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(54) **BOXING MACHINE**

(57) A boxing machine (1) comprises: an inlet conveyor (2), a loader (4), a first picking head (3) to pick the products from the inlet conveyor (2) and position said products in the loader (4), and a second picking head (5) to pick the products from the loader (4) and position said products in a box to form a package. The loader (4) comprises: a body (40) slidingly mounted in horizontal direc-

tion in a horizontal guide (10), a support (42) slidingly mounted in vertical direction in the body (4), a base plate (43) mounted on the support (42) and suitable for receiving said products to be boxed, a fixed edge (46) fixed to the support (42), and a mobile edge (47) movably connected to the fixed edge (46).

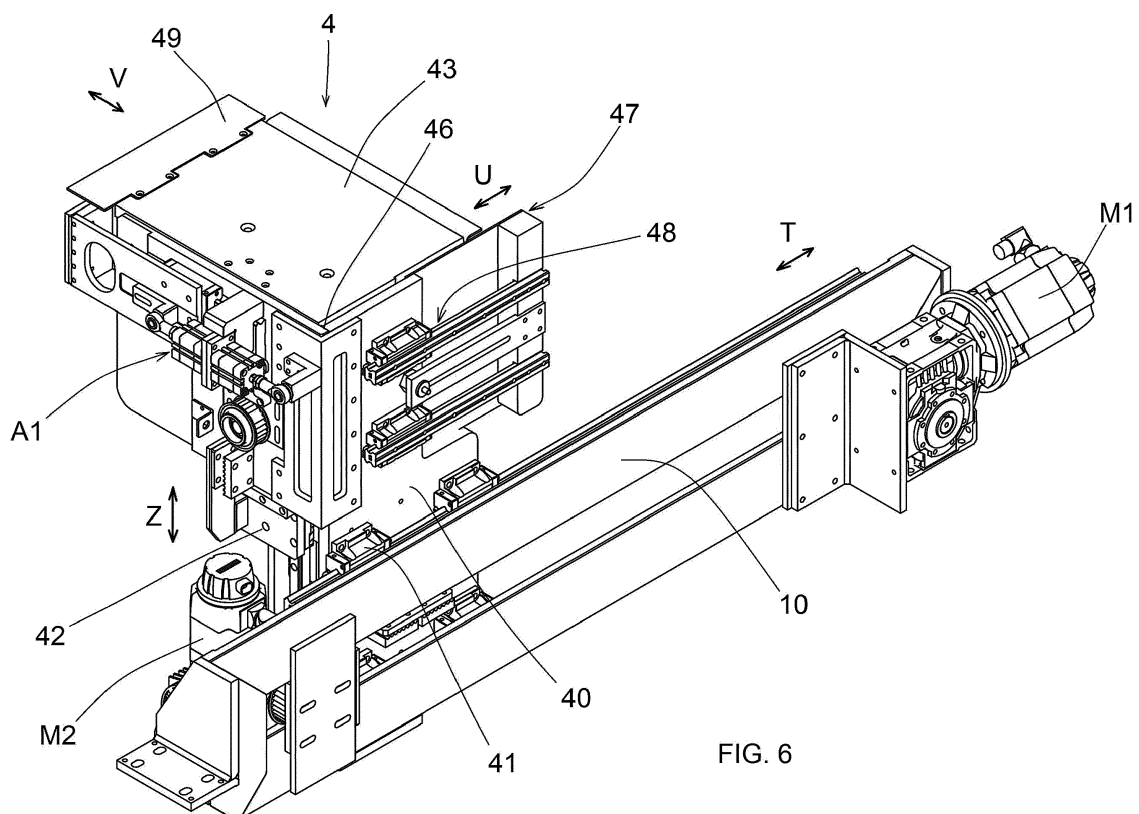


FIG. 6

Description

[0001] The present patent application for industrial invention relates to a boxing machine for packing a product or a plurality of products in a box of cardboard or similar material.

[0002] Fig. 12 shows a boxing machine according to the prior art, which is indicated with reference numeral 100.

[0003] The boxing machine (100) comprises an inlet conveyor (102) suitable for transporting products (P), such as for example bags that are disposed horizontally on the inlet conveyor (102). The inlet conveyor (102) moves along a forward traveling direction (A),

[0004] The products (P) on the inlet conveyor (102) are fed towards a rotary loader (103) with cylindrical shape. The rotary loader (103) rotates around an axis (X) parallel to the forward traveling direction (A) of the inlet conveyor. The rotary loader (103) has a plurality of housings (130) divided by partitions (131) that protrude radially from the loader. In view of the above, each product (P) is disposed in horizontal position in a housing (130) of the rotary loader.

[0005] A picking head (104) picks the products (P) from the rotary loader (103) and places them in a box (S) disposed in a boxing area (105). The picking head (104) translates in the directions of the arrows (F).

[0006] When the box (S) is filled with products (P), the full box (S) is fed towards a closing head (106) to close the box (S). In this way, a closed package (S') is obtained, which is fed towards an outlet conveyor (107).

[0007] This type of boxing machine (100) is impaired by some drawbacks because of lack of versatility. In fact, such a boxing machine can only work with a given size of products (P) and of boxes (S). If the size of the products and of the boxes is to be changed during production, a different boxing machine must be used.

[0008] In the following description the parts that are identical or correspond to the parts described above are identified with the same numerals, omitting their detailed description.

[0009] Fig. 13 shows a second embodiment of a boxing machine according to the prior art, which is indicated with reference numeral 200.

[0010] The boxing machine (200) comprises an inlet conveyor (102) suitable for transporting products (P), such as for example bags that are disposed in horizontal direction on the inlet conveyor (102).

[0011] The products (P) on the inlet conveyor (102) are fed towards a rotary loader (103) that rotates around an axis (X) orthogonal to the forward traveling direction (A) of the inlet conveyor. In view of the above, each product (P) is disposed in vertical position in a housing (130) of the rotary loader.

[0012] A pusher (204) pushes the products (P) from the rotary loader (103) towards a boxing area (205) where a picking head (206) operates. The pusher (204) moves along a horizontal direction (F1) parallel to the axis of

rotation (X) of the rotary loader. The pusher (204) is provided with comb-shaped prongs (240) suitable for being inserted in the housings (130) of the rotary loader.

[0013] A lid feeder (207) contains a plurality of lids consisting in precut pieces (B) of cardboard with a planar shape. The precut pieces (B) are stacked in the lid feeder (207).

[0014] A transfer device (208) is used to pick a precut piece (B) from the lid feeder (207) and take the precut piece (B) to the boxing area (205).

[0015] The picking head (206) is provided with suction cups in order to pick the precut piece (B) from the transfer device (208).

[0016] Successively, the picking head (206) places the precut piece (B) on a set of products (P) that stand in vertical position in the boxing area (205). By means of folding plates, the picking head folds the edges of the precut piece around the set of products, in such a way as to group the set of products (P) and form a pack formed of the set of products (P) and of the precut piece (B) with folded edges.

[0017] Then the pack is taken by the picking head (206) and moved towards a second boxing area (209) wherein a box (S) is provided. The picking head (206) places the pack in the box (S) and the assembly formed by the box (S), the products (P) and the lid is taken towards a closing head (210) that is used to close the lid on the box, in such a way to form a package that can be unloaded from the machine.

[0018] Also this type of boxing machine (200) is impaired by drawbacks because of lack of versatility. In fact, such a boxing machine can work only with a given size of products (P), of precut pieces (B) of the lids and of boxes (S). If the size of the products, of the precut pieces and of the boxes is to be changed during production, a different boxing machine must be used.

[0019] The lack of versatility of the boxing machines (100) and (200) of the prior art is especially caused by the presence of the rotary loader (103) that does not adapt to the size of the products.

[0020] The purpose of the present invention is to eliminate the drawbacks of the prior art by disclosing a boxing machine that is versatile and suitable for adapting to different sizes of products, boxes and lids used to form the package.

[0021] Another purpose is to disclose such a boxing machine that is reliable, efficient and simple to make.

[0022] These purposes are achieved according to the invention with the characteristics of the independent claim 1.

[0023] Advantageous embodiments of the invention appear from the dependent claims.

[0024] The boxing machine of the invention comprises:

- an inlet conveyor that transports the products to be boxed along a forward traveling direction,
- a loader that transfers the products to be boxed,
- a first picking head that picks the products from the

inlet conveyor and places the products in the loader, and

- a second picking head that picks the products from the loader and places the products in a box to form a package.

[0025] The loader comprises:

- a body slidably mounted in horizontal direction in a horizontal guide in such a way as to translate along a horizontal direction,
- a support slidably mounted in vertical direction in said body in such a way as to translate along a vertical direction,
- a base plate mounted on said support and suitable for receiving said products to be boxed according to the size of a package to be obtained,
- a fixed edge that is fixed to the support of the base plate, and
- a mobile edge movably connected to the fixed edge, in such a way as to translate horizontally in order to adjust to the dimensions of the base plate according to the size of the package to be obtained.

