arranged alongside and substantially parallel to the article conveyer 15. The packing box conveyer 25 is configured to provide a flow F20 of packing boxes in a second direction D2. The first and second directions D1, D2 may be the same, that is both the articles 10 and the packing box are moving parallel in the same direction, which is also referred to as co-flow. This is shown in the embodiment of the figures. In an alternative embodiment, which is not shown in the figures, the flow F10 of articles 10 and the flow F20 of packing boxes 20, and therefore the first and second directions, are directed opposite to one another, which is also referred to as counter-flow. Basically, the working principles of co-flow and counter-flow are the same.

[0028] The articles 10 are conveyed in direction D1 and have a length 11, a width 12 and a thickness 13 as is shown in figure 7. The length 11 of the articles is longer than or equal to the width 12, and the width 12 is longer than or equal to the thickness 13. The articles are directed with their lengths 11 parallel to the direction D1 of the article flow F10. Both the lengths and widths 11, 12 of the articles are directed parallel to the conveying plane of conveyer 15.

[0029] The packing boxes 20 are conveyed by packing box conveyer 25 in direction D2, which is identical to direction D1 in the embodiment shown. The packing boxes have, as specifically identified in figures 2 and 6, a bottom 21, side walls 22 (including 22.1 and 22.2) and flaps 23 that can be folded to close the packing box. The figures show two packing boxes 20 next to one another in the packing box flow F20 on the packing box conveyer 25. Alternatively, a flow F20 of single packing boxes is provided, or a flow of more than two packing boxes next to one another. Initially, the packing boxes 20 are conveyed horizontally, that is with their bottoms 21 on a conveying plane that is parallel to a horizontal plane. This is shown on the right-hand side of figures 1 a and 1 b. Figures 1a

and 1 b are the same, except for a frame of the packing device 1. Figure 1 a does show such frame, whereas in figures 1 b, 2, 3, 4 and 5 the frame is not drawn.

[0030] At some point along the conveyer 25 the packing boxes are put in a slanted position. In the slanted position, the bottom 21 of the packing box makes an angle with the horizontal plane H as specifically shown in figure 6. Packing boxes are also shown in the slanted position in figures 1 a, 1 b, 2, 3, 4 and 5. When in the slanted position a first side wall 22.1 is in a lower position with respect to the other side walls 22 of the packing box. A lower position of side wall 22.1 means that the other side walls have been raised with respect to the first side wall 22.1 when the packing box is put in the slanted position. A mid (center) point of a side wall in a lower position is lower than the mid (center) point of the other side walls of the packing box, when in the slanted position. In the embodiment shown, the packing boxes 20 are provided in the flow F20 of packing boxes with the first side wall 22.1 perpendicular to the second direction D2 as seen when the packing boxes are not in the slanted position.

[0031] The packing boxes are put in the slanted position by one or more slanting arrangements 26, which are part of the packing box conveyer 25 in the embodiment shown. The slanting arrangement is schematically depicted in figure 6 and comprises a supporting plate 27 bearing the packing box 20. The supporting plate 27 is rotatable around a rotation axis R, as shown in figure 2, which lies in the horizontal plane H and is directed perpendicular to the packing box conveying direction D2. The supporting plate may be rotated by a driven rotation axle 28 and/or a driven cam 29. One or both may be employed, or any other means for rotating the supporting plate27. A position of the cam 29 when the supporting plate would be horizontal is shown in a dashed outline in figure 6. Any means for rotating the axle 28 and/or the cam 29 are known as such. The supporting plate 27 comprises an upstanding edge at a side associated with the first side wall 22.1 of the packing box to prevent the packing box from sliding of the supporting plate when in the slanted position.

[0032] Articles 10 are provided individually from the article conveyer 15 into packing boxes 20 on the packing box conveyer 25 using a gripping and placing arrangement 40 (including 40.1) while articles and packing boxes are moving in their respective flows F10, F20 on their respective conveyers 15, 25. In the embodiment depicted two packing boxes 20 are provided next to one another on a supporting plate 27 on the packing box conveyer 25. A gripping and placing arrangement 40 comprising a delta robot 50 picks up individual articles 10 from the article flow F10 on the conveyer 15 and places the articles individually in a packing box 20. The gripping end of the gripping and placing arrangement 40, which actually grips an article may be configured in various manners. The gripping end may, for instance, comprise gripping fingers that grip around or on the sides of the articles or comprise a suction cup, although other types of configurations may be employed as well. Two stations are shown with a gripping and placing arrangement 40. Dependent on the capacity of articles and packing boxes to be processed more stations with a gripping and placing arrangement 40 can be added to the packing device 1 along the conveyers 15, 25, or only one such station may be provided. Multiple gripping and placing arrangements will then consecutively fill the packing boxes 20 with articles 10 as they pass along the stations with the gripping and placing arrangements 40.

[0033] The gripping and placing arrangements 40 place the articles 10 in a vertical orientation in one or more rows 18 into the packing box. In the vertical orientation the article is positioned such that the length 11 or width 12 of the article is substantially in the vertical direction. The article is placed such in the packing box20 that the length 11 and the width 12 of the article are parallel to the first side wall 22.1, one of the length and width is perpendicular to the bottom 21 of the packing box, and the other one of the length and width is parallel to the bottom 21. The thickness 13 of the article is positioned along the bottom and perpendicular to the first side wall of the packing box. In the embodiment shown in the figures the length 11 of the articles 10 is directed perpendicular to the bottom of the packing box. The first side wall 22.1 of the packing box is the side wall in the lower position with respect the other side walls when the packing box is in the slanted position. The gripping and placing arrangement 40 does not completely fill a packing box by not completing the rows 18 of articles 10 from the first side wall 22.1 to an opposing wall 22.2 since the gripper end holding an article 10 cannot access into the packing box when a certain filling level of the packing box 20 has been reached.

