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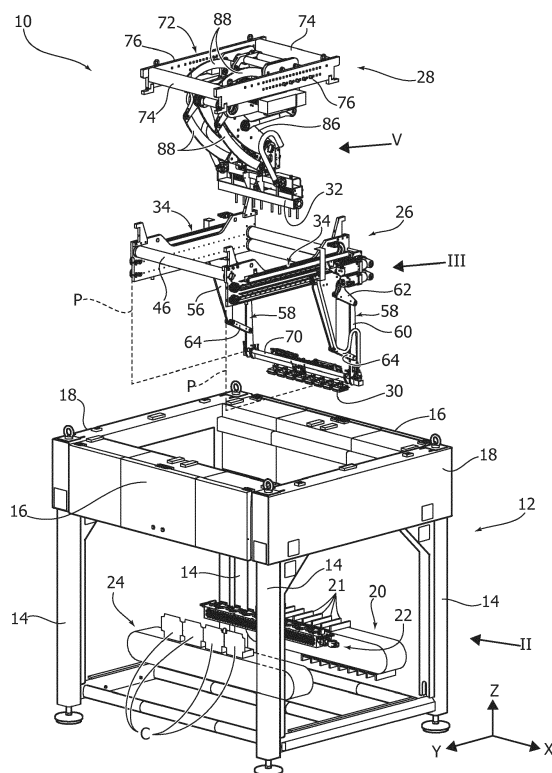
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(54) **AN APPARATUS FOR LOADING PRODUCTS INTO CONTAINERS**

(57) An apparatus for loading products into containers, comprising:

- a stationary frame (12),
 - a first conveyor (20) for advancing a flow of products along a longitudinal direction (X),
 - an intermediate station (22),
 - a second conveyor (24) for advancing a continuous flow of containers (C),
 - a first manipulator (26) configured to pick-up products from the first conveyor (20) and to deposit them in the intermediate station (22), and
 - a second manipulator (28) configured to pick-up products from the intermediate station (22) and to deposit them in the said containers (C),
- wherein the first manipulator (26) comprises two arms (56) spaced apart in said longitudinal direction (X) and carrying a first pick-up head (30), wherein the two arms (56) of the first manipulator (26) move together in respective plane portions (P) transverse with respect to said longitudinal direction (X), and
- wherein the second manipulator (28) is arranged between said plane portions (P).

FIG. 1



Description

Field of the invention

[0001] The present invention relates, in general, to packaging of products and regards an apparatus for loading products into containers, configured to pick up products that advance along a first conveyor and to load them - with a predetermined order - within containers that move along a second conveyor.

Description of the prior art

[0002] In the simplest embodiment, a robotic device for loading products into containers comprises a stationary frame carrying a single manipulator having a controlled pick-up head to pick up the products advancing on a first conveyor and to place the products in an ordered manner into containers advancing along a second conveyor.

[0003] An apparatus of this type is generally indicated if the operations to be carried out on the products are not too complex and if the transfer rates from the first conveyor to the second conveyor are not too high. For example, an apparatus including a single manipulator is suitable in cases in which the products do not have to be rotated between the pick-up position and the deposition position, and in cases in which the manipulator speed is in the order of 20-25 cycles per minute. Another important factor is the distance between the first and the second conveyor. Generally, there are no particular problems if the distance between the two conveyors is less than 500-600 mm. In the case in which the distance exceeds these values, the manipulator that performs the transfer of the products must make longer runs, and the number of cycles per minute that the manipulator can perform is reduced.

[0004] In cases in which more complex operations are required between the pick-up position and the deposition position of the products in the containers, such as rotating the products, in an apparatus with a single manipulator, additional mechanisms that weigh down the pick-up head are required, so that the manipulator tends to slow down because of the greater weight.

[0005] Apparatuses have been previously proposed comprising a first manipulator that picks up the products from the first conveyor and deposits them in an intermediate station, and a second manipulator that picks up the products from the intermediate station and arranges them with a predetermined orientation in the containers that advance on a second conveyor. The orientating and positioning operations of the products with respect to the containers can be subdivided between the two manipulators. For example, the first manipulator can rotate the products during transfer from the first conveyor to the intermediate station and the second manipulator can place the products at the required distance for correct positioning in the containers.