[0026] The advantages of the machine according to the invention are manifest, which comprises a new type of loader that is adapted to the size of the package to be obtained. This new type of loader permits to avoid the use of rotary loaders and pushers that cannot adapt to the change of package size.

[0027] Additional features of the invention will appear clearer from the detailed description below, which refers to merely illustrative, not limiting embodiments, wherein:

Fig. 1 is a perspective view of the boxing machine of the invention;

Fig. 2 is a side view of the boxing machine of Fig. 1; Fig. 3 is the same view as Fig. 1, wherein a loader is disposed in the boxing area;

Fig. 4 is the same view as Fig. 3, wherein a lid feeder and a lid picking transfer device in lid picking position is added;

Fig. 5 is the same view as Fig. 4, wherein the lid transfer device is in lid placing position in the boxing area;

Fig. 6 is a perspective view of a loader;

Fig. 7 is a perspective view of the loader of Fig. 6 from another angle;

Fig. 8 is the same view as Fig. 7, which shows a base plate of the loader in lowered position;

Fig. 9 is the same view as Fig. 8, which shows a compacting edge of the loader in open position;

Fig. 10 is a side view of the loader, which shows the base plate of the loader in tilted position;

Fig. 11 is a perspective view of the loader, wherein the size of the base plate has been changed;

Fig. 12 is a diagrammatic view of a boxing machine according to the prior art;

Fig. 13 is a diagrammatic view of a second embodiment of boxing machine according to the prior art.

[0028] With reference to Figs. 1 to 5, the boxing machine according to the invention is disclosed, which is indicated with reference numeral 1.

[0029] With reference to Figs. 1 and 2, the boxing machine (1) comprises an inlet conveyor (2) suitable for transporting various types of products along a forward traveling direction (A). The inlet conveyor (2) can be a conveyor belt.

[0030] A first picking head (3) is adapted to pick the products from the inlet conveyor (2) and place the products on a loader (4) disposed in lateral position to the inlet conveyor (2).

[0031] The first picking head (3) has a picking system (30) provided with suction cups or clamps suitable for picking the products one by one or as a group. The picking system (30) is supported by articulated arms (31) connected to a head (32) supported by upper crosspieces of the machine frame. In view of the above, the picking system (30) is disposed above the inlet conveyor (2). The first picking head (3) can rotate in all directions and oscillate, disposing the products from the horizontal position to the vertical position, in edgewise position, etc.

[0032] The first picking head (3) can be an anthropomorphic robot capable of translating in a direction that is orthogonal to the forward traveling direction (A) and rotating in order to adapt to the different types of sizes and arrangements of the products traveling on the inlet conveyor (2).

[0033] As shown in Fig. 3, after placing a set of products on the loader (4), the loader (4) translates in a horizontal direction (T) orthogonal to the forward traveling direction (A) of the inlet conveyor. Successively the loader (4) is moved away from the inlet conveyor (2) in order to be positioned in a boxing area (I) under a second picking head (5).

[0034] With reference to Figs. 4 and 5, the boxing machine (1) comprises a lid feeder (6) composed of a fixed frame where a plurality of precut pieces is disposed in substantially vertical position and stacked one behind the other.

[0035] A transfer device (7) is used to pick a precut piece (B) from the lid feeder (6) and to take the precut piece (B) to the boxing area (205).

[0036] The transfer device (7) comprises arms (70) wherein suction cups (71) are mounted in order to pick a precut piece. The arms (70) of the transfer device are hinged in a mobile support (72), in such a way that the arms can go from a vertical picking position (Fig. 4), wherein a precut piece is picked, to a horizontal positioning position (Fig. 5), wherein the precut piece is positioned in the boxing area (I). In view of the above, the precut piece is disposed in horizontal position in the boxing area.

[0037] The second picking head (5) translates vertically along a vertical direction (Y) and is lowered to pick the

precut piece from the transfer device (7). The second picking head (5) is provided with suction cups in order to hold the precut piece.

[0038] Successively the second picking head (5) places the precut piece on the set of products that are positioned on the loader (4). Then the second picking head (5) folds the lateral edges of the precut piece, in such a way as to obtain a lid with lateral edges that surround the set of products. In this way a pack is formed, which is composed of a set of products and of the lid obtained from the precut piece.

[0039] The second picking head (5) holds the pack and translates in the horizontal direction (X) in order to take the pack to a second boxing area (12) (see Fig. 3) where a box is provided. For illustrative purposes, as shown in the figures, the horizontal translating direction (X) of the second picking head is parallel to the forward traveling direction (A) of the inlet conveyor (2) and orthogonal to the horizontal translating direction (T) of the loader (4). However, the inlet conveyor (2) may travel in any direction relative to the horizontal translating direction (X) of the second picking head (5) because the first picking head (3) is free to rotate and oscillate.

[0040] The second picking head (5) places the pack inside the box and returns to the first boxing area (1).

[0041] The box with the products and the lid is taken by means of a conveyor (8) towards a closing station (9) provided with a closing head used to close the box in order to form a package.

[0042] The package is unloaded from the boxing machine by means of an outlet conveyor (20).

[0043] It must be considered that the lid feeder (6) and the transfer device (7) are optional and can be omitted. In such a case, the second picking head (5) is configured in such a way as to directly pick the products on the loader (4), without lid, and to place the products in the box.

[0044] Advantageously, two loaders (4) can be provided, which are moved according to an alternate motion, in staggered position, along the horizontal direction (T) orthogonal to the horizontal translating direction (X) of the second picking head (5). In any case, by translating in the horizontal direction (X) orthogonal to the horizontal translating direction (T) of the loaders, the second picking head (5) can be disposed either on the first loader or on the second loader.

[0045] With reference to Figs. 6 to 11, this description continues with a detailed illustration of the loader (4).

[0046] With reference to Figs. 6 and 7, the loader (4) comprises a body (40) that is slidingly mounted in a horizontal guide (10) disposed in transversal position relative to the inlet conveyor (2). The body (40) comprises a slide that slides in the horizontal guide (10). Consequently, the body (40) of the loader can translate horizontally in a horizontal direction (T).

[0047] The body (40) of the loader is moved along the horizontal guide (10) by means of a transmission belt (not shown) actuated by an electrical motor (M1) mounted on the horizontal guide (10). Clamps that are integral

with the body (40) are engaged with the transmission belt. The transmission belt is returned on pulleys (12). One of said pulleys (12) is driven in rotation by the electrical motor (M1) by means of reduction gears.

[0048] The body (40) comprises a vertical guide (41). A support (42) is mounted with possibility of sliding in vertical direction in the vertical guide (41) in such a way as to translate along a vertical direction (Z). The support (42) supports a base plate (43) disposed horizontally and suitable for receiving the products to be boxed. The dimensions of the base plate (43) define the size of the package to be obtained.

[0049] The support (42) of the base plate is moved along the vertical guide (41) by means of a transmission belt (not shown) actuated by a second electrical motor (M2) mounted on the body (10). Clamps (44) that are integral with the body (40) are engaged with the transmission belt. The transmission belt is returned on pulleys (45). One of said pulleys (45) is driven in rotation by the second electrical motor (M2) by means of reduction gears.

[0050] Fig. 8 shows the base plate (43) in a lowered position relative to the position of Fig. 7.

[0051] A fixed edge (46) is fixed to the body (40). The fixed edge (46) has an "L"-shaped section in such a way as to define a lateral wall (46a) and a back wall (46b), which are disposed on the side and behind the base plate (43), respectively.

[0052] A mobile edge (47) is movably connected to the fixed edge (46) in such a way as to translate horizontally in a horizontal direction (U) parallel to the horizontal translating direction (T) of the body (40) of the loader. The mobile edge (47) has an "L"-shaped section in such a way as to define a lateral wall (47a) and a back wall (47b), which are disposed on the side and behind the base plate (43), respectively.

[0053] In view of the above, the fixed edge (46) and the mobile edge (47) define a parallelepiped compartment that contains the base plate (43) and the support (42) of the base plate. By moving the mobile edge (47), the distance between the lateral wall (47a) of the fixed edge and the lateral wall (47b) of the mobile edge is adjusted according to the dimensions of the base plate (43), i.e. according to the size of the package to be obtained.

[0054] Fig. 11 shows an embodiment wherein the base plate (43') has a lower width than the base plate (43) of Fig. 7. In such a case, the mobile edge (47) has been moved in such a way as to move the lateral wall (47a) of the mobile edge closer to the lateral wall (46a) of the fixed edge. The back wall (47b) of the mobile edge slides on the back wall (47a) of the fixed edge. A system of guides and slides (48) is mounted in the back walls (46b, 47b) of the fixed edge and of the mobile edge in order to guide the sliding movement of the mobile edge relative to the fixed edge.