[0034] The articles 10 are directed with their length dimension 11 along the first direction D1 of the article flow F10 on the article conveyer 15. The packing boxes 20 are rotated into their slanted position around a rotation axis R that is in the horizontal plane and perpendicular to the second direction D2 of the packing box flow F20 on the packing box conveyer 25. Since the first and second directions D1, D2 are parallel, the rotation axis R is perpendicular to the first direction D1 as well. Therefore, the slanted position of the packing boxes 20 is such that article 10 can be taken from the article conveyer 10 and be placed into the packing box with a minimum amount of translation and rotation of a gripped article by the gripping and placing arrangement. Only translation is required to transfer the article from the article conveyer to the packing box conveyer, and only rotation is required to align the article with the slanted position of the first side wall 22.1 of the packing box with the length 11 of the article perpendicular to the bottom as is shown in the figures. In case the width 12 of the articles is to be oriented perpendicular to the bottom of the packing box then the articles are positioned such on the article conveyer 15 that the width 12 is directed along the first direction D1 of the article flow F10.

[0035] At the end of the article flow F10 and end of the article conveyer 15 articles 10 are collected in a holder 31 of a collecting and placing arrangement 30. In the embodiment shown, articles are collected in two positions next to one another in the holder since two packing boxes are conveyed next to one another on the packing box conveyer 25. The last picking and placing arrangement 40.1 as seen in the direction of the article flow F10 both provides articles 10 into packing boxes 20 and onto a collecting conveyer 35. Guides 36 are provided on the collecting conveyer to provide two paths corresponding to the two positions of the holder 31. The picking and placing arrangement 40.1 provides articles onto the collecting conveyer in both paths, either as a single article or a stack of articles. When one or more layers of two articles next to one another are provided in the respective paths the collecting conveyer is advanced so that next articles can be provided on the collecting conveyer. The articles that are advanced on the track can be provided directly into the holder 31 or can be provided into a waiting position on the collecting track to wait until the holder becomes available for placing the articles into the holder. Loading of the holder 31 with articles is visible in figures 2 and 3.

[0036] The holder 31 allows to place articles into the adjacent packing boxes in one go after collection of one or more layers of two articles next to one another in the holder. The holder 31 is arranged at the positioning end of a delta robot 50 in the collecting and placing arrangement 30. The delta robot 50 of the collecting and placing arrangement provides the holder with articles towards a packing box. Figure 4 shows the position of the holder 31 after articles have been provided into the holder and the holder is moving towards a packing box. Figure 5 and figures 1 a and 1b show that the articles are provided into two adjacent packing boxes 20 on the packing box conveyer 25. At an appropriate position with respect to the packing boxes the holder 31 can be rotated such that the articles slide off from the holder into the packing boxes. Each one or more layers of articles from the holder completes a row 18 of articles 10 within the packing box between the first side wall 22.1 and its opposing second side wall 22.2, a complete row filling the length between the first and second side walls 22.1, 22.2. The holder 31 is further provided with pushers 32 that are arranged to push a back wall of the holder forward to push the articles from the holders into the packing box. Rotation and pushing may either or both be employed for transferring the articles from the holder into the packing box.

[0037] Again a minimum amount of translation and rotation of articles collected in the holder 31 by the collecting and placing arrangement 30 is required. Only translation is required to transfer the articles from the article conveyer to the collecting conveyer 35 and to the packing box conveyer, and only rotation is required to align the holder with the articles with the slanted position of the first side wall 22.1 of the packing box. After a packing box has been completely filled with articles it is rotated back from its slanted position into the horizontal position for further handling.

[0038] Alternative embodiments of the collecting and placing arrangement 30 can be employed as well. A separate collecting conveyer might be dispensed with. The products could be directly provided by the article conveyer 15 or by the picking and placing arrangement 40.1 into the holder 30. Or the articles could be put first by the article conveyer 15 or by the picking and placing arrangement 40.1 into a collecting cassette, and subsequently be provided into the holder 31.

[0039] In an alternative embodiment the article conveyer 15 can be positioned such that that article flow F10 comes from the opposite direction as shown in the figures. The article flow F10 is then in a direction D1 that is opposite direction D2. The article flow F10 and packing box flow are in counter-flow is such embodiment. The collecting conveyer 35 is then again provided at the end of the article flow F10 with respect to the article conveyer 15.