[0006] The solution that involves the use of two independent manipulators increases the transfer rate of the products, but has some drawbacks. A first drawback is that the frame of an apparatus with two manipulators must be larger than the size of the frame of an apparatus having a single manipulator. This involves a greater production area and a higher cost. A second drawback is that the working areas of the two manipulators overlap and create potential interferences. In order to avoid collisions between the two manipulators, it is necessary to limit the freedom of movement of the two manipulators or to increase the distance between the manipulators, which further increases the footprint of the apparatus.

15 Object and summary of the invention

[0007] The present invention aims to provide an apparatus for loading products into containers that overcomes the problems of the prior art.

20 **[0008]** According to the present invention, this object is achieved by an apparatus having the characteristics forming the subject of claim 1.

[0009] The claims form an integral part of the disclosure provided here in relation to the invention.

25 Brief description of the drawings

[0010] The present invention will now be described in detail with reference to the attached drawings, given purely by way of non-limiting example, wherein:

- Figure 1 is an exploded perspective view of an apparatus according to the present invention,
- Figure 2 is an elevational view according to the arrow II of Figure 1,
- Figure 3 is a perspective view of a first manipulator indicated by the arrow III in Figure 1,
- Figure 4 is a side view of the first manipulator according to the arrow IV of Figure 3, and
- 40 - Figure 5 is a perspective view of a second manipulator indicated by the arrow V in Figure 1,

Detailed description

45 **[0011]** With reference to Figures 1 and 2, numeral 10 indicates an apparatus for loading products into containers. The apparatus 10 comprises a stationary frame 12 having a general portal configuration. In the illustrated example, the stationary frame 12 comprises four vertical uprights 14 joined together at their upper ends by two longitudinal beams 16 and two transverse beams 18.

[0012] The apparatus 10 comprises a first conveyor 20 that advances a flow of products along a longitudinal direction X. The first conveyor 20 can, for example, be a belt conveyor and can be provided with a plurality of seats 21 within which the products are arranged.

[0013] The apparatus 10 comprises an intermediate station 22 and a second conveyor 24. The second con-

veyor 24 can be a belt conveyor and is designed to advance a plurality of containers C in a longitudinal direction X parallel to the feed direction of the products of the first conveyor 20. The containers C can be formed of boxes, trays or other packaging elements. Alternatively, the containers C could be formed by seats of the second conveyor 24, configured for carrying the ordered products in a predetermined manner towards a packaging machine. The first conveyor 20 and the second conveyor 24 extend within the stationary frame 12. The first conveyor 20 and the second conveyor 24 can be driven in the same direction or different directions. The first and second conveyors 20, 24 are spaced apart in the transverse direction Y, and the intermediate station 22 is located between the first conveyor 20 and the second conveyor 24.

[0014] The intermediate station 22 may consist of a simple plane on which the products are temporarily positioned during transfer from the first conveyor 20 to the containers C. In the case in which the orientation of the products must be varied between the pick-up position and the position of deposition into the containers C, the intermediate station 22 could be provided with a plurality of rotating elements aligned with each other along a longitudinal direction X, and rotating about respective vertical axes, so as to vary the orientation of the products about their respective vertical axes.

[0015] With reference to Figure 1, the apparatus 10 comprises a first manipulator 26 and a second manipulator 28 having respective pick-up heads 30, 32.

[0016] The first manipulator 26 is configured to pick up products from the first conveyor 20 and to deposit them in the intermediate station 22. The second manipulator 28 is configured to pick up products from the intermediate station 22 and to place them in an ordered manner in the containers C that advance on the second conveyor 24. The second manipulator could also be configured to perform any rotation and "step-by-step" operations of the products.

[0017] Referring to Figures 3 and 4, the first manipulator 26 comprises two parallel stationary plates 34 spaced apart in the longitudinal direction X. The first manipulator 26 comprises two motors 36, 38 carried by one of the plates 34. The motors 36, 38 rotate respective transmission shafts 40, 42, which extend parallelly to the direction X between the two plates 34. The two shafts 40, 42 are located between two homologous ends of the plates 34. The opposite ends of the two plates 34 are connected to each other by a fixed shaft 46. The space between the plates 34 and the shafts 40, 42 and 46 is empty.

[0018] Each of the two plates 34 carries a first transmission belt 48 and a second transmission belt 50, which extend parallelly to the transverse direction Y. The two first transmission belts 48 are driven by the first motor 36 by means of the first transmission shaft 40. The two second transmission belts 50 are driven by the second motor 38 by means of the second transmission shaft 42.

[0019] With reference to Figure 4, each plate 34 carries

a first slide 52 and a second slide 54, guided in the transverse direction Y. The first transmission belt 48 drives the first slide 52 in the transverse direction Y, and the second transmission belt 50 drives the second slide 54 in the transverse direction Y.