[0055] The mobile edge (47) can be moved either manually or automatically by means of an actuator (not shown) mounted in the fixed edge (46) and connected

to the mobile edge (47).

[0056] A front edge (49) is movably connected to the fixed edge (46) in such a way as to translate horizontally in a horizontal direction (V) orthogonal to the horizontal translating direction (T) of the body of the loader. The front edge (49) is moved by means of an actuator (A1) mounted on the fixed edge (46). The actuator (41) can be a linear actuator, such as for example a cylinder-piston assembly or an electrical motor. In this way, the distance between the front edge (49) and the base plate (43) can be adjusted in order to group the products on the base plate (43). Therefore the front edge (49) acts as compactor of the products.

[0057] Figs. 6 and 7 show the situation wherein the front edge (49) is in closed position in proximal position to an edge of the base plate.

[0058] Fig. 9 shows the situation wherein the front edge (49) is in open position in distal position from the edge of the base plate.

[0059] As shown in Fig. 10, the base plate (43) is hinged in the back to the support (42), with a hinging axis (P) parallel to the translating direction of the body (40) of the loader.

[0060] An actuator (A2) is connected to the support (42) and to the base plate (43), in such a way as to lift the base plate (43), rotating it around the hinging axis (P), in such a way that the base plate is inclined relative to a horizontal plane. When the base plate (43) is in such an inclined position, the products slide by gravity on the base plate towards the back wall of the loader.

[0061] Several equivalent variations and modifications can be made to the present embodiments of the invention, which are within the reach of an expert of the field, falling in any case within the scope of the invention.

Claims

1. Boxing machine (1) comprising:

- an inlet conveyor (2) for transporting products to be boxed along a forward traveling direction (A),
- a loader (4) for transferring the products to be boxed,
- a first picking head (3) for picking the products from the inlet conveyor (2) and positioning said products in the loader (4), and
- a second picking head (5) for picking the products from the loader and positioning said products in a box to form a package,

wherein said loader (4) comprises:

- a body (40) slidingly mounted in horizontal direction in a horizontal guide (10) in order to translate along a horizontal direction (T),
- a support (42) slidingly mounted in vertical di-

rection in said body (4) in order to translate along a vertical direction (Z),

- a base plate (43) mounted on said support (42) and intended to receive said products to be boxed according to the size of a package to be obtained,
- a fixed edge (46) fixed to the support (42) of the base plate, and
- a mobile edge (47) movably connected to the fixed edge (46), in such a way to translate horizontally in order to adjust to the dimensions of the base plate (43) according to the size of the package to be obtained.

2. The boxing machine (1) of claim 1, wherein said loader (4) comprises a front edge (49) movably connected to the fixed edge (46) in such a way to translate horizontally to compact the products on the base plate (43).
3. The boxing machine (1) of claim 2, wherein said front edge (49) is suitable for translating horizontally along a horizontal direction (V) that is orthogonal to the horizontal translation direction (T) of the body (40) of the loader.
4. The boxing machine (1) of claim 2 or 3, wherein said loader (4) comprises an actuator (A1) connected to the fixed edge (46) and to said front edge (49) in order to move said front edge (49).
5. The boxing machine (1) of any one of the preceding claims, wherein said mobile edge (47) is suitable for translating horizontally along a horizontal direction (U) that is parallel to the horizontal translation direction (T) of the body (40) of the loader.
6. The boxing machine (1) of any one of the preceding claims, wherein said fixed edge (46) has an "L"-shaped section in such a way to define a lateral wall (46a) and a back wall (46b) and said mobile edge (47) has an "L"-shaped section in such a way to define a lateral wall (47a) and a back wall (47b).
7. The boxing machine (1) of any one of the preceding claims, wherein said base plate (43) is pivoted to the support (42) with a pivoting axis (P) and said loader comprises an actuator (A2) connected to the support (42) and to the base plate (43), in such a way to lift the base plate (43), making it rotate around the pivoting axis (P) so that the base plate is inclined with respect to a horizontal plane.
8. The boxing machine (1) of any one of the preceding claims, wherein said loader comprises an electrical motor (M1) fixed to said horizontal guide (10) for moving a driving belt connected to said body (40) of the loader in order to move the body of the loader.

9. The boxing machine (1) of any one of the preceding claims, wherein said loader comprises an electrical motor (M2) fixed to said body (40) of the loader for moving a driving belt connected to a clamp (44) joined to said support (42) of the base plate in order to move said support (42) of the base plate. 5
10. The boxing machine (1) of any one of the preceding claims, wherein said second picking head (5) is suitable for translating in a horizontal direction (X) and said horizontal translation direction (T) of said body (40) of the loader is orthogonal to the horizontal translation direction (X) of the second picking head (5). 10

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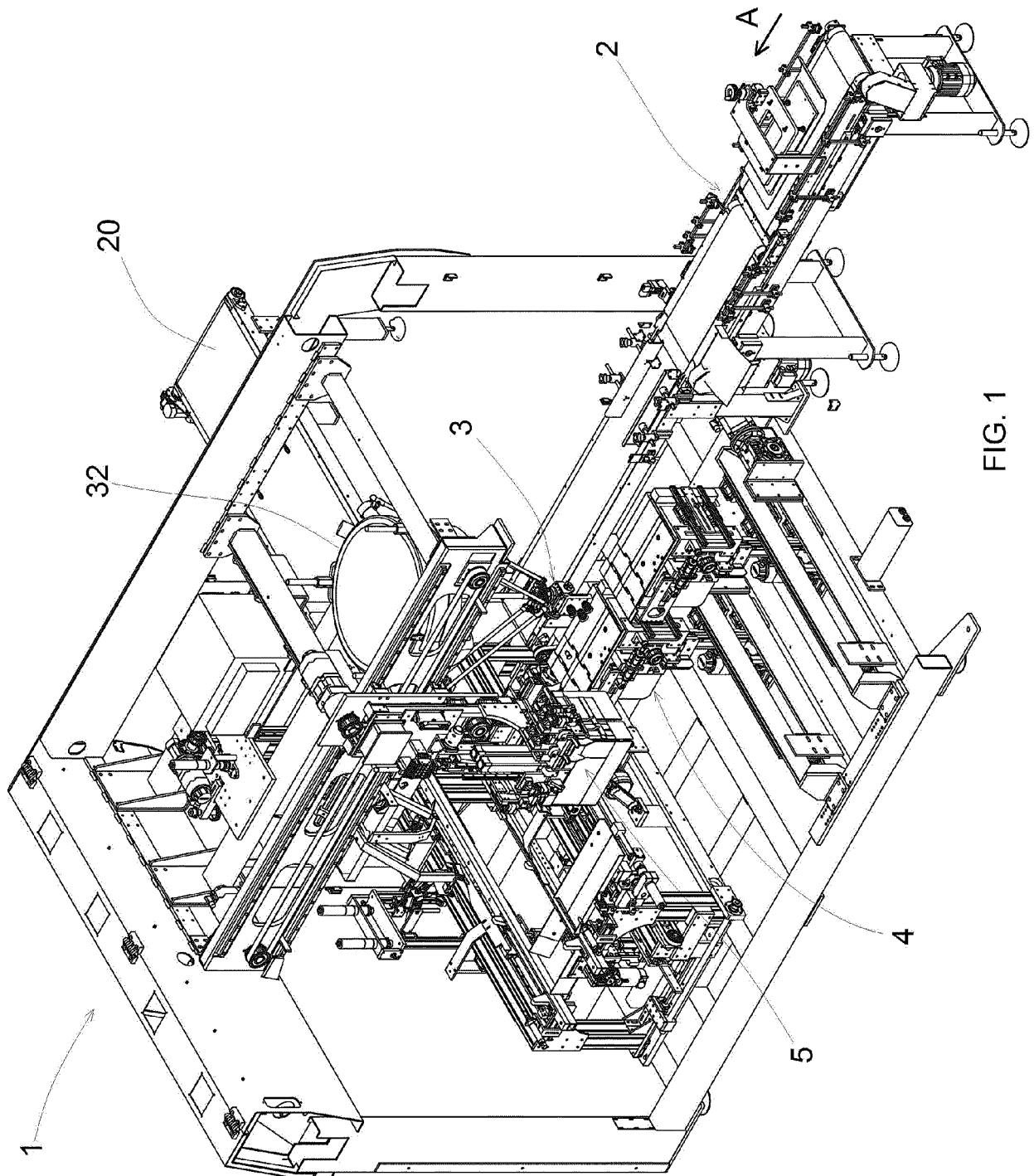