Claims

1. A method of packing articles (10) into a packing box (20) having a bottom (21) and side walls (22) connected to the bottom, the articles having a length (11), a width (12) and a thickness (13), the length being longer than or equal to the width and the width being longer than the thickness, the method comprising

   - providing a flow (F10) of articles (10) in a first direction (D1);
   - providing a flow (F20) of packing boxes (20) in a second direction (D2) substantially parallel to the first direction (D1);
   - providing the packing boxes in the flow (F20) of packing boxes (20) in a slanted position, for packing of articles into the packing boxes, such that the bottom of each packing box is slanted with respect to a horizontal plane (H), a first side wall (22.1) is in a lower position with respect to other side walls of the packing box, and articles provided in the packing box (20) will bear against the bottom (21) and the first side wall (22.1);
   - gripping articles (10) from the flow (F10) of articles and placing the articles, optionally individually gripping articles (10) from the flow (10) of articles and placing the articles individually, into one or more packing boxes that are provided in the slanted position in the flow of packing boxes such that the articles are placed in a vertical orientation into each packing box (20) with the length and the width of the articles parallel to the first side wall to provide a row (18) of articles bearing against the bottom (21) and the first side wall (22.1), optionally while both the flow of ar-

ticles and the flow of packing boxes are continuously progressing; and
- subsequently collecting and providing at least one article (10) from the flow (F10) of articles in a holder (31), and placing the at least one article from the holder in vertical orientation into a packing box (20) that is provided in the slanted position in the flow of packing boxes to complete a row (18) of articles in the packing box between the first side wall (22.1) and an opposing second side wall (22.2) of the packing box.

2. The method according to claim 1, wherein placing the at least one article (10) from the holder (31) into the packing box comprises at least one of sliding and pushing the at least one article from the holder into the packing box (20).

3. The method according to any one of the preceding claims, wherein collecting at least one article (10) from the flow (F10) of articles comprises collecting at least two articles with sides comprising the length and the width on top of one another.

4. The method according to any one of the preceding claims, wherein collecting and providing at least one article (10) from the flow (F10) of articles in a holder comprises in a first step collecting the at least one article and in a subsequent step providing the at least one article into the holder (31).

5. The method according to any one of the preceding claims, wherein collecting and providing at least one article (10) from the flow (F10) of articles in a holder is carried out at an end of the flow of articles.

6. The method according to any one of the preceding claims, wherein the articles (10) are provided with one of the length and the width along the first direction (D1) in the flow (F10) of articles, and subsequently are provided with said one of the length and the width perpendicular to the bottom into the packing box.

7. The method according to any one of the preceding claims, wherein the packing boxes (20) are provided in the flow (F20) of packing boxes with the first side wall (22.1) perpendicular to the second direction (D2) as seen when the packing boxes are not in the slanted position.

8. The method according to any one of the preceding claims, wherein gripping articles (10) from the flow (F10) of articles and providing the articles into the packing box comprises gripping the articles and providing the articles into the box using a delta robot.

9. A packing device for packing articles (10) into a packing box (20) having a bottom (21) and side walls (22) arranged perpendicular to the bottom, the articles having a length (11), a width (12) and a thickness (13), the length being longer than or equal to the width and the width being longer than the thickness, the packing device comprising

- an article conveyer (15) configured for providing a flow (F10) of articles (10) in a first direction (D1);
- a packing box conveyer (25) configured for providing a flow (F20) of packing boxes (20) in a second direction (D2) substantially parallel to the first direction;
- at least one slanting arrangement (26) associated with the packing box conveyer (25) and configured for providing the packing boxes in the flow (F20) of packing boxes (20) in a slanted position, for packing of articles into the packing boxes, such that the bottom of each packing box is slanted with respect to a horizontal plane (H), a first side wall (22.1) is in a lower position with respect to other side walls of the packing box, and articles provided in the packing box (20) will bear against the bottom (21) and the first side wall (22.1);
- at least one gripping and placing arrangement (40) configured for gripping articles (10) from the flow (F10) of articles and placing the articles, optionally individually gripping articles (10) from the flow (10) of articles and placing the articles individually, into one or more packing boxes that are provided in the slanted position in the flow of packing boxes such that the articles are placed in a vertical orientation into each packing box (20) with the length and the width of the articles parallel to the first side wall to provide a row (18) of articles bearing against the bottom (21) and the first side wall (22.1), optionally while both the flow of articles and the flow of packing boxes are continuously progressing; and
- a collecting and placing arrangement (30) configured and arranged for subsequently collecting and providing at least one article (10) from the flow (F10) of articles in a holder (31), and for placing the at least one article from the holder in vertical orientation into a packing box (20) that is provided in the slanted position in the flow of packing boxes to complete a row (18) of articles in the packing box between the first side wall (22.1) and an opposing second side wall (22.2) of the packing box.

10. The device according to the preceding claim, wherein the collecting and placing arrangement is configured for at least one of sliding and pushing the at least one article from the holder (31) into the packing box (20).

11. The device according to any one of claims 9-10, wherein the collecting and placing arrangement (30) is configured for collecting at least two articles (10) with sides comprising the length and the width on top of one another.

12. The device according to any one of claims 9-11, wherein the collecting and placing arrangement (30) comprises a collecting arrangement (35) for collecting the at least one article (10), and a placing arrangement (30) with the holder (31) and configured for providing the at least one article into the holder (31).

13. The device according to any one of claims 9-12, wherein the collecting and placing arrangement (30) is provided at an end of the article conveyer (15).

14. The device according to any one of claims 9-13, wherein the slanting arrangement (26) is configured to rotate a packing box (20) around a rotation axis (R) perpendicular to the second direction (D2) in the slanted position,
optionally the rotation axis being perpendicular to the horizontal plane (H),
optionally the slanting arrangement (26) comprising at least one of a driven rotation axle (28) and a driven cam (29) to provide the packing box (20) in the slanted position, and optionally comprises a supporting plate (27) configured for bearing the packing box (20) and to be rotated to a slanted position.