[0020] With reference to Figures 3 and 4, the first manipulator 26 comprises two arms 56 that move the pick-up head 30. Each of the two arms 56 is guided by the respective plate 34 in the transverse direction Y. The two arms 56 are connected to their respective first slides 52 and move together in the transverse direction Y. The two arms 56 move along respective plane portions P, orthogonal to the longitudinal direction X. The two plane portions P are parallel to each other and spaced apart in the longitudinal direction X. The pick-up head 30 is connected to the two arms 56 by means of two articulated quadrilateral mechanisms 58. Each articulated quadrilateral mechanism 58 comprises an element 60 articulated to the arm 56 by means of an upper lever 62 and a lower lever 64. The upper lever 62 is L-shaped and is connected to the second slide 54 by means of a connecting rod 66.

[0021] The pick-up head 30 of the first manipulator 26 is elongated in the longitudinal direction X and extends between the lower ends of the elements 60 of the two articulated quadrilateral mechanisms 58. The pick-up head 30 comprises, in a conventional manner, a plurality of pick-up members 68 spaced apart in the longitudinal direction X and configured to pick up the respective products. The pick-up elements 68 can be movable along a guide 70 in the longitudinal direction X to vary the distance between the products from the pick-up position on the first conveyor 20 to the release position in the intermediate station 22.

[0022] When the first and the second transmission belts 48, 50 are driven together at the same speed, the pick-up head 30 moves in the transverse direction Y, remaining at the same height. When the second transmission belt 50 is driven at a different speed from the first transmission belt 48, there is a relative movement between the second slide 52 and the arm 56 which, by means of the connecting rod 66 and the upper lever 62, controls a movement in the vertical direction of the elements 60 of the two articulated quadrilaterals 58 and, consequently, a vertical movement of the pick-up head 30.

[0023] Alternatively, each of the plates 34 of the first manipulator 26 can carry just one first transmission belt 48 to drive the pick-up head 30 in the transverse direction Y. In this case, the movement in the vertical direction of the pick-up head 30 can be controlled by an electric or pneumatic linear actuator.

[0024] With reference to Figure 1, the first manipulator 26 is housed in the empty space defined between the beams 16, 18 of the stationary frame 12. The plates 34 can be fixed to the transverse beams 18 of the frame 12.

[0025] The second manipulator 28 is mounted within the first manipulator 26. In particular, the second manipulator 28 is housed between the two plane portions P,

along which the two arms 56 of the first manipulator 26 are movable. The pick-up head 32 of the second manipulator 28 is elongated in the longitudinal direction X and has an extension in the longitudinal direction X that is less than the distance between the arms 56 of the first manipulator 26.

[0026] The second manipulator 28 can be a manipulator of various types, for example: SCARA, PUMA, Cartesian, delta, etc. For the purposes of the present invention, it is sufficient that the movement mechanisms that impart movement to the pick-up head 32 are contained between the two planes P of the first manipulator 26 in each working configuration. This arrangement ensures that the first manipulator 26 and the second manipulator 28 are free to move in their respective working areas without risk of interference or collision between the moving parts of the two manipulators.

[0027] In the example illustrated in the figures, the second manipulator 28 comprises a rectangular-shaped fixed support 72 comprising two longitudinal elements 74 and two transversal elements 76. The fixed support 72 is positioned in the empty space provided between the plates 34 of the first manipulator 26. Preferably, the transverse elements 76 of the fixed support 72 are fixed to the plates 34 of the first manipulator 26.

[0028] In the embodiment illustrated in Figure 5, the second manipulator 28 comprises a base 78 fixed to the fixed support 72 and carrying two motors 80, 82. The first motor 80 controls the rotation of a first pair of arms 84, rotatable about an axis A parallel to the longitudinal direction X. The second motor 82 controls the rotation of a second pair of arms 86 articulated to the distal ends of the first arms 84 about a second axis B parallel to axis A. The second arms 86 carry the pick-up head 32 at their distal end. A pantograph mechanism 88 ensures the parallelism of the pick-up head 32 with respect to the base 78.

[0029] Controlling the non-interference conditions between the two manipulators 26, 28 verifies that the two pick-up heads 30, 32 do not collide with each other. The actuating mechanisms of the two manipulators 26, 28 are free of collision risks, without limitations of the working areas.