FIG. 1

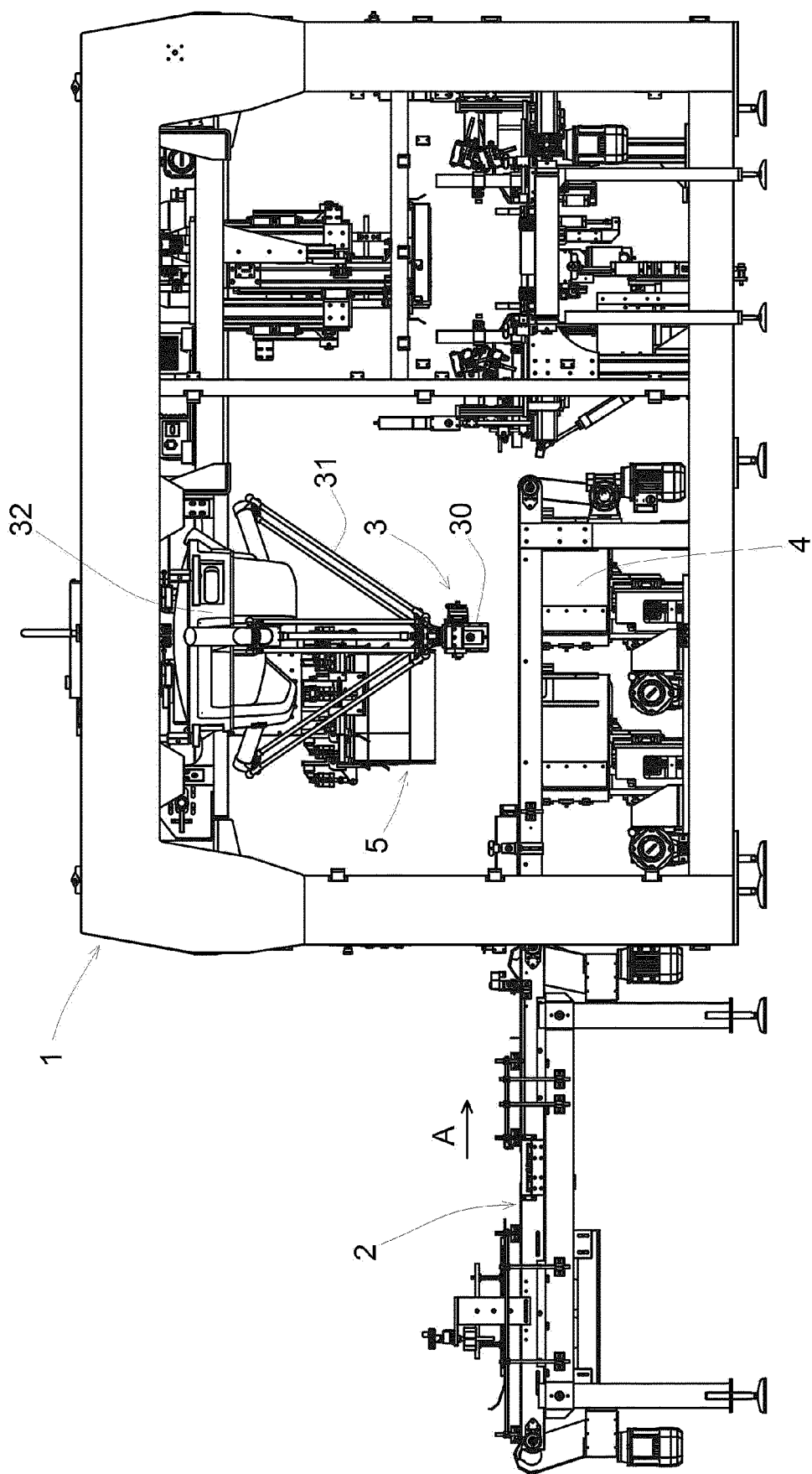
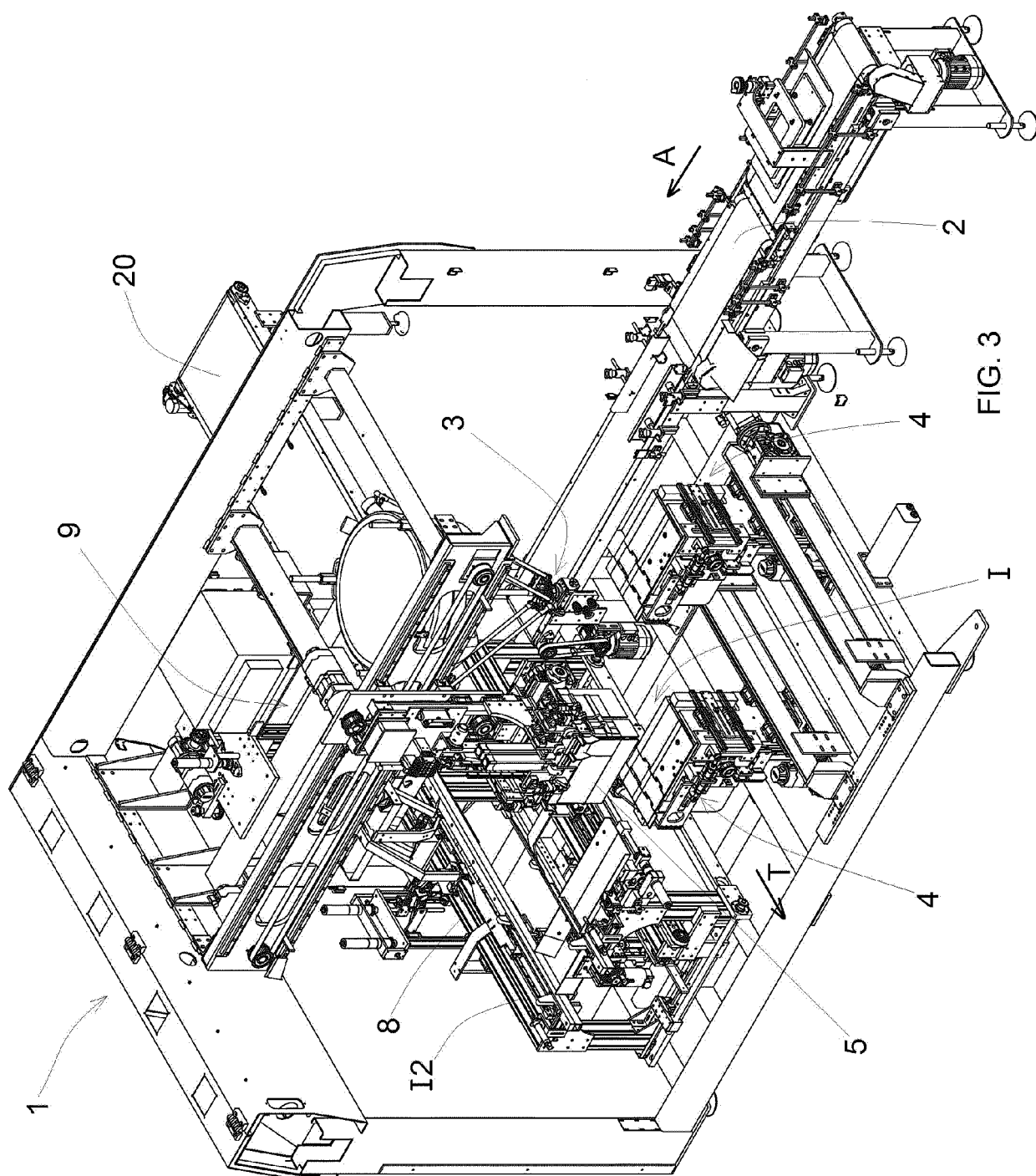