15. The device according to any one of claims 9-14, wherein one or both of the at least one gripping and placing arrangement (40) and the collecting and placing arrangement (30) comprises a delta robot (50).

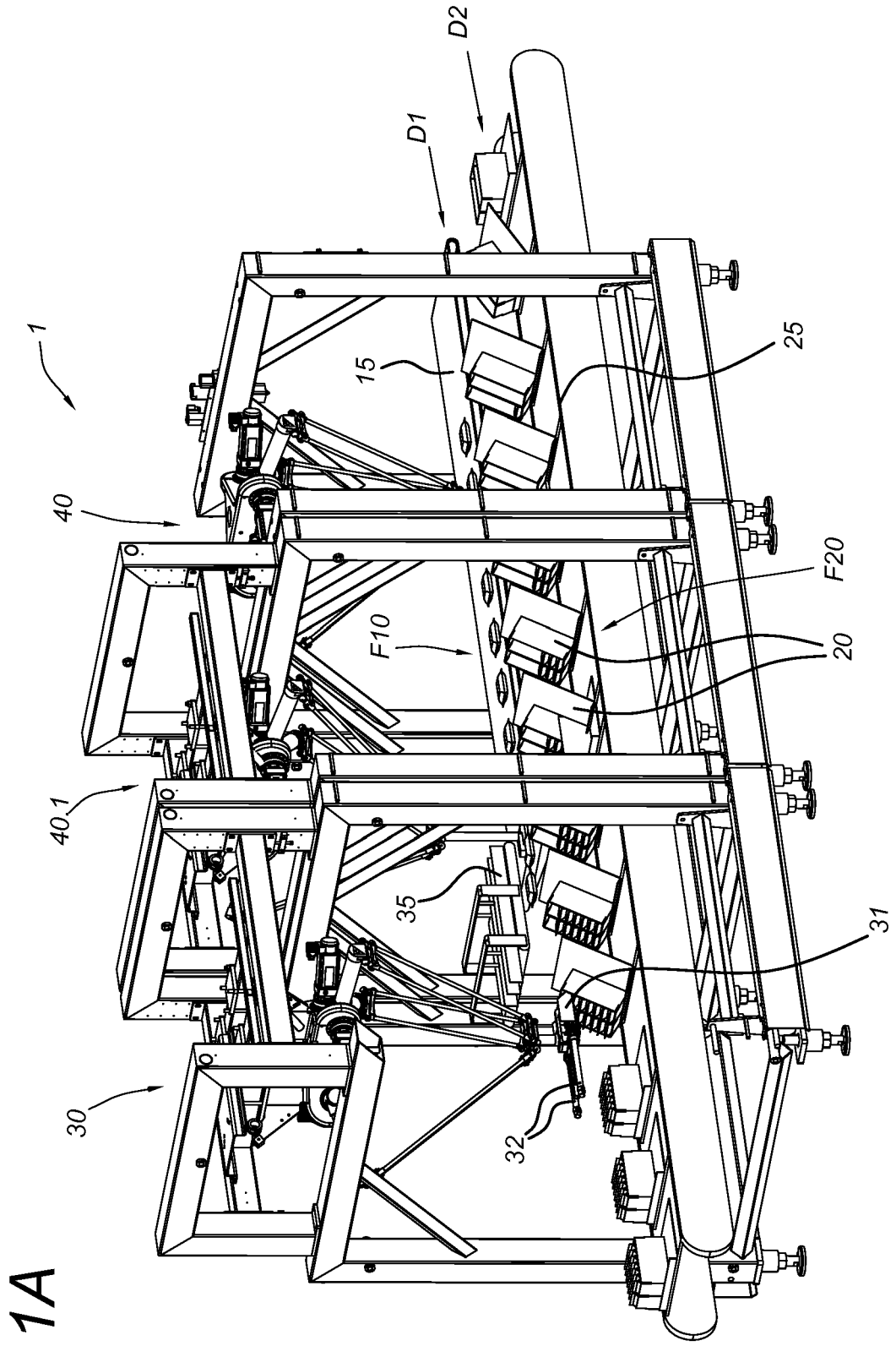


Fig. 1A

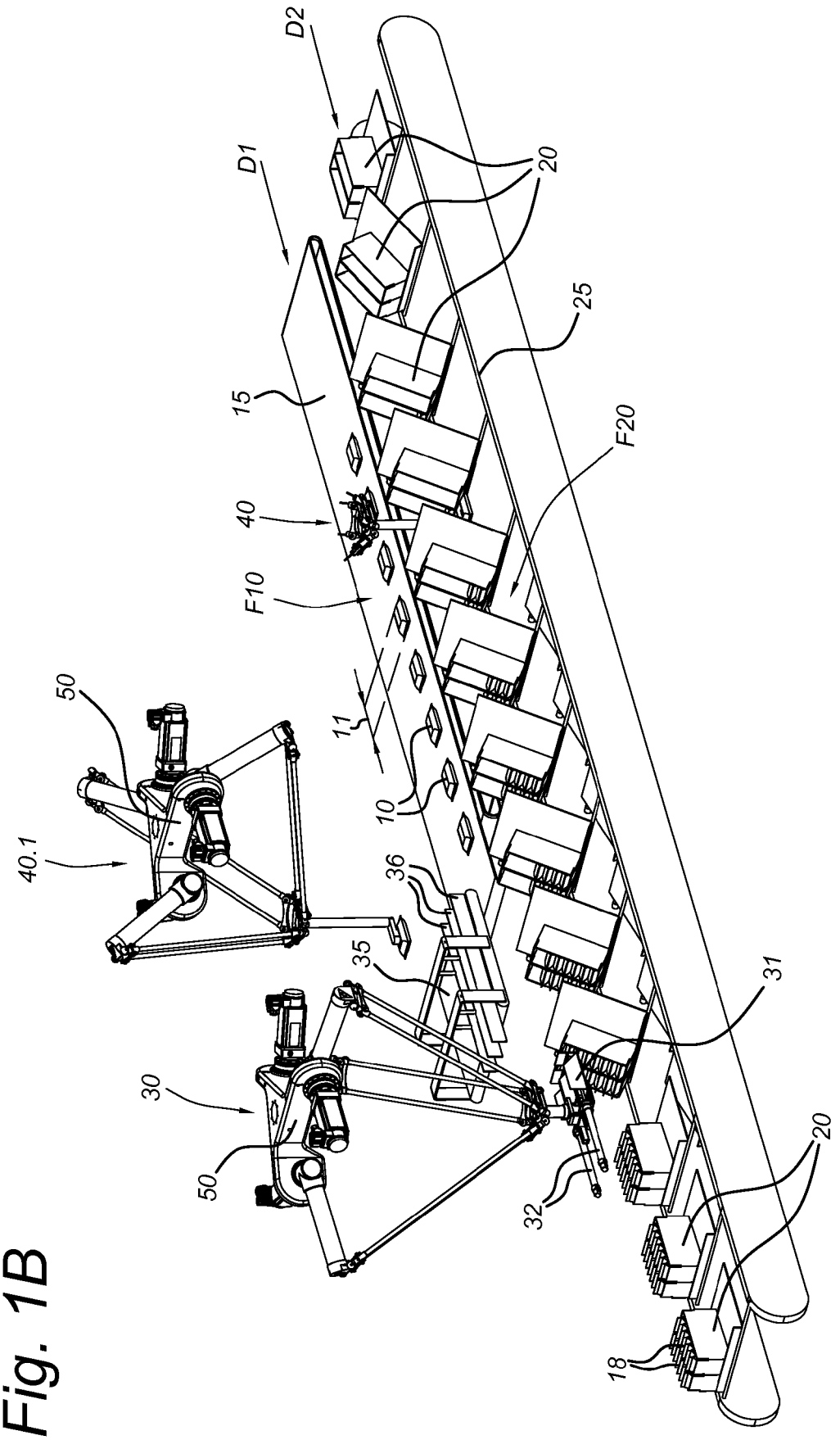


Fig. 1B