[0030] A particularly important characteristic of the present invention is that this arrangement of the two manipulators 26, 28 does not require an increase in the size of the stationary frame 12 compared to an apparatus with a single manipulator.

[0031] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments can be widely varied with respect to those described and illustrated, without thereby departing from the scope of the invention as defined by the claims that follow.

Claims

1. An apparatus for loading products into containers, comprising:

- a stationary frame (12),
- a first conveyor (20) for advancing a flow of products along a longitudinal direction (X),
- an intermediate station (22),
- a second conveyor (24) for advancing a continuous flow of containers (C),
- a first manipulator (26) configured to pick-up products from the first conveyor (20) and to deposit them in the intermediate station (22), and
- a second manipulator (28) configured to pick-up products from the intermediate station (22) and to deposit them in the said containers (C),

wherein the first manipulator (26) comprises two arms (56) spaced apart in said longitudinal direction (X) and carrying a first pick-up head (30), wherein the two arms (56) of the first manipulator (26) move together in respective plane portions (P) transverse with respect to said longitudinal direction (X), and wherein the second manipulator (28) is arranged between said plane portions (P).

2. An apparatus according to claim 1, wherein the first manipulator (26) comprises two plates (34) spaced apart in the longitudinal direction (X), each of which carries a respective arm (56) movable on the respective plate (34) in a transverse direction (Y).
3. An apparatus according to claim 2, wherein each of said plates (34) carries a first transmission belt (48), wherein the two first transmission belts (48) of the two plates (34) control the joint movement of said arms (56) along the transverse direction (Y).
4. An apparatus according to claim 3, wherein said first pick-up head (30) is elongated in the longitudinal direction (X) and is connected to said arms (56) by means of two articulated quadrilateral mechanisms (58).
5. An apparatus according to claim 4, wherein each of said plates (34) carries a second transmission belt (50), wherein the two second transmissions belts (50) of the two plates (34) control the vertical movement of the first pick-up head (30) by means of said articulated quadrilateral mechanisms (58).
6. An apparatus according to claim 5, wherein the first two transmission belts (48) and the two second transmission belts (50) are connected to each other by means of respective longitudinal transmission shafts (40, 42).

7. An apparatus according to any of the preceding claims, wherein the second manipulator (28) comprises a fixed support (72) arranged between said transverse plates (34) of the first manipulator (26).

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8. Apparatus according to any of the preceding claims wherein the second manipulator (28) has a second pick-up head (32) having an extension in the longitudinal direction (X) that is less than the distance between said arms (56).