FIG. 2



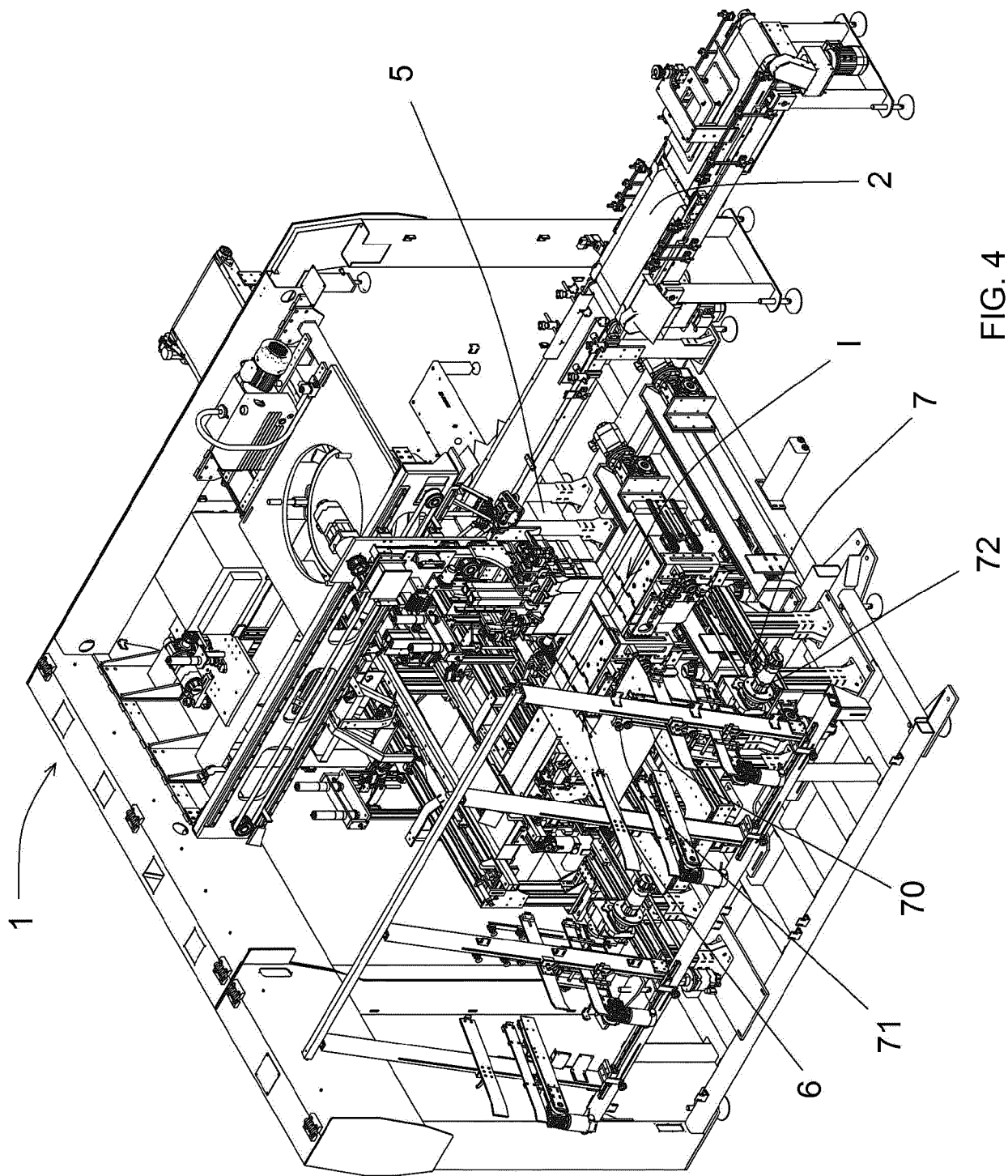


FIG. 4

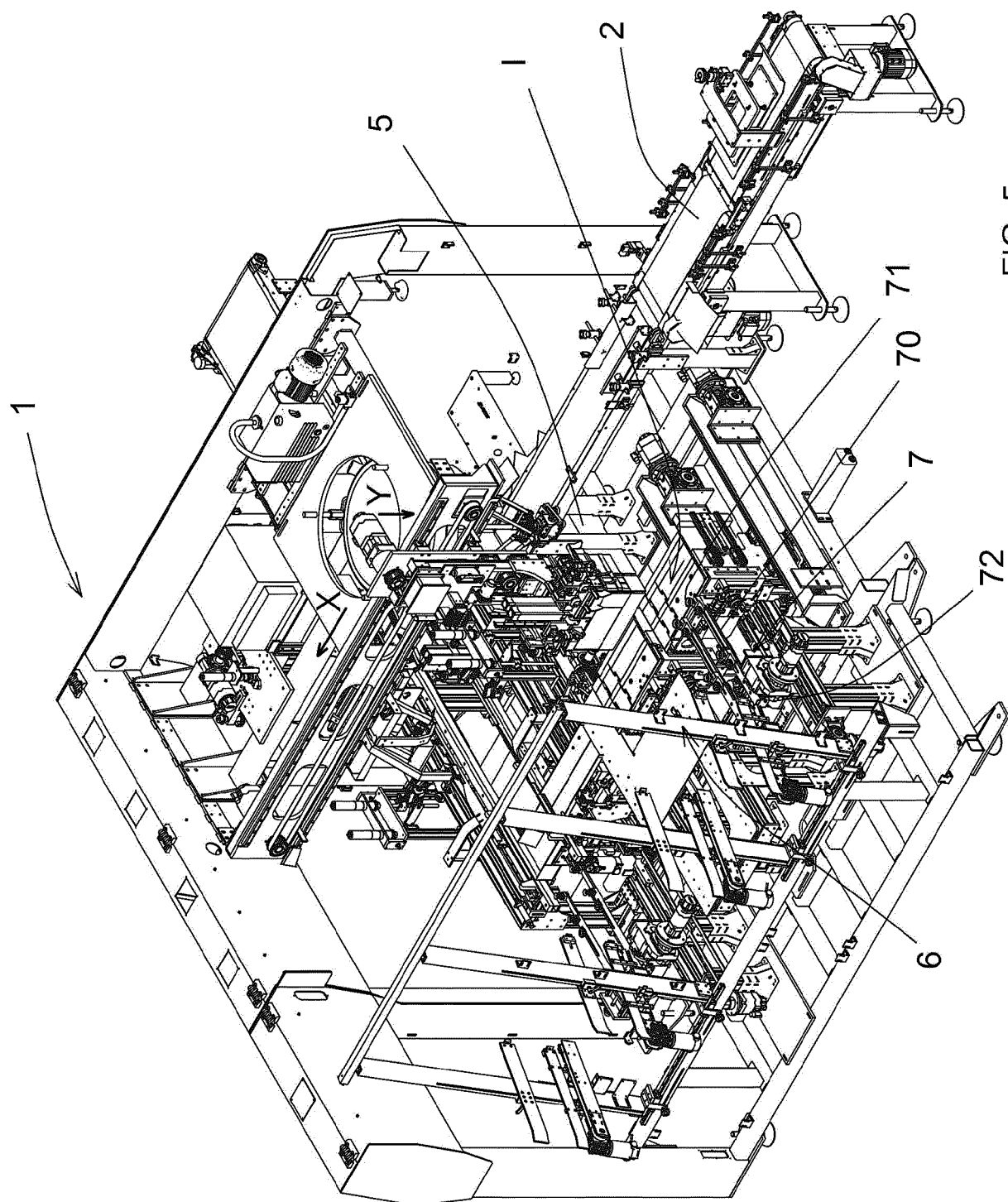


FIG. 5

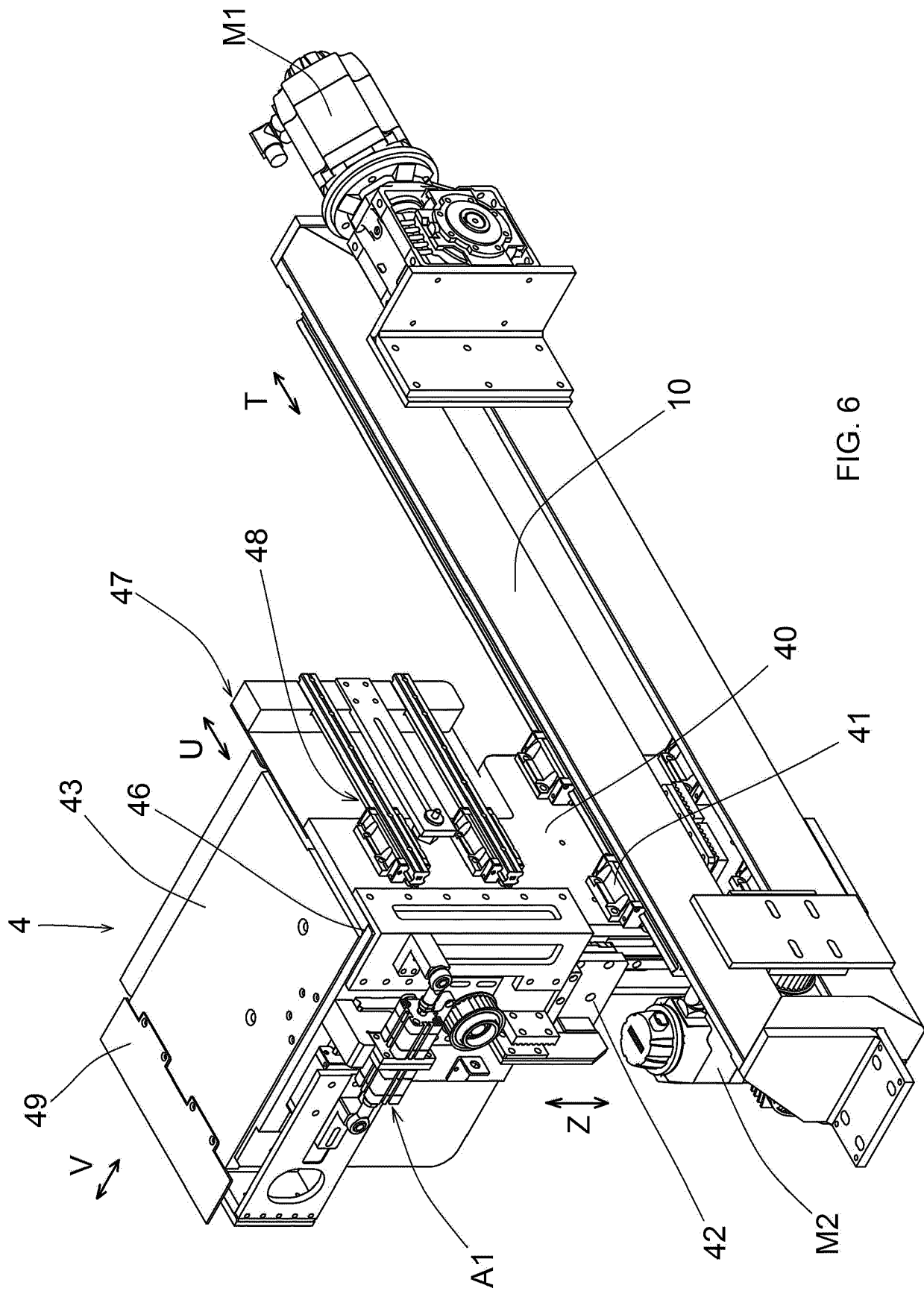


FIG. 6