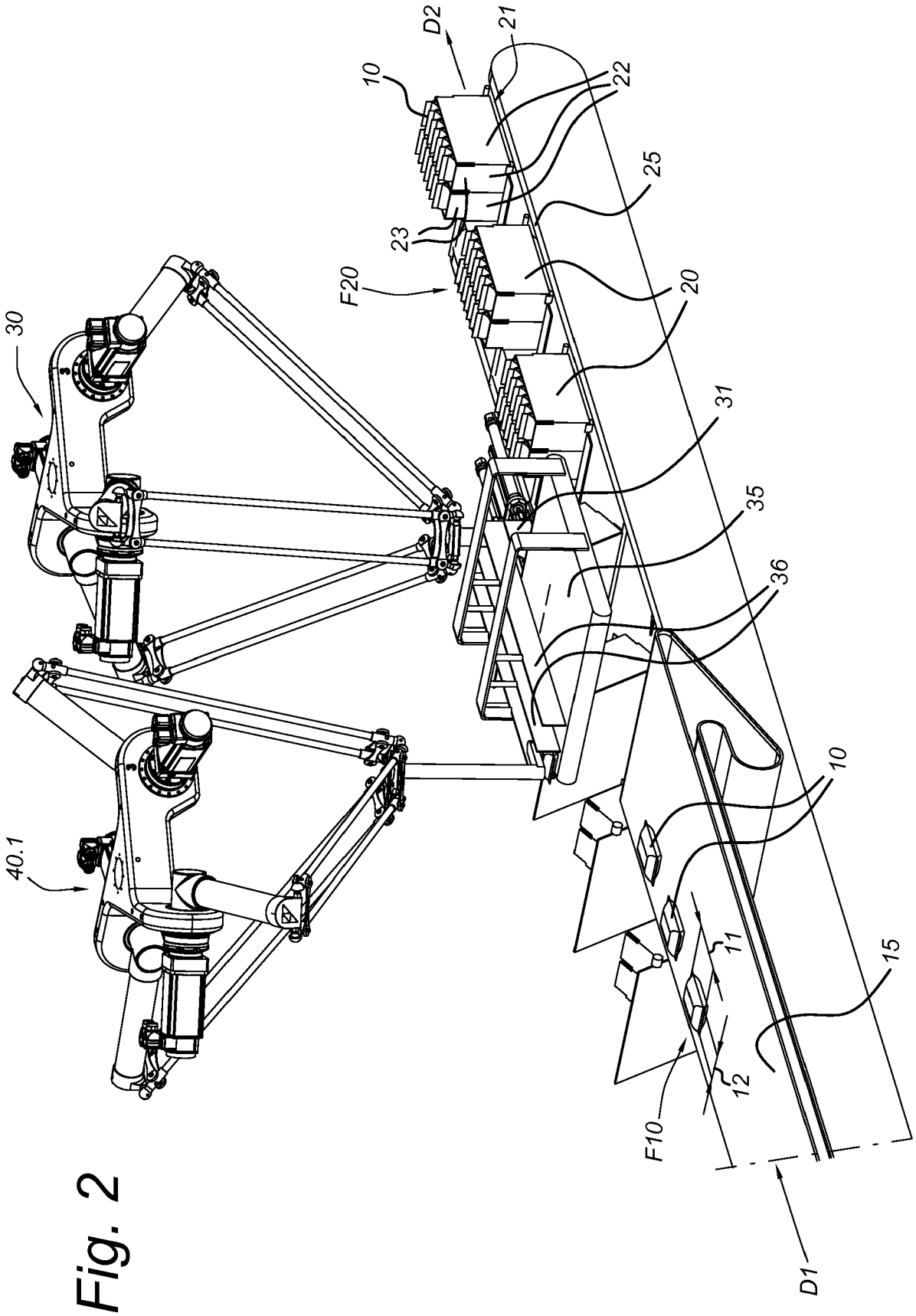


Fig. 2

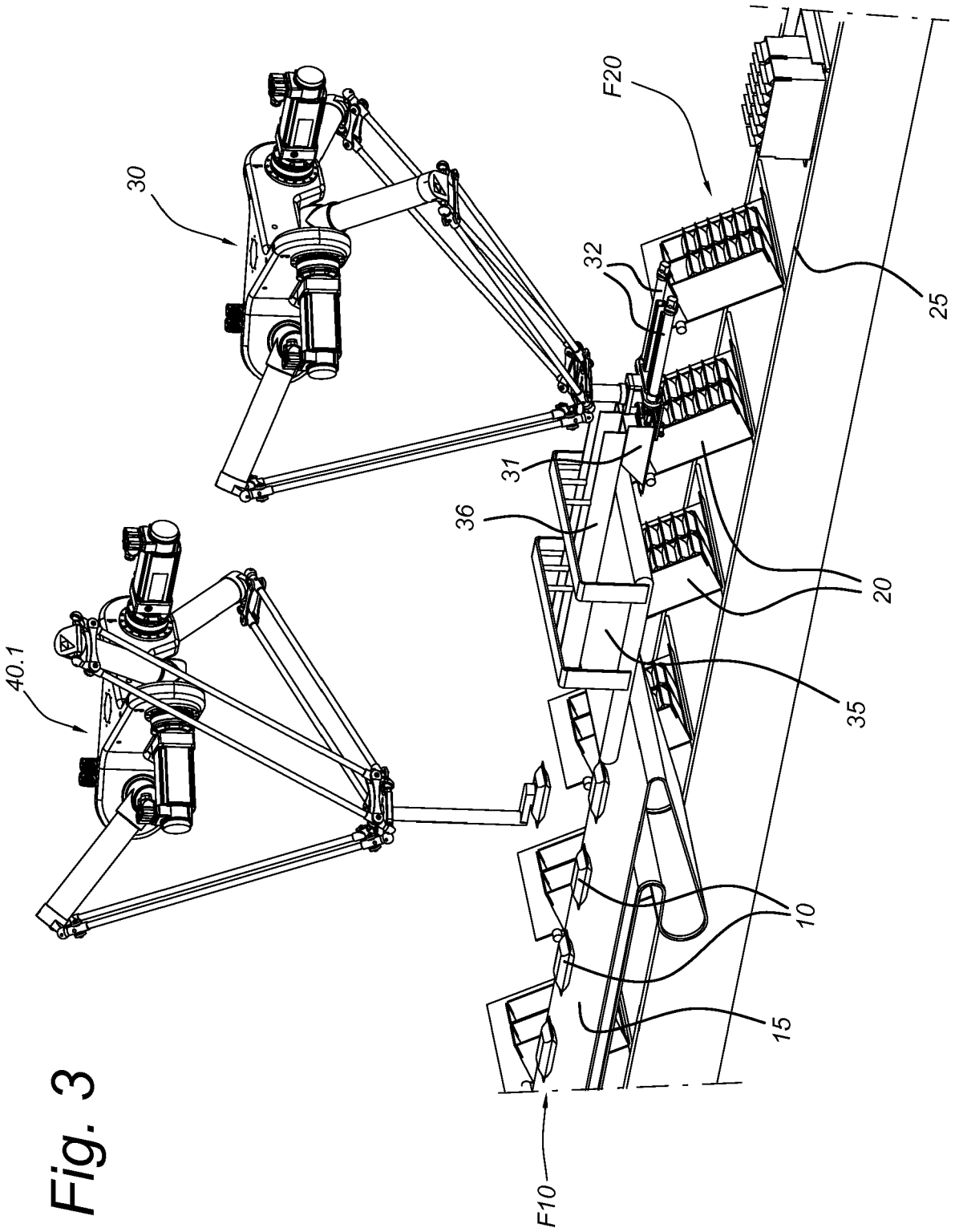


Fig. 3

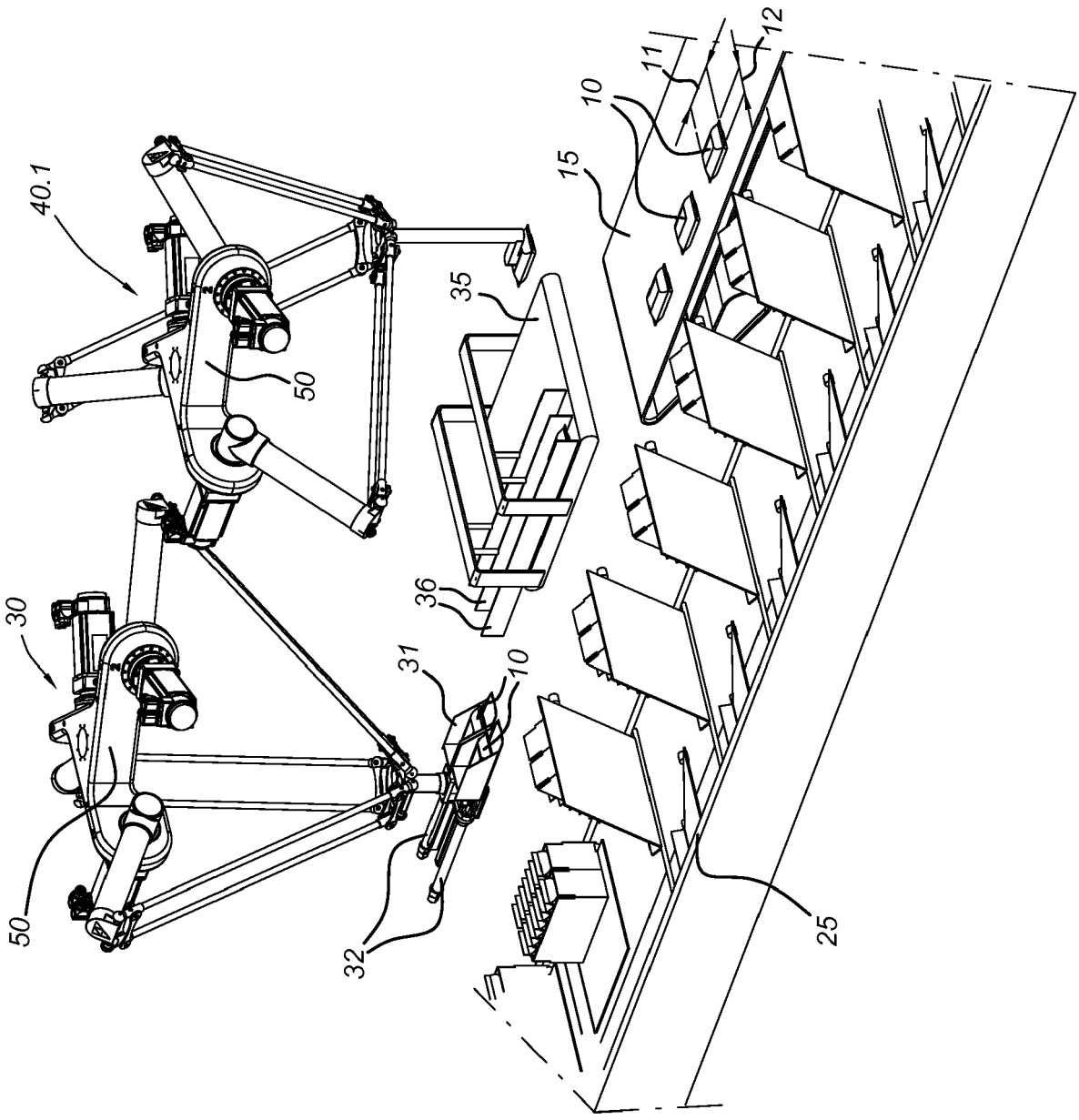


Fig. 4

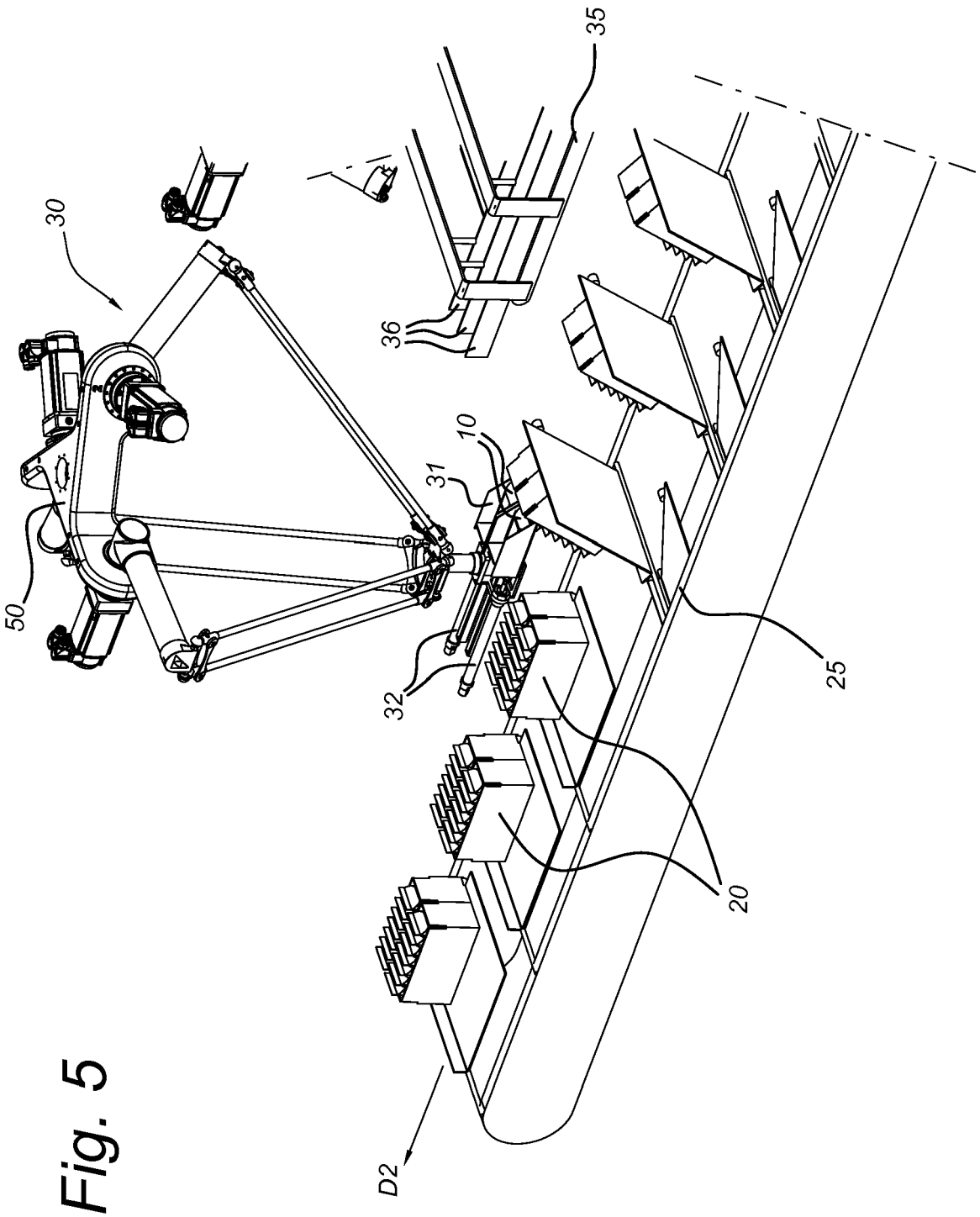


