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(54) **MACHINE FOR ASSEMBLING CARDBOARD BOXES**

(57) The invention relates to a machine for assembling cardboard boxes that comprises a suction cup system (6) joined to an actuation mechanism (1), and a transporter (9), both synchronously activated by a motor (4), wherein a disc (2) is joined in an off-centred way to one end of a brace (101) which, at the other end, is joined to the actuation mechanism (1) by a support (102), and the support (102) is joined with rotational capability to a shaft of a fixed toothed wheel (103) which, in turn, is joined by means of a chain to a rotary toothed wheel (104), integral with an arm (105) fixed to the suction cup system (6), such that the movement of the motor (4) causes the movement of the suction cup system (6) to move a sheet from the stacking area (7) to the forming station.

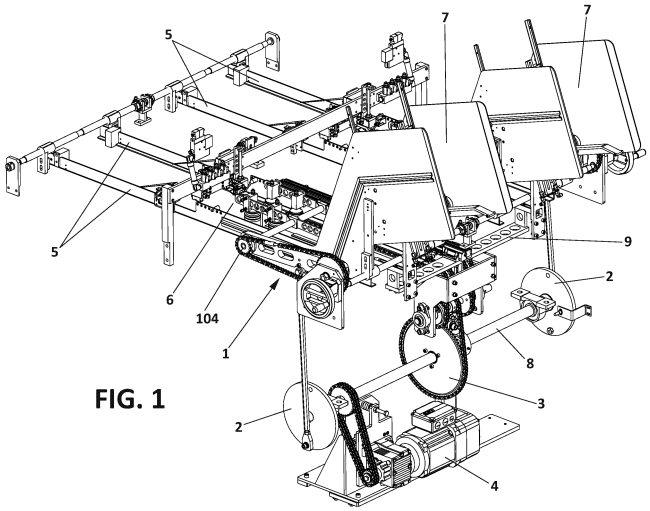

FIG. 1

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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a new machine for the automatic assembly of cardboard boxes, trays or containers.

[0002] It falls within the technical field of forming machines for forming cardboard packages from laminated or honeycombed and pre-punched cardboard.

BACKGROUND OF THE INVENTION AND TECHNICAL PROBLEM TO SOLVE

[0003] Cardboard box forming machines are known from the prior art. Generally, the cardboard used is corrugated cardboard, which is much more resistant than laminated cardboard, although the use of any type of cardboard is equally possible.

[0004] The problem with cardboard packages, especially small packages manufactured with laminated cardboard, is its fragility and the immense number of formats, sizes and asymmetries. Therefore, it is necessary for the machines in which they are formed to have low energy consumption and to be very precise to allow easy adaptation to any box size.

DESCRIPTION OF THE INVENTION

[0005] In order to achieve the objectives and avoid the drawbacks mentioned above, the present invention describes a machine for assembling cardboard boxes that comprises a forming station, with at least one core and one mould, and a sheet stacking area.

[0006] The machine comprises a suction cup system joined to an actuation mechanism, activated by a motor, and a transporter, also activated by the motor. The transporter is mechanically and synchronously connected with the actuation mechanism, such that the movements are determined sequentially.

[0007] With this configuration, the movement of the motor causes the movement of the suction cup system, through the actuation mechanism, and of the transporter, such that a sheet is picked up in the stacking area and deposited in the forming station.

[0008] Preferably, the transporter comprises a pusher.

[0009] The motor is mechanically connected to a shaft that is integral with a disc, by means of which it is joined to the actuation mechanism, and also to a transmission wheel, by means of which it is joined to the transporter.

[0010] The disc is joined in an off-centred way to one end of a brace which, at the other end, is joined to the actuation mechanism by a support.

[0011] On the other hand, the support is joined with rotational capability to a shaft of a fixed toothed wheel which, in turn, is joined by means of a chain to a rotary toothed wheel, integral with an arm that is fixed to the suction cup system, thereby achieving a reversal of rotation between the stacking area and the forming station.

[0012] Moreover, each of the cores incorporates a servomotor, such that they are independent when working.

[0013] The machine may also comprise a second suction cup system, a second actuation mechanism and a second disc, also integral with the shaft, with the same configuration as the first ones, such that the machine has the capability to handle two sheets at the same time.

[0014] Furthermore, the machine may have another configuration in which the arms of the two suction cup systems are joined in extension creating a single arm, the centres of rotation of the fixed toothed wheels are joined by a common shaft, the single arm and the common shaft being joined by a joining element and wherein a central support, which the common shaft goes through, fixes the common shaft and the single arm to the machine via the joining element, all for the purpose of providing rigidity to the machine, avoiding vibration problems and increasing smoothness in operation.

BRIEF DESCRIPTION OF THE FIGURES

[0015] To complete the description of the invention, and for the purpose of helping to make the features thereof more readily understandable, according to a preferred exemplary embodiment thereof, a set of drawings is included wherein, by way of illustration and not limitation, the following figures have been represented:

- Figure 1 depicts a perspective view of the stacking area and the forming area of the box forming machine of the invention together with the transmission system.
- Figure 2 depicts a perspective view of the transmission system of the machine, including the motor, two actuation mechanisms with the respective suction cup systems and the transporter.
- Figures 3 to 6 depict different positions of the actuation mechanism of the suction cup system according to the rotation of the disc to which it is joined.
- Figure 7 depicts a box forming core together with the servomotor that activates it.
- Figure 8 depicts a framework with two cores.
- Figure 9 depicts a new embodiment where the two actuation mechanisms are joined by a bar mechanism that is fixed to the machine to give it stability.