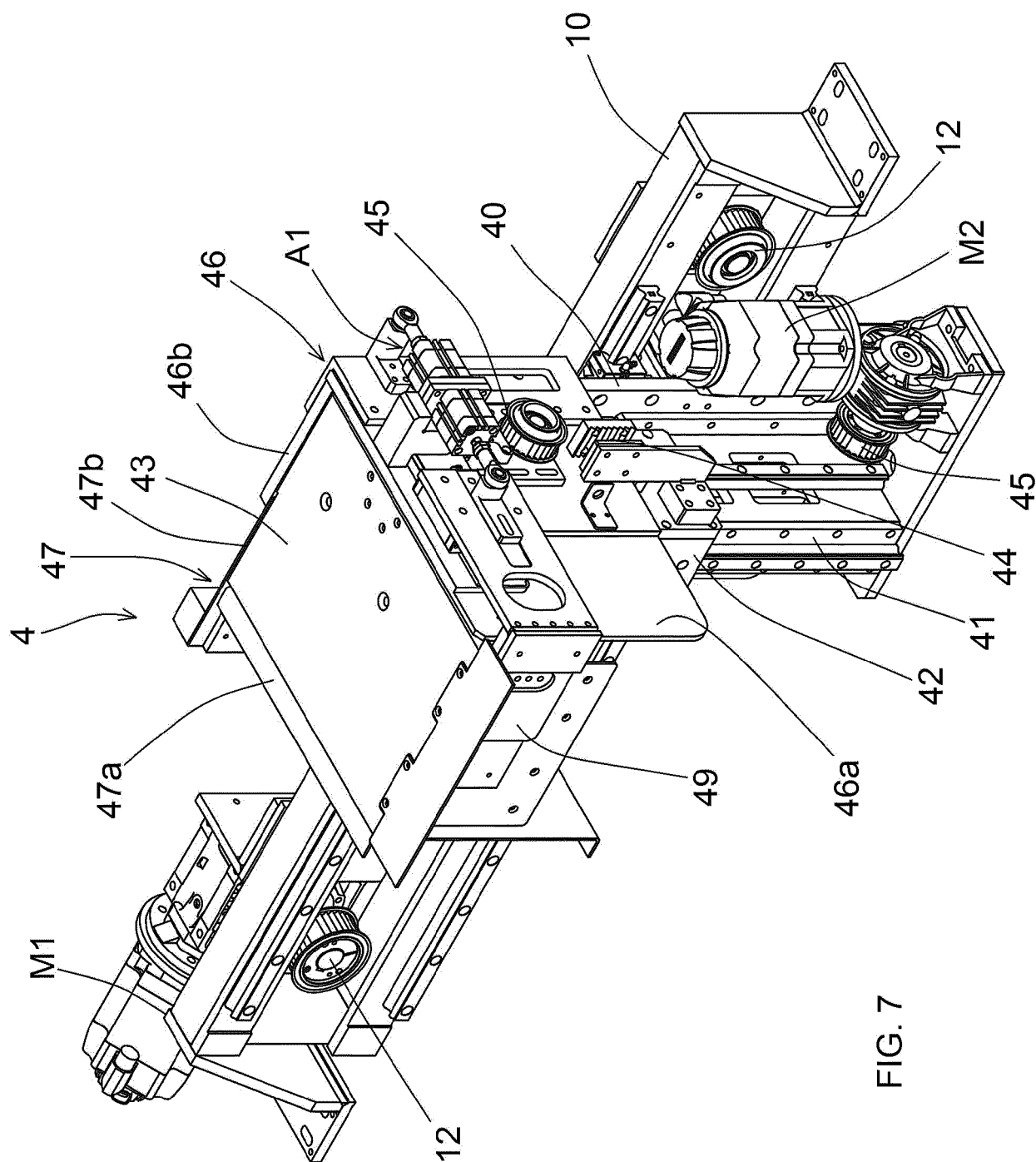


FIG. 7

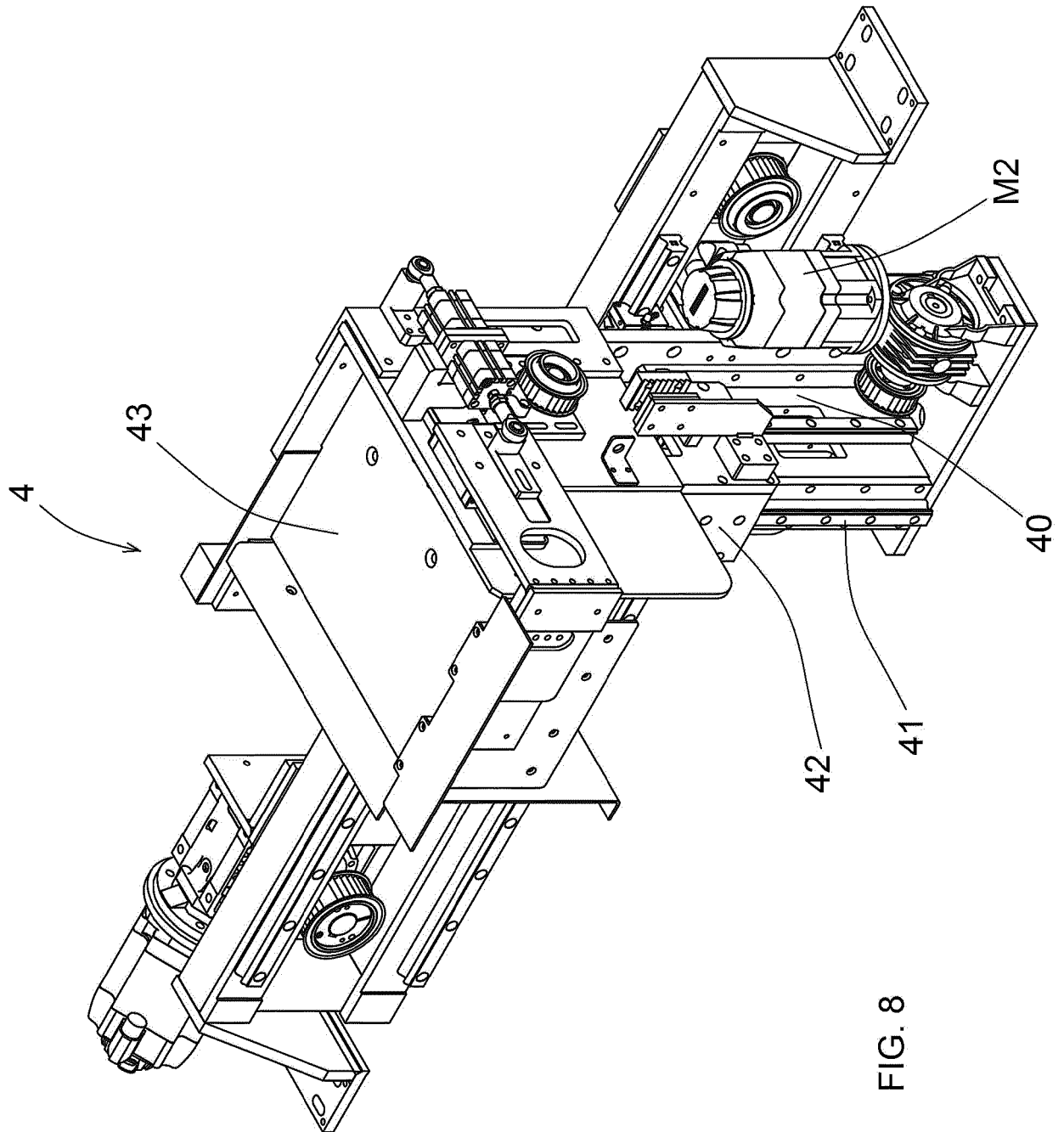


FIG. 8

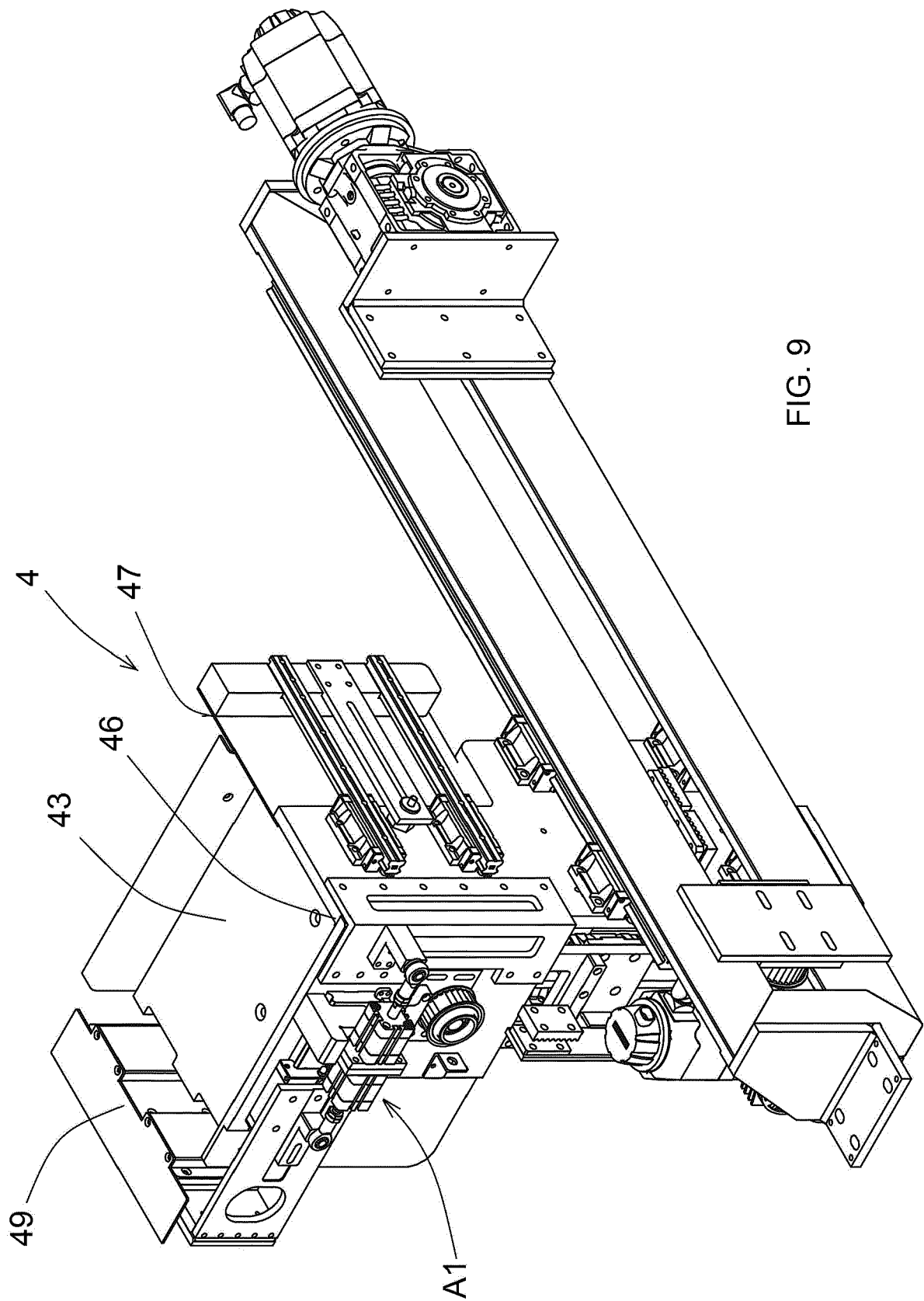


FIG. 9