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FIG. 1

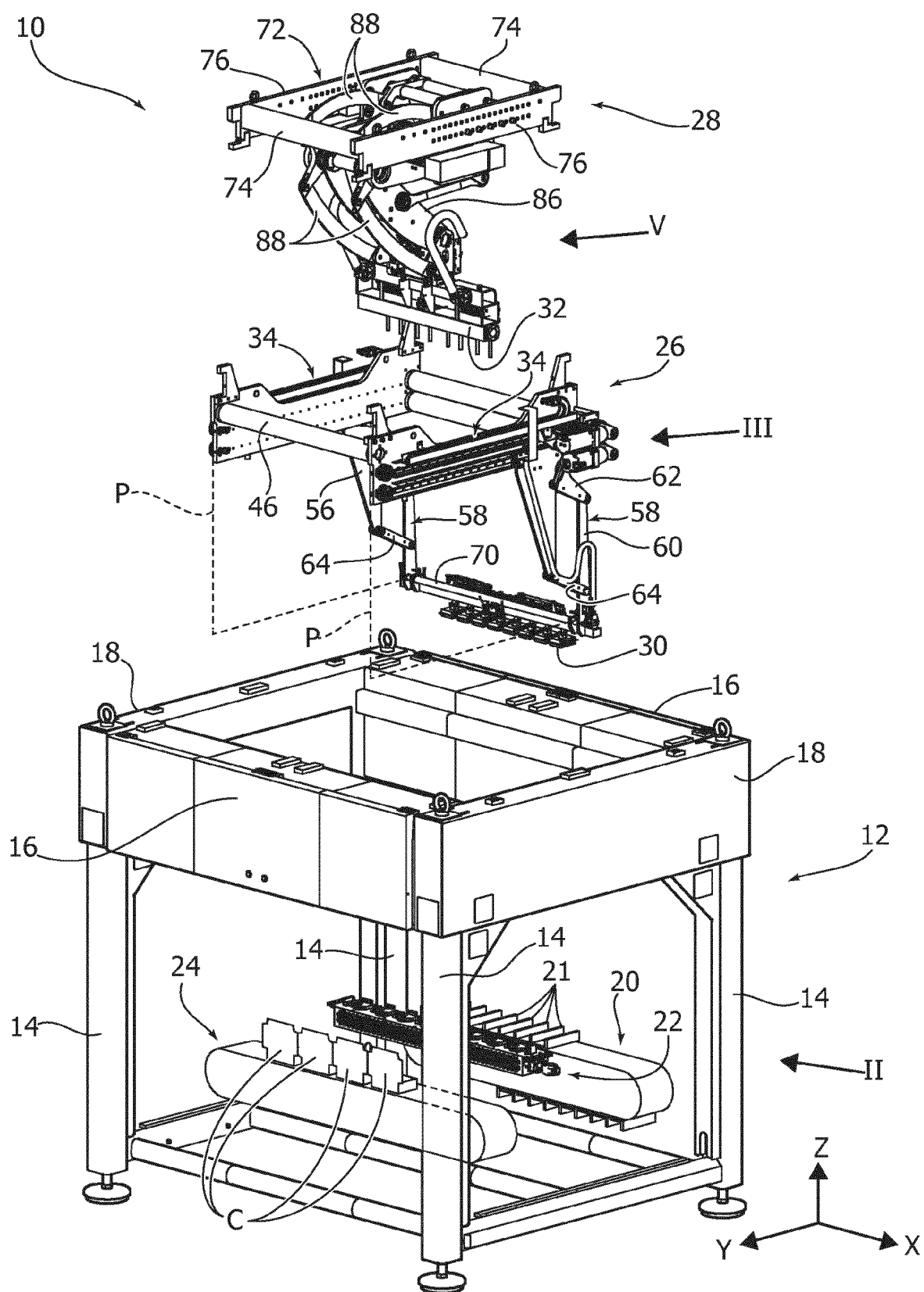


FIG. 2

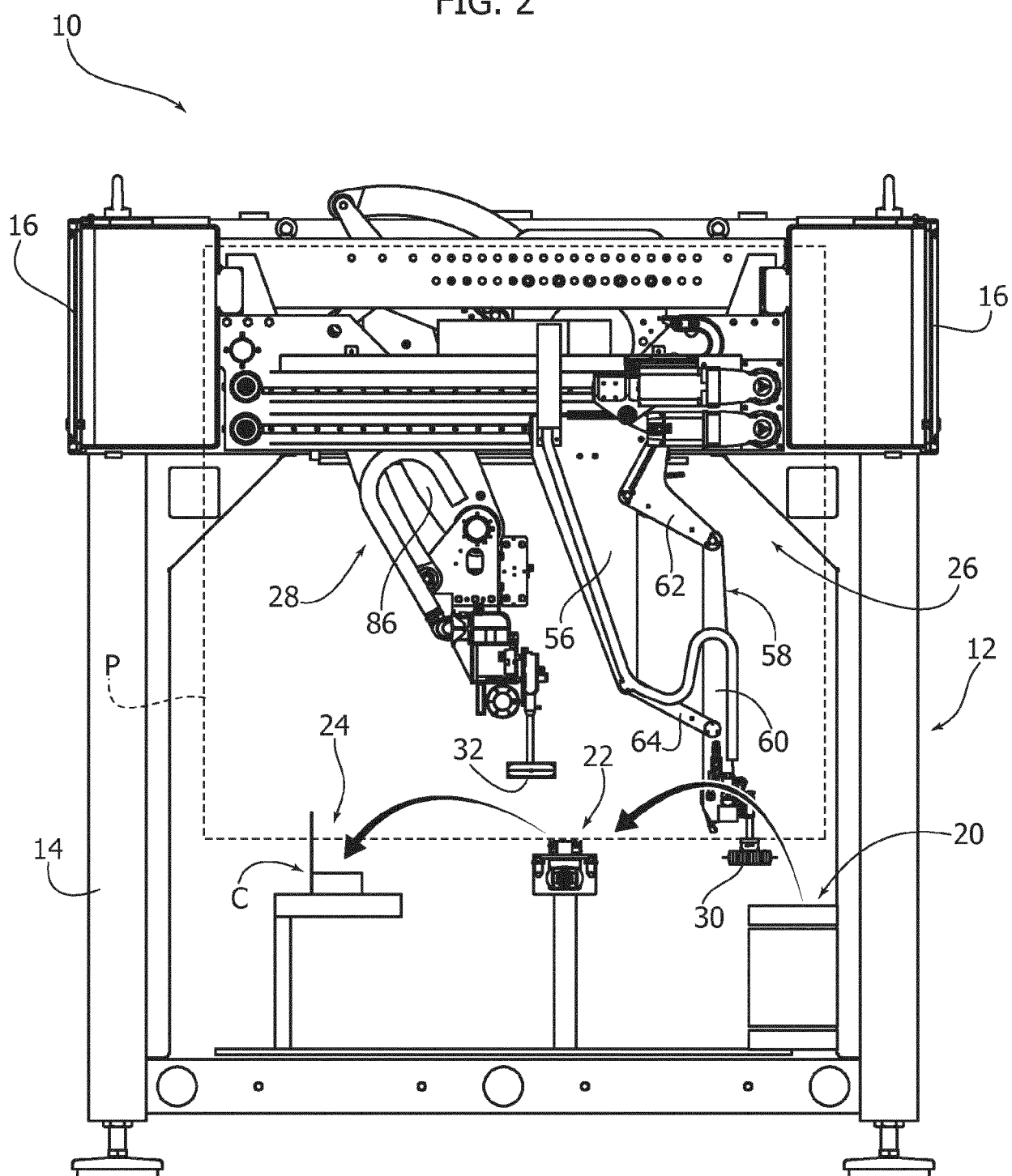