Fig. 5

Fig. 6

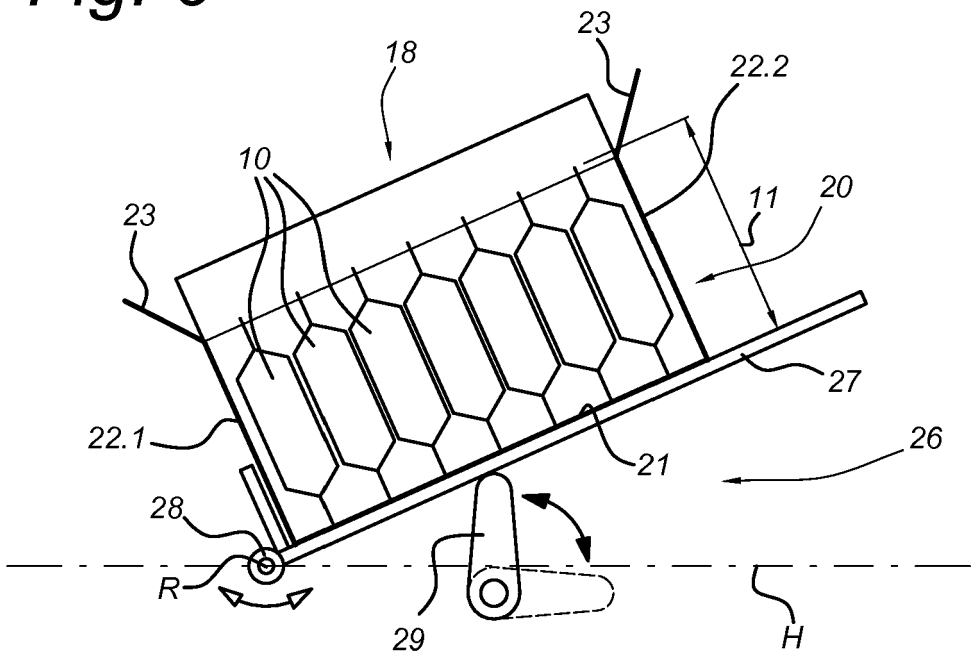
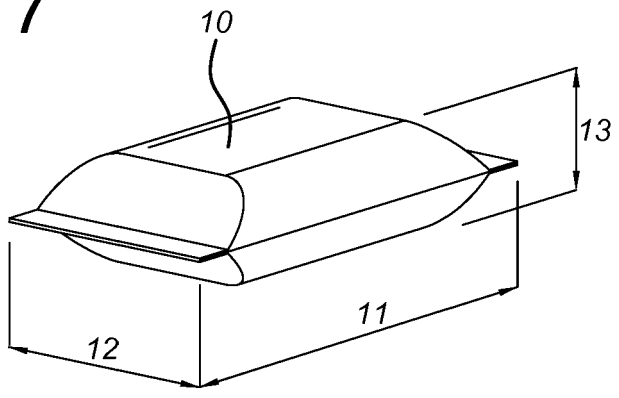


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 2477

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Place of search	Date of completion of the search	Examiner
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