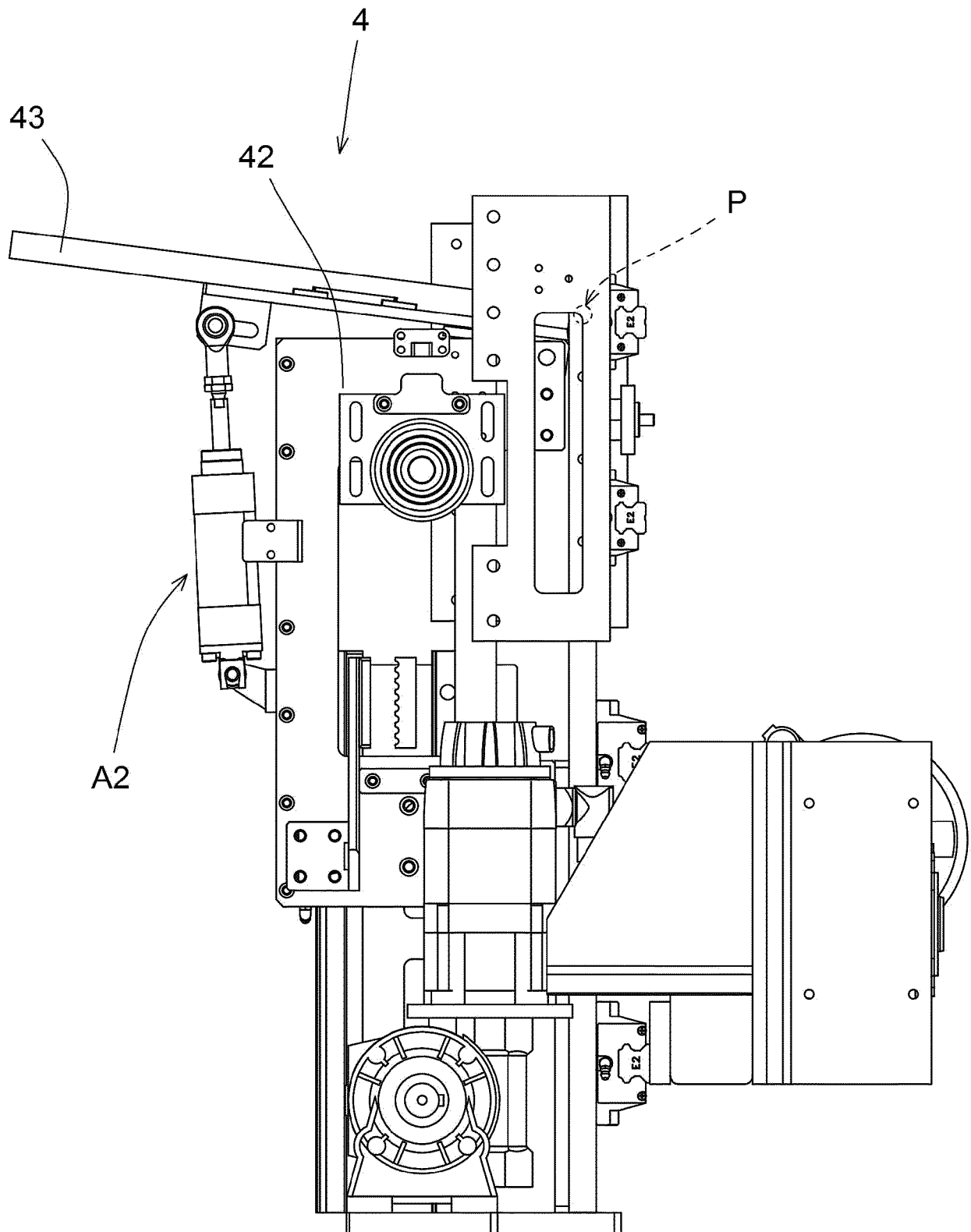


FIG. 10

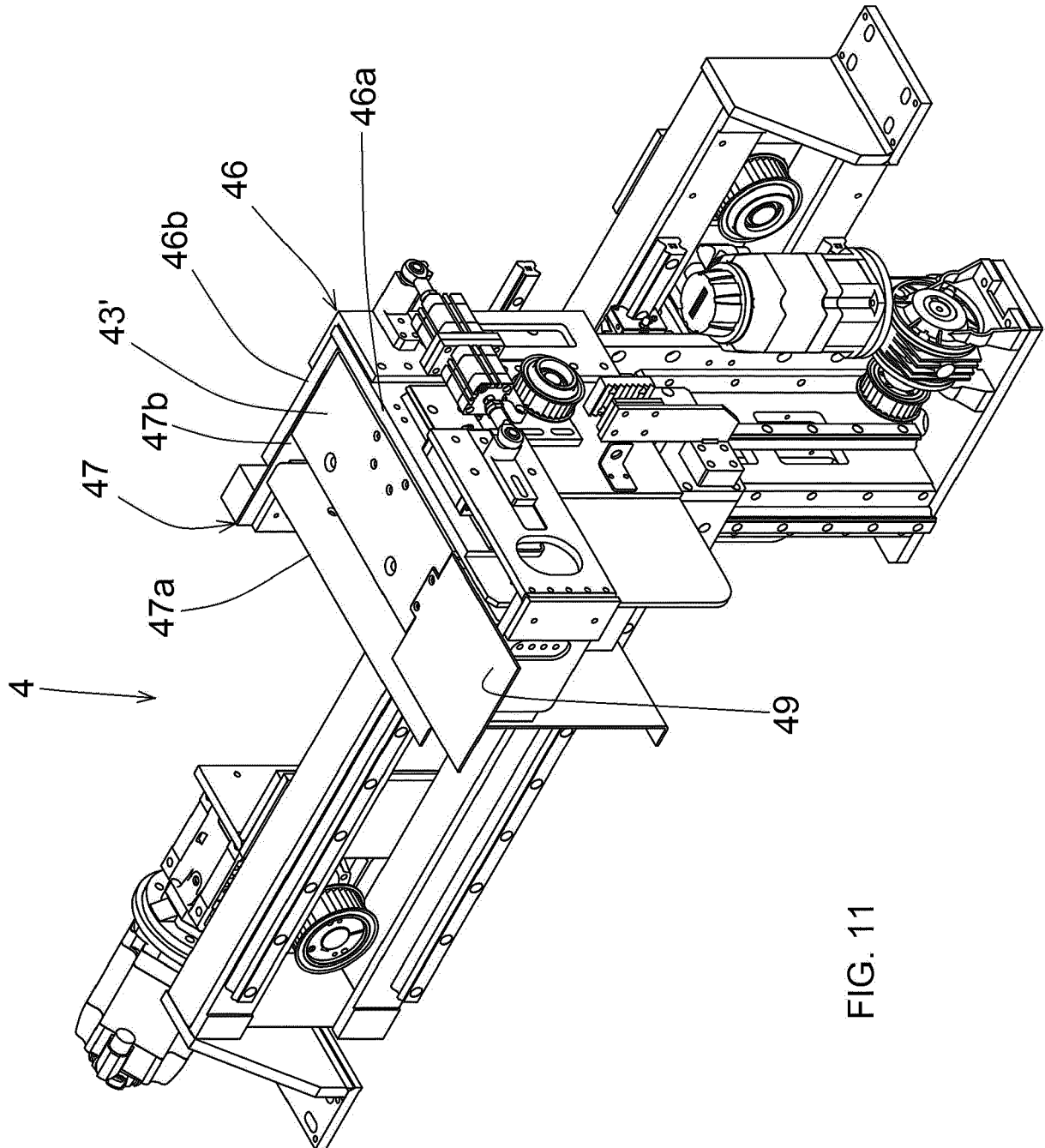
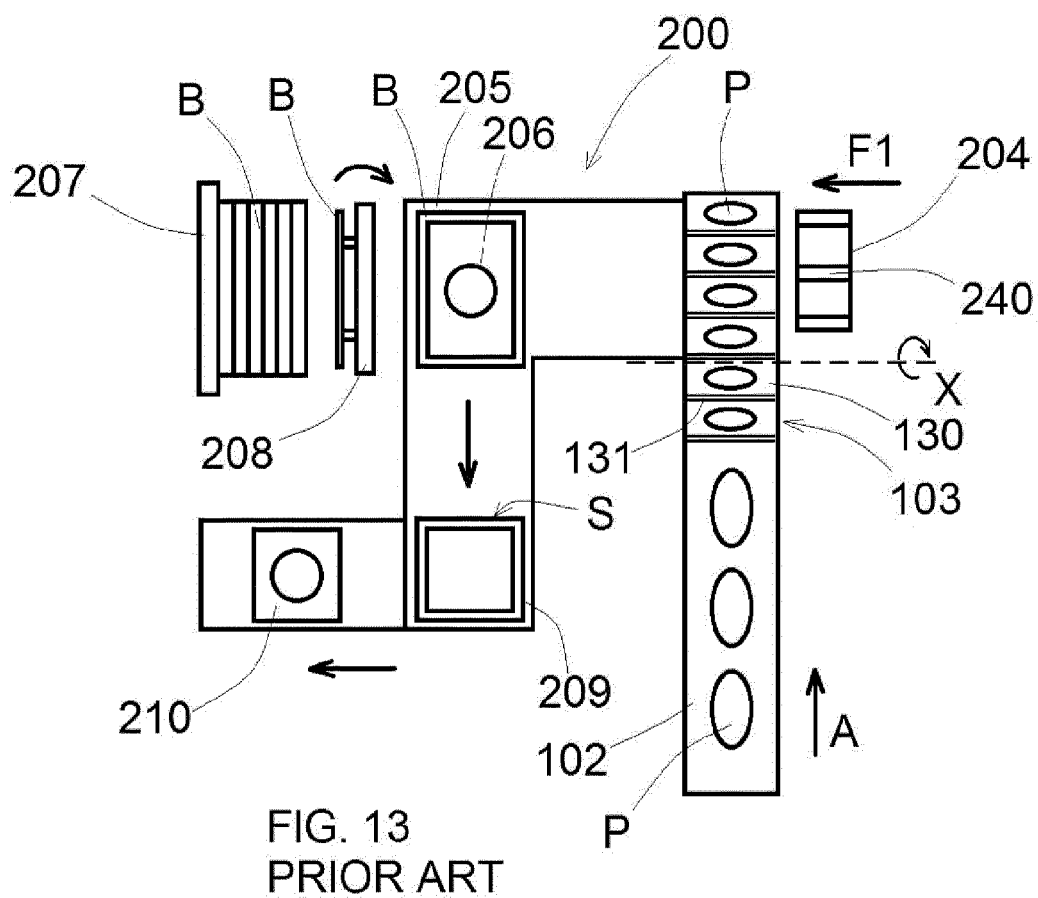
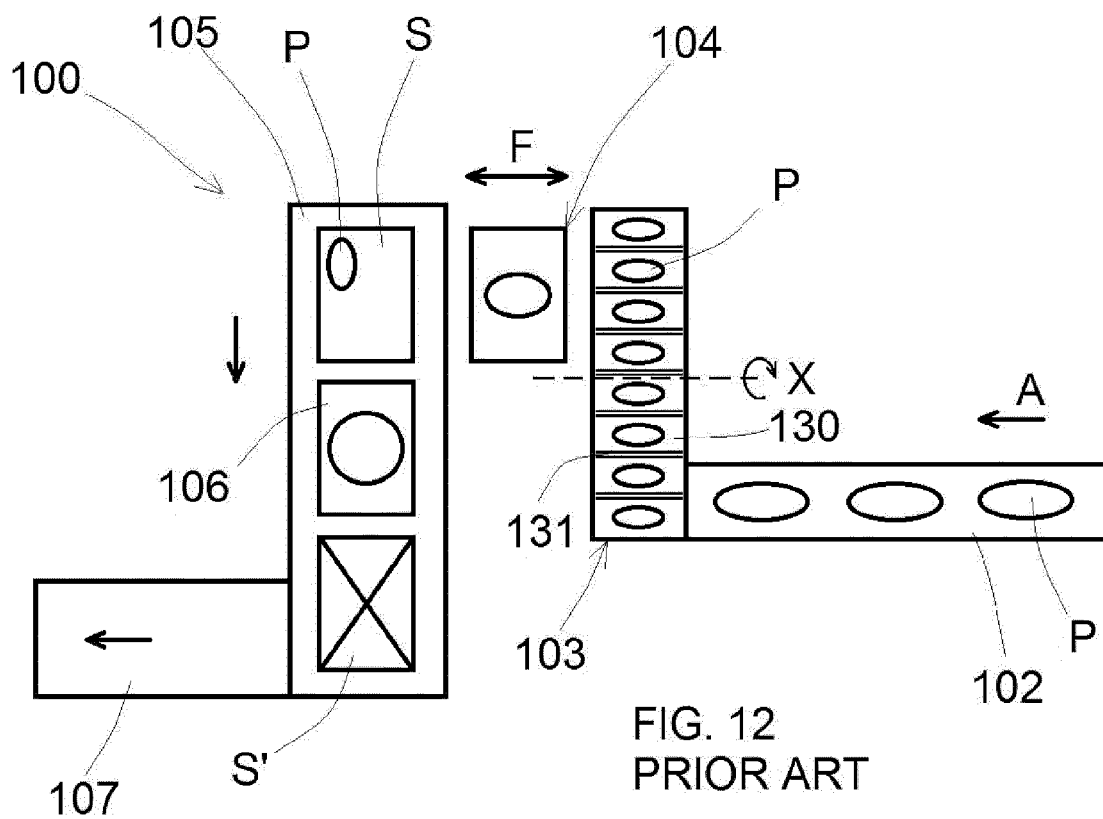


FIG. 11





EUROPEAN SEARCH REPORT

Application Number
EP 18 17 3319

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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