[0016] A list of the references used in the figures is provided below:

1. Actuation mechanism.
2. Disc.
3. Transmission wheel.
4. Motor.
5. Rails.
6. Suction cup system.
7. Stacking area.
8. Shaft.

9. Transporter.
10. Pusher.
11. Servomotor.
12. Core.
13. Fixed bridge.
14. Joining element.
15. Central support.
101. Brace.
102. Support.
103. Fixed toothed wheel.
104. Rotary toothed wheel.
105. Arm.
106. Single arm.
107. Common shaft.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

[0017] The invention relates to a cardboard container forming machine, of the type already known, which has at least one cardboard container forming station where two cores are located, each with its corresponding mould, between which two cardboard sheets are positioned such that, as each of the cores moves vertically towards the corresponding mould, the body of the container is formed, being ejected from below, as usual.

[0018] The configuration of the faces of the core and the configuration of the elements of the mould make it possible to work equally with corrugated or laminated cardboard without the risk of it being damaged or broken.

[0019] The forming station of the cardboard package forming machine is fed by a transporter 9 of sheets that are extracted from a stacking area 7 by means of a suction cup system 6.

[0020] The machine works with tray-type laminated cardboard sheets, whereby the packages are formed, which remain open once formed to be closed after filling.

[0021] In a typical use, the packages are used as containers for sales units in the agricultural industry.

[0022] The novelty that the machine of the invention incorporates consists of the actuation mechanism 1 of the suction cup system 6 mechanically synchronized with the cardboard sheet transporter 9.

[0023] As can be seen in the figures, the machine depicted incorporates two forming stations that are fed with cardboard sheets by means of the suction cup systems 6 of respective actuation mechanisms 1 by means of the pushers 10 of the transporter 9. The sheets are extracted from the stacking area 7 by the suction cup system 6 of each of the actuation mechanisms 1 to be deposited on rails 5 to be moved by means of pushers 10 located on the transporter 9, which will move with a system synchronized with the actuation mechanism 1 of the suction cup system 6 and will deposit each of the sheets in the forming area between the mould and the corresponding core 12 to be formed.

[0024] The mould, not shown so as not to complicate the drawings, has the classic fixed forming elements and mobile forming elements, adjustable stops, the position of which with respect to the mould elements and the core can be modified depending on the characteristics of the cardboard used and the size of the container, among other factors.

[0025] In turn, as depicted in Figures 7 and 8, the cores 12 are arranged on a fixed bridge 13 and are actuated by a servomotor 11 individually, which allows greater precision of movements and greater ease in regulating the vertical movement thereof, depending on the different box formats.

[0026] With respect to the new actuation mechanism 1, as can be seen in detail in Figure 2, the machine has a motor 4 responsible for conveying movement to two discs 2. Each disc 2 is joined to the respective mechanism 1 through a brace 101. To do this, one of the ends of each brace 101 is joined to a disc 2 in an off-centred way and the other end is joined to a support 102 of mechanism 1.

[0027] The support 102 can pivot around the shaft of a fixed toothed wheel 103 on which a chain meshes, also being joined to another rotary toothed wheel 104, integral with a shaft which is the arm 105 of the suction cup system 6. The arm 105 is responsible for transmitting the movement of the mechanism 1 to the suction cup system 6, for which purpose it is joined to a frame where the suction cups are located. In this way, a compound movement is obtained in which the suction cup system 6 moves vertically and changes the plane of attack, as depicted in Figures 3 to 6 where there are shown different positions of the path it takes, from the cardboard sheet collection position where the cardboard sheets are moved from the stacking area 7, defined by a pair of plates between which the sheets are located, to a horizontal position of the suction cup system 6 to deposit the sheets vertically in the forming area.

[0028] However, with the device described, there are times when, due to the very rapid movements of the suction cup system 6, annoying vibrations are generated, as the two suction cup systems 6 behave as independent mechanisms, when their essential functions are actually synchronised.

[0029] For the purpose of providing rigidity to the device, avoiding these vibrations and gaining smoothness of operation, a new embodiment has been created, as depicted in Figure 9. In this embodiment, the arms 105 of the two suction cup systems 6 are joined, forming the new single arm 106, while the centres of rotation of the fixed toothed wheels 103 that activate the suction cup systems 6 have also been joined by a common shaft 107. The single arm 106 and the common shaft 107 are joined by an intermediate area of their length by a joining element 14. Furthermore, the common shaft 107 is also fixed with rotational capability to a central support 15 that is fixed to the chassis of the machine for the purpose of providing rigidity and stability to the new generated mechanism. This central support 15 is configured as two plates which the common shaft 107 goes through to keep the

joining element 14 between them, said plates being joined by a third plate whereby the central support 15 is joined to the chassis of the machine.

[0030] Lastly, it must be taken into account that the present invention must not be limited by the embodiment described herein. Other configurations may be carried out by those skilled in the art based on the present description. Accordingly, the scope of the invention is defined by the following claims.

Claims

1. A machine for assembling cardboard boxes that comprises a forming station, with at least one core (12) and one mould, and a sheet stacking area (7), **characterised in that** it comprises

   - a suction cup system (6) joined to an actuation mechanism (1) activated by a motor (4), and
   - a transporter (9) activated by the motor (4) synchronously with the actuation mechanism (1),

   wherein:

   - a disc (2) is joined in an off-centred way to one end of a brace (101) which, at the other end, is joined to the actuation mechanism (1) by a support (102), and
   - the support (102) is joined with rotational capability to a shaft of a fixed toothed wheel (103) which, in turn, is joined by means of a chain to a rotary toothed wheel (104), integral with an arm (105) fixed to the suction cup system (6),

   such that the movement of the motor (4) causes the movement of the suction cup system (6) through the actuation mechanism (1) and of the transporter (9), such that a sheet is moved from the stacking area (7) to the forming station.

2. The machine for assembling cardboard boxes according to claim 1, **characterised in that** the transporter (9) comprises a pusher (10).

3. The machine for assembling cardboard boxes according to claim 1, **characterised in that** the motor (4) meshes with a shaft (8) integral with a disc (2) and a transmission wheel (3), wherein the disc (2) has the function of activating the actuation mechanism (1) and the transmission wheel (3) has the function of activating the transporter (9).

4. The machine for assembling cardboard boxes according to claim 1, **characterised in that** each of the cores (14) incorporates a servomotor.

5. The machine for assembling cardboard boxes according to claim 3, **characterised in that** it comprises a second suction cup system (6), a second actuation mechanism (1) and a second disc (2) integral with the shaft (8) with the same configuration as the first ones.

6. The machine for assembling cardboard boxes according to claim 5, **characterised in that**:

   - the arms (105) of the two suction cup systems (6) are joined in extension creating a single arm (106),
   - it comprises a common shaft (107) that joins the centres of rotation of the fixed toothed wheels (103),
   - it comprises a joining element (14) that joins the single arm (106) and the common shaft (107), and
   - it comprises a central support (15), which the common shaft (107) goes through with rotational capability, that fixes the common shaft (107) and the single arm (106) to the machine via the joining element (14).

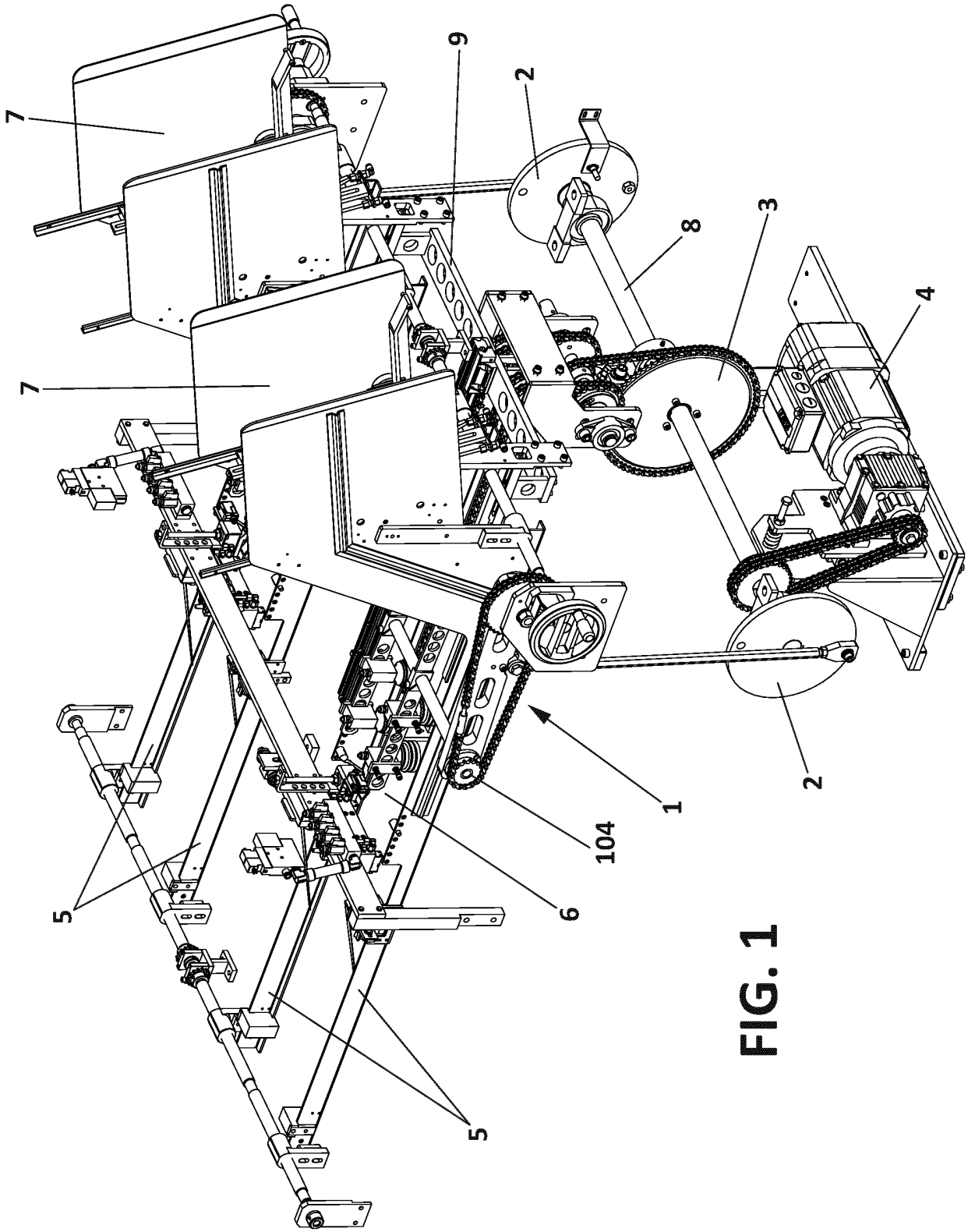

FIG. 1

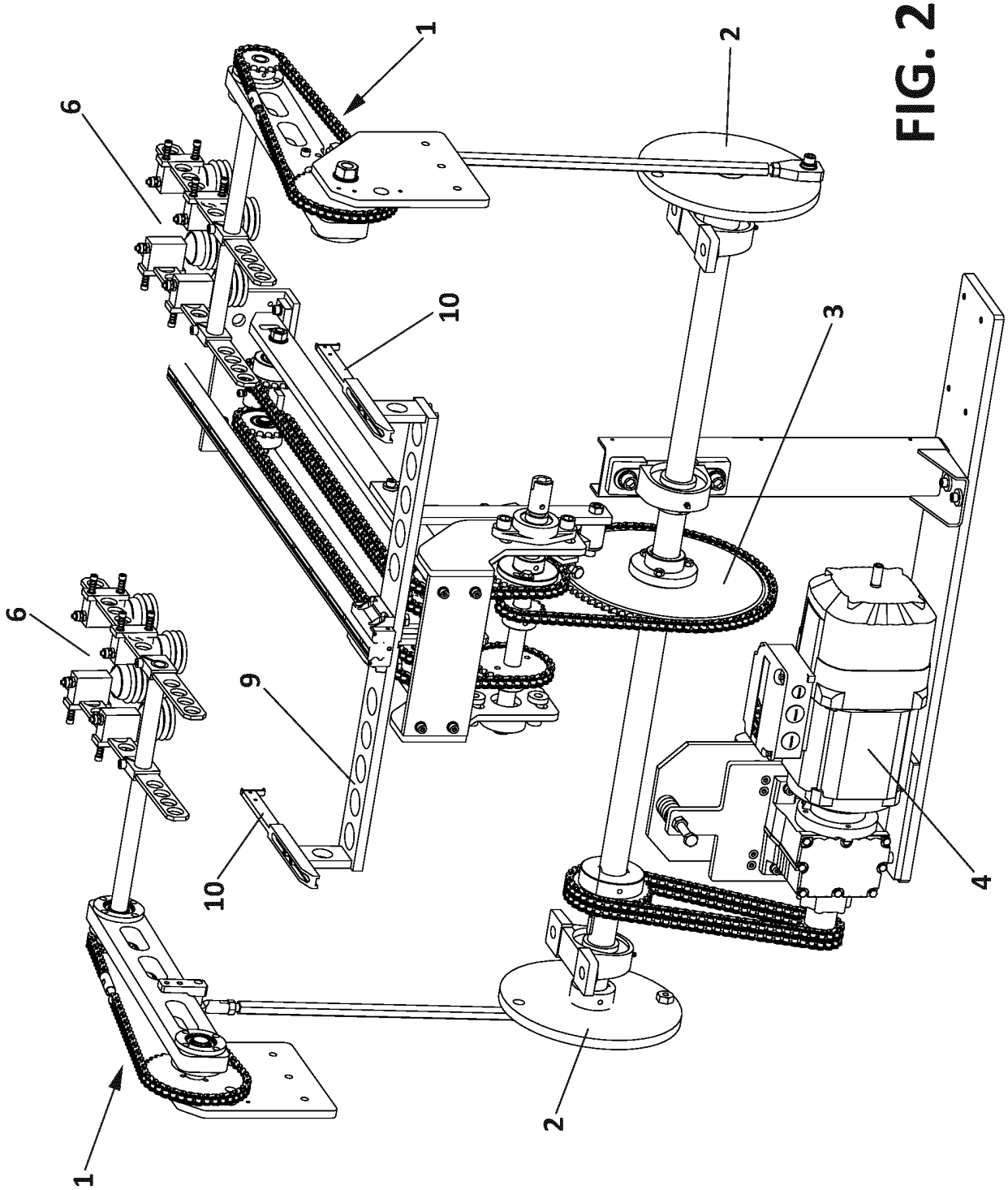

FIG. 2

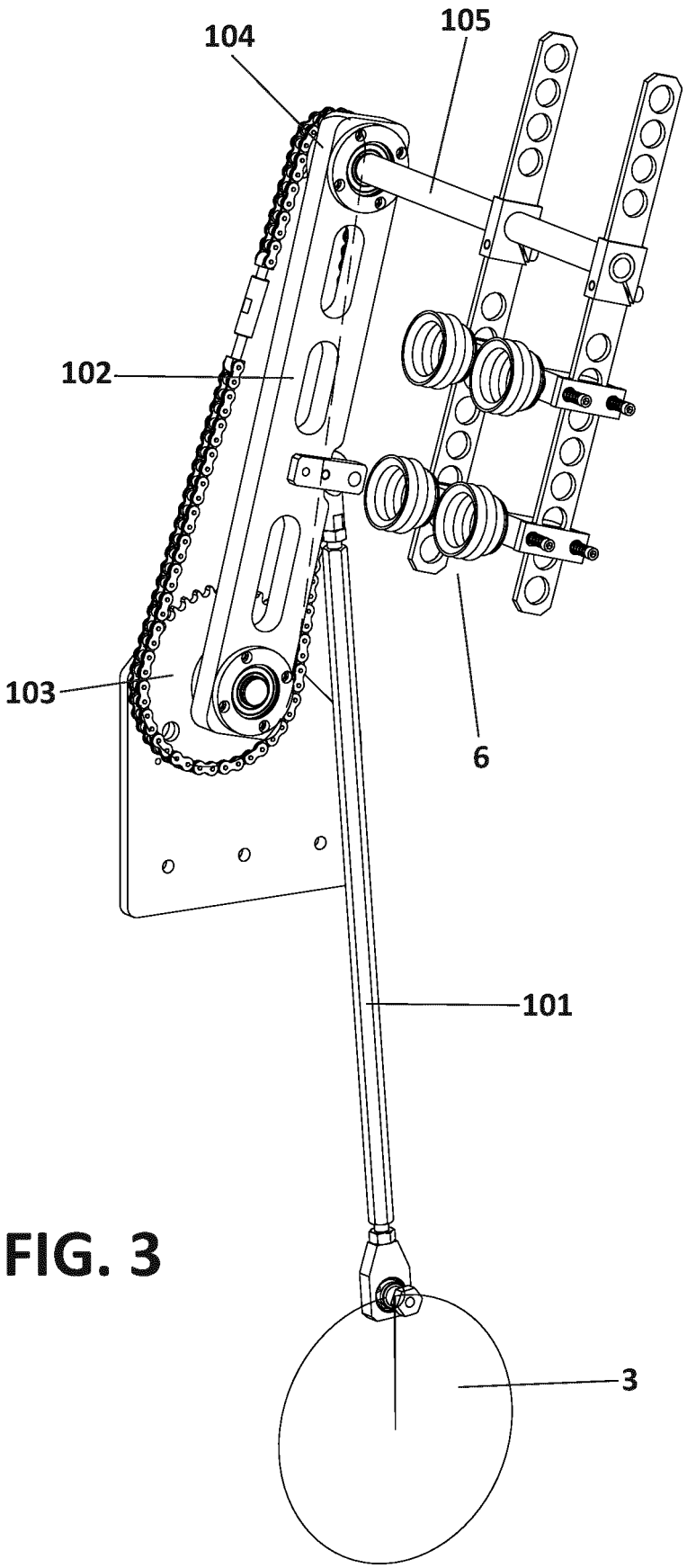

FIG. 3

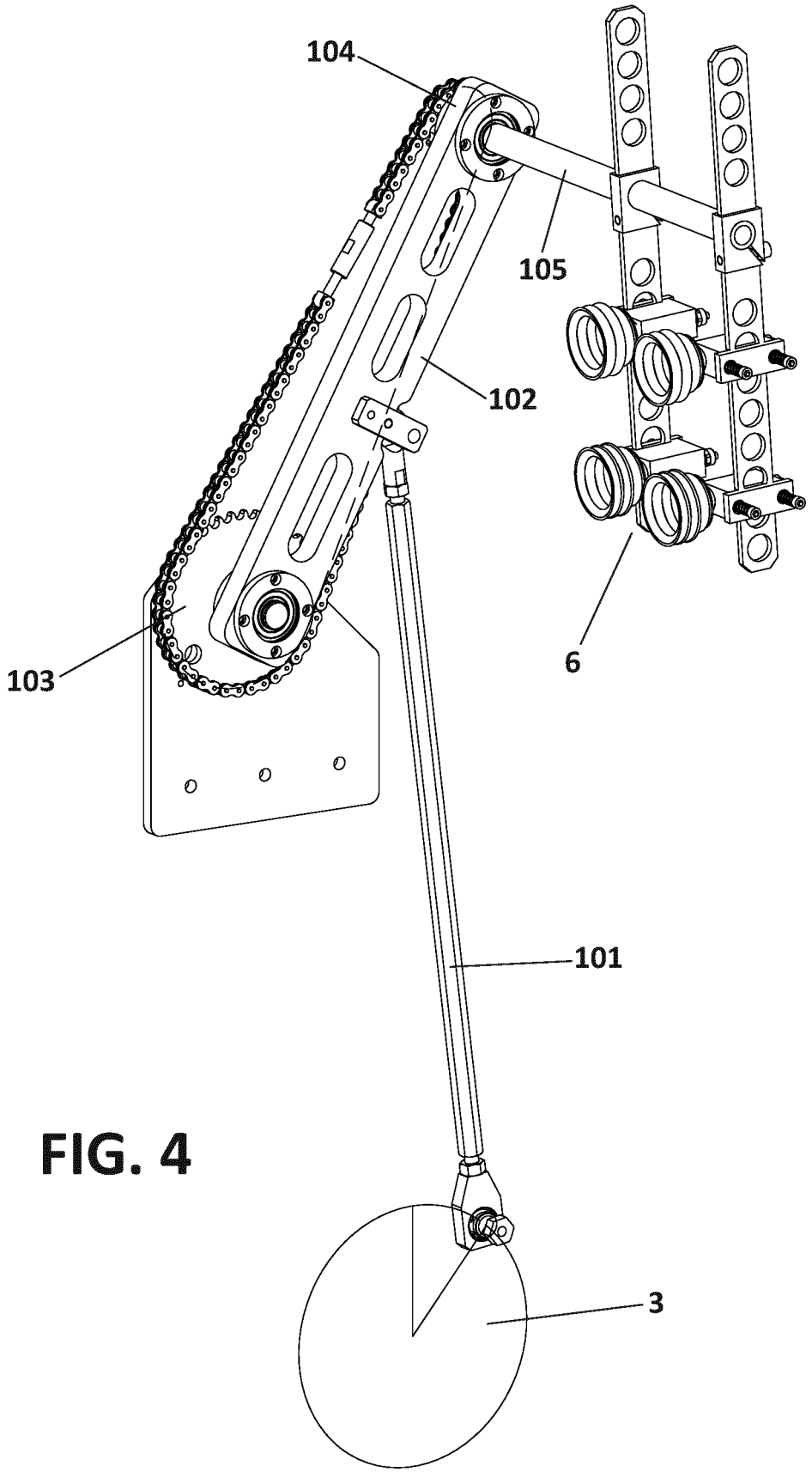

FIG. 4

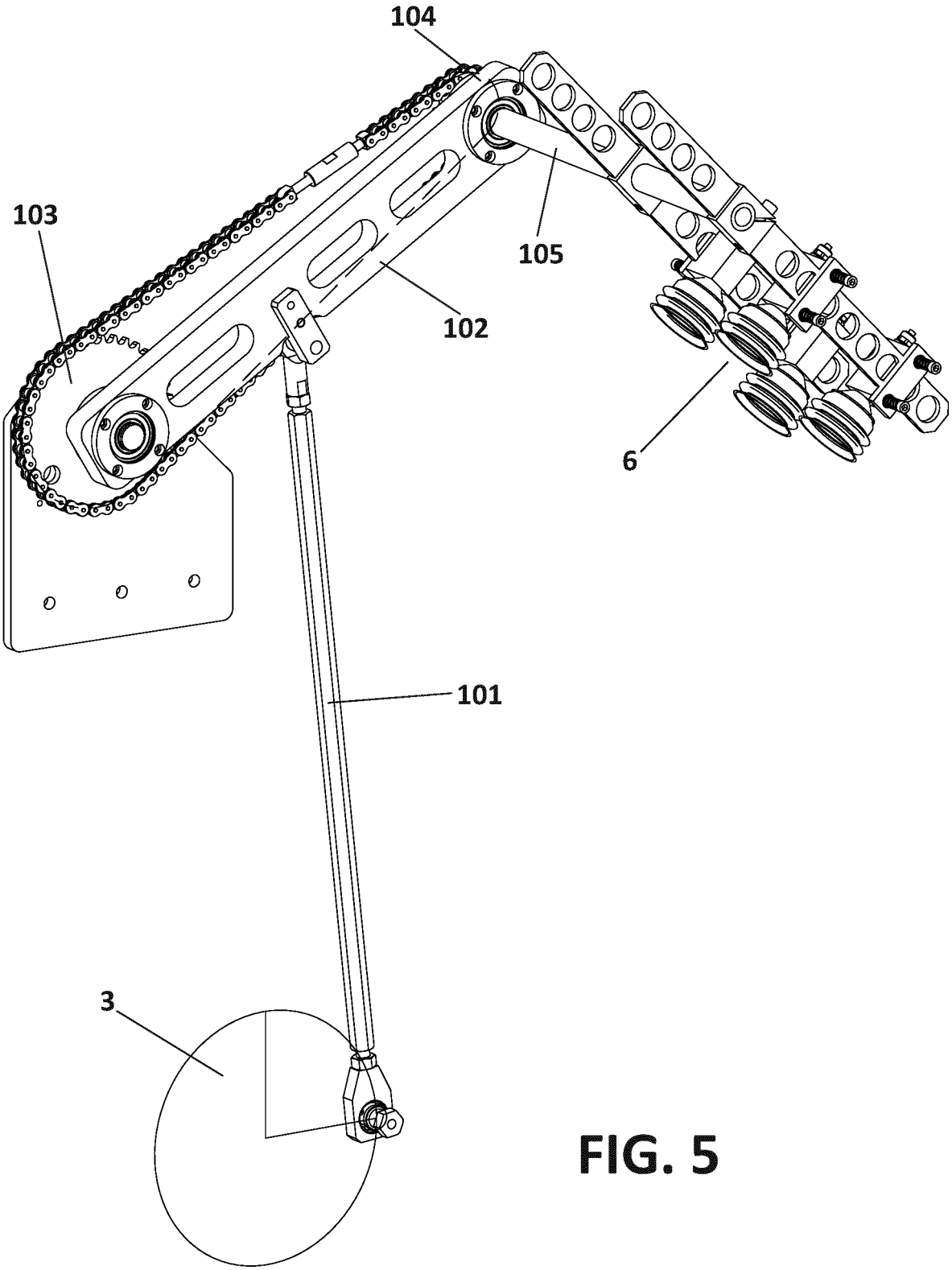

FIG. 5

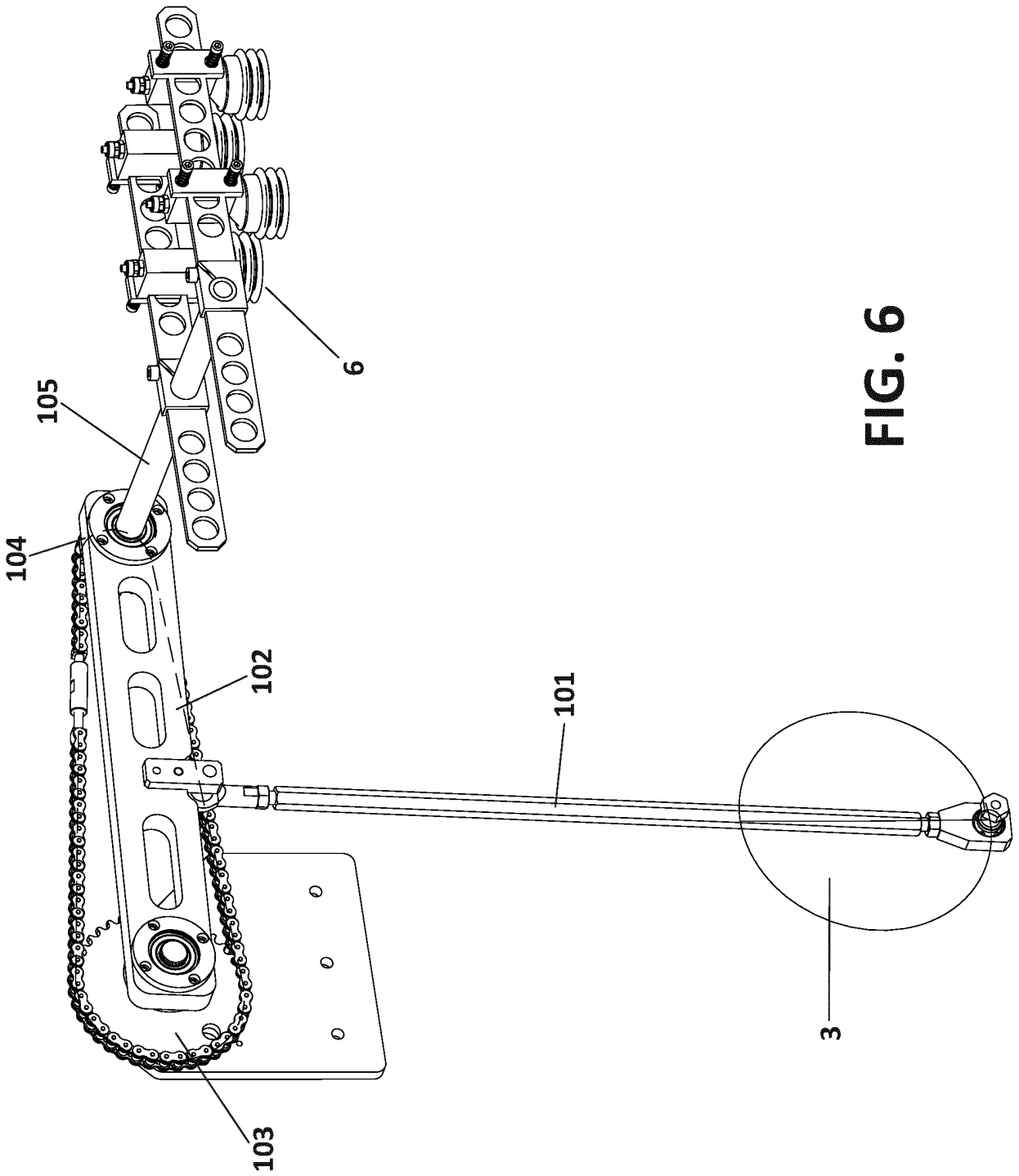

FIG. 6

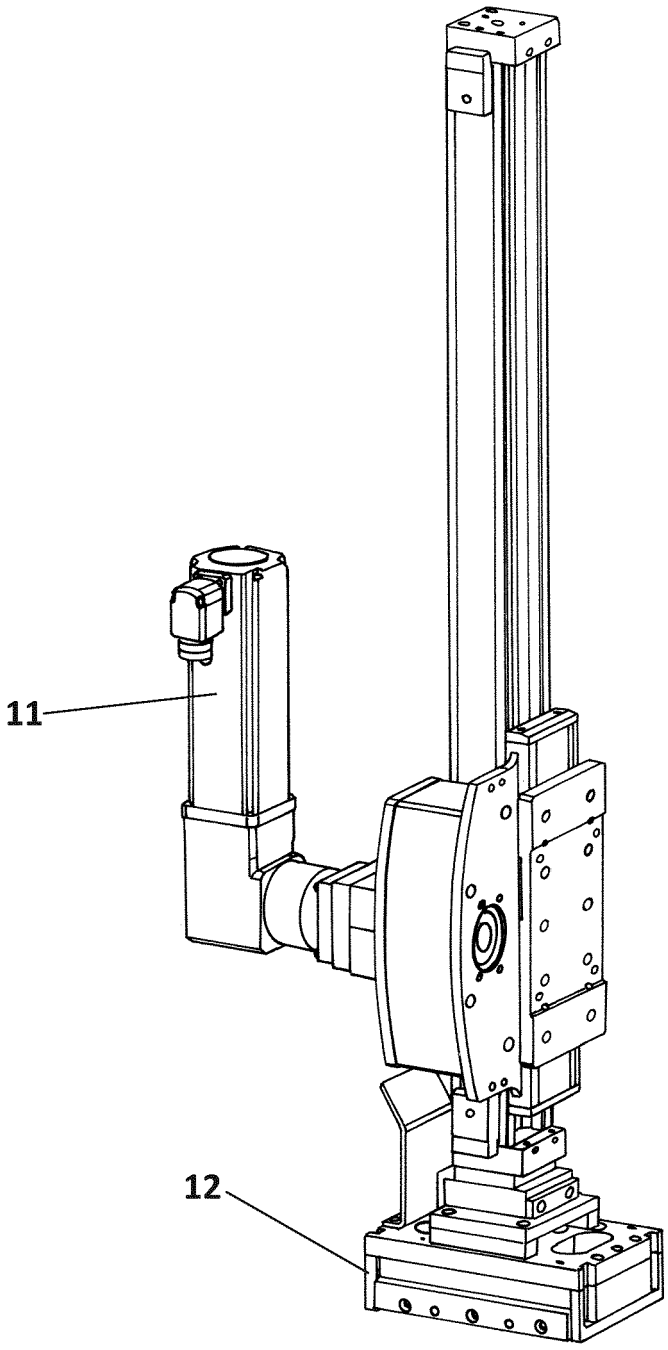

FIG. 7

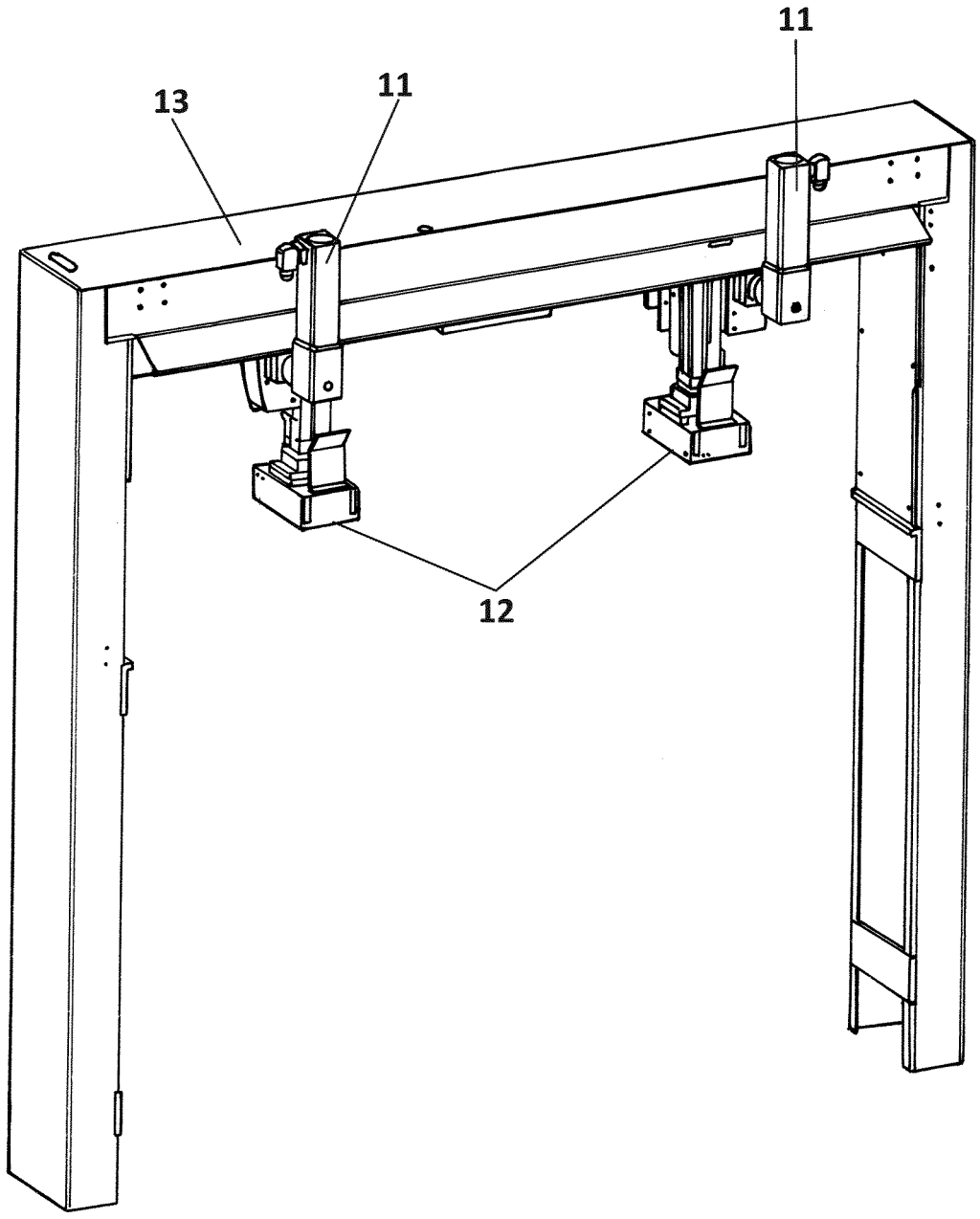

FIG. 8