FIG. 3

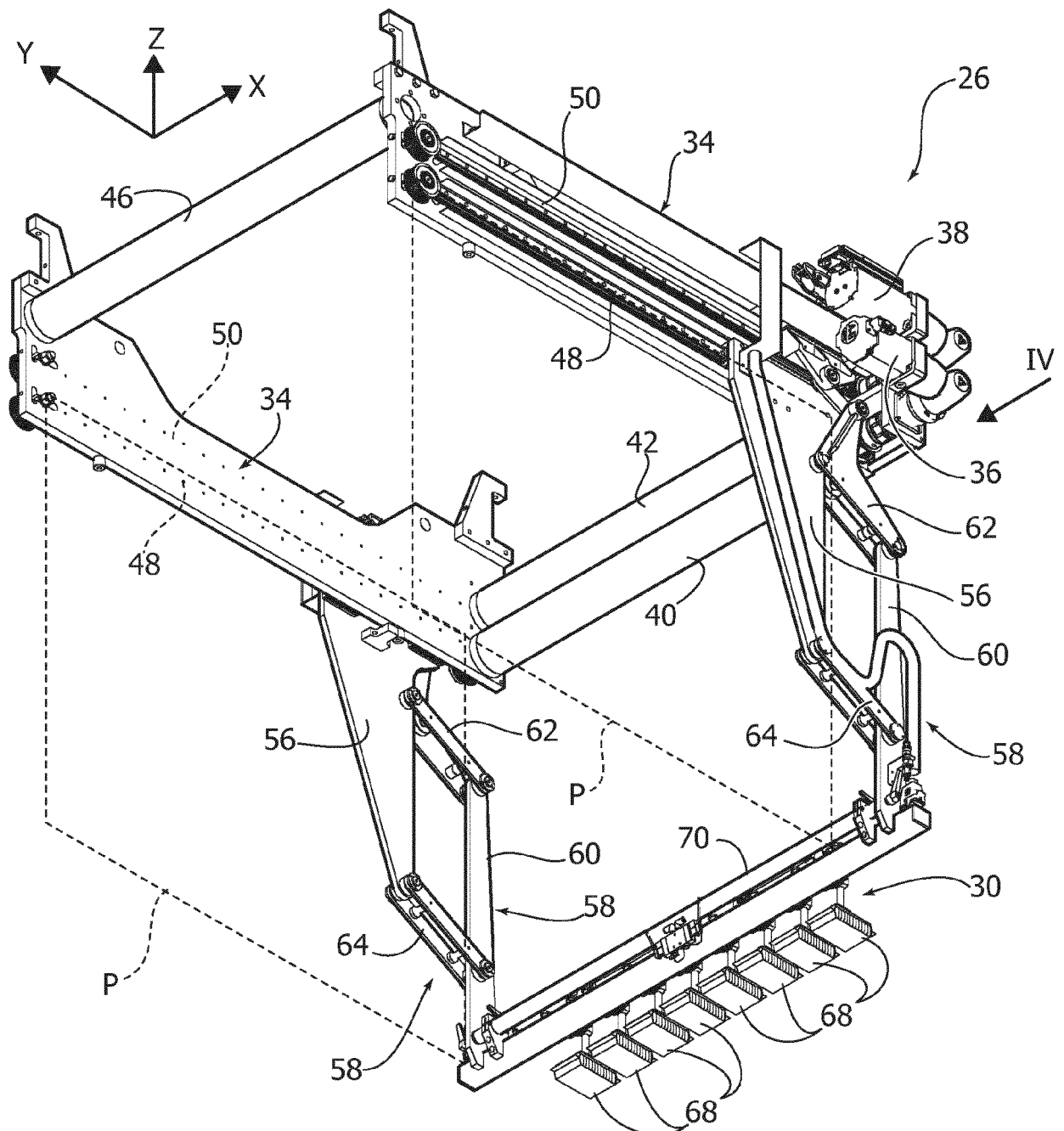


FIG. 4

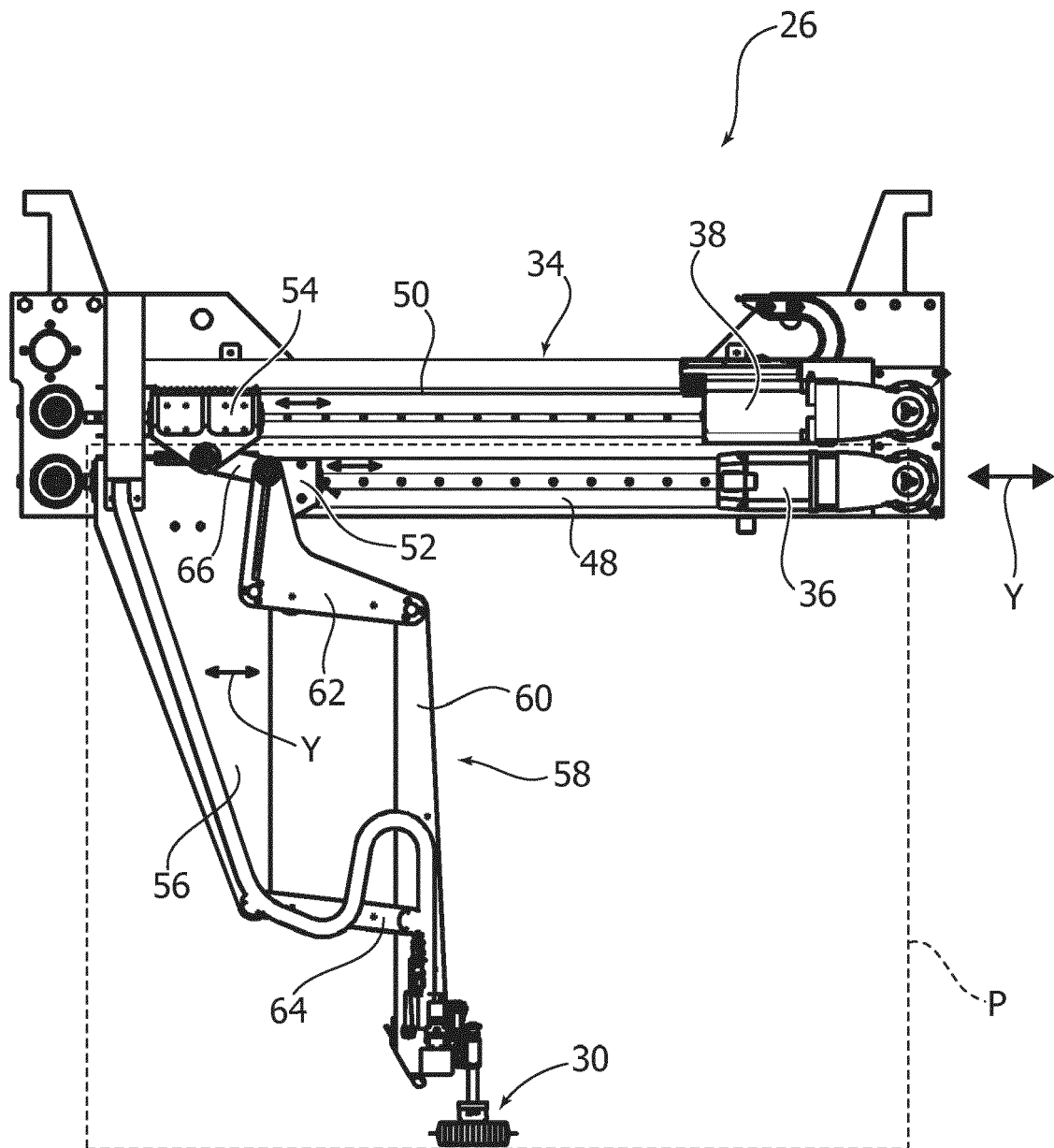
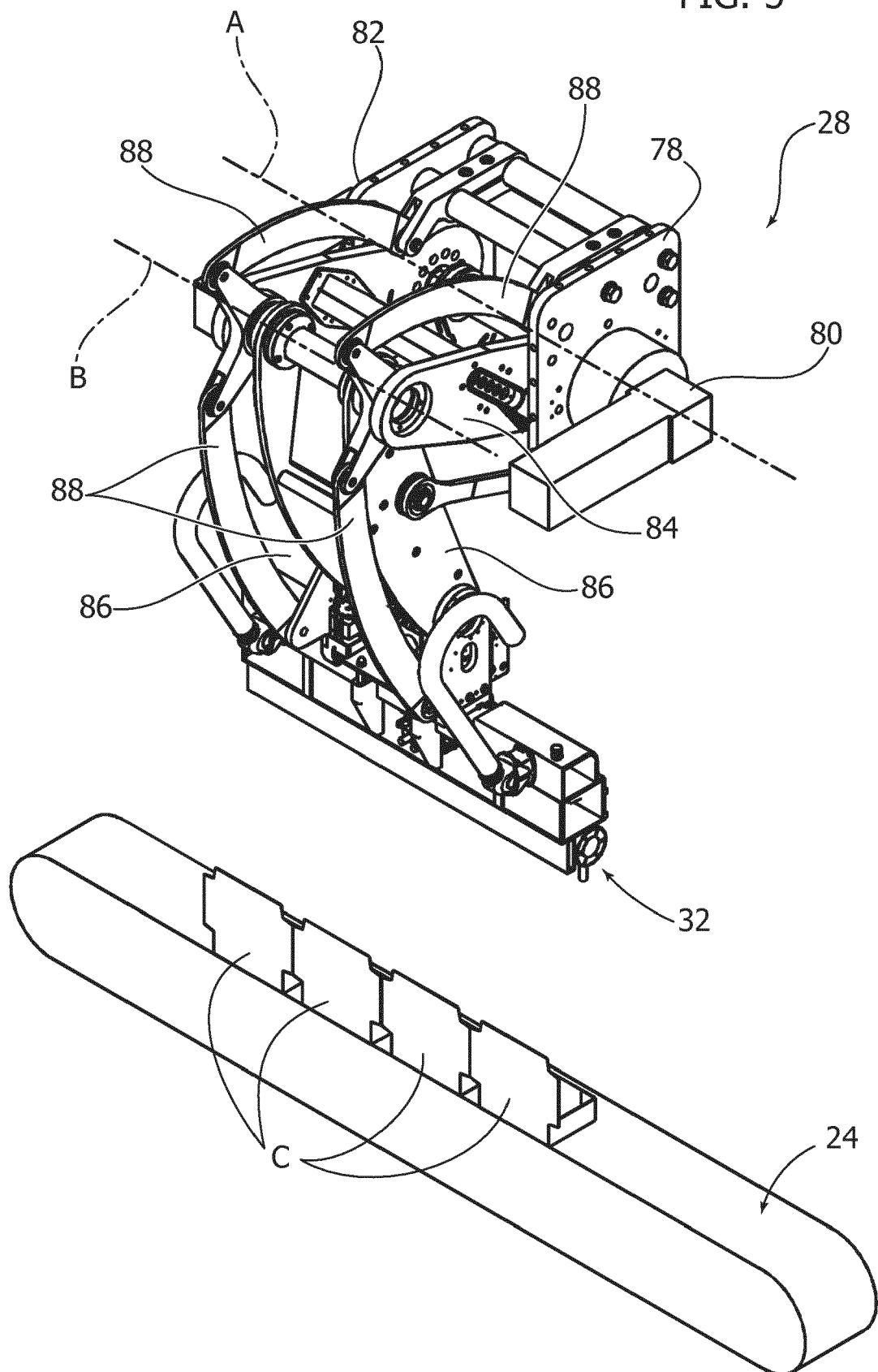


FIG. 5





EUROPEAN SEARCH REPORT

Application Number
EP 17 19 9707

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 December 2017	Examiner Ngo Si Xuyen, G
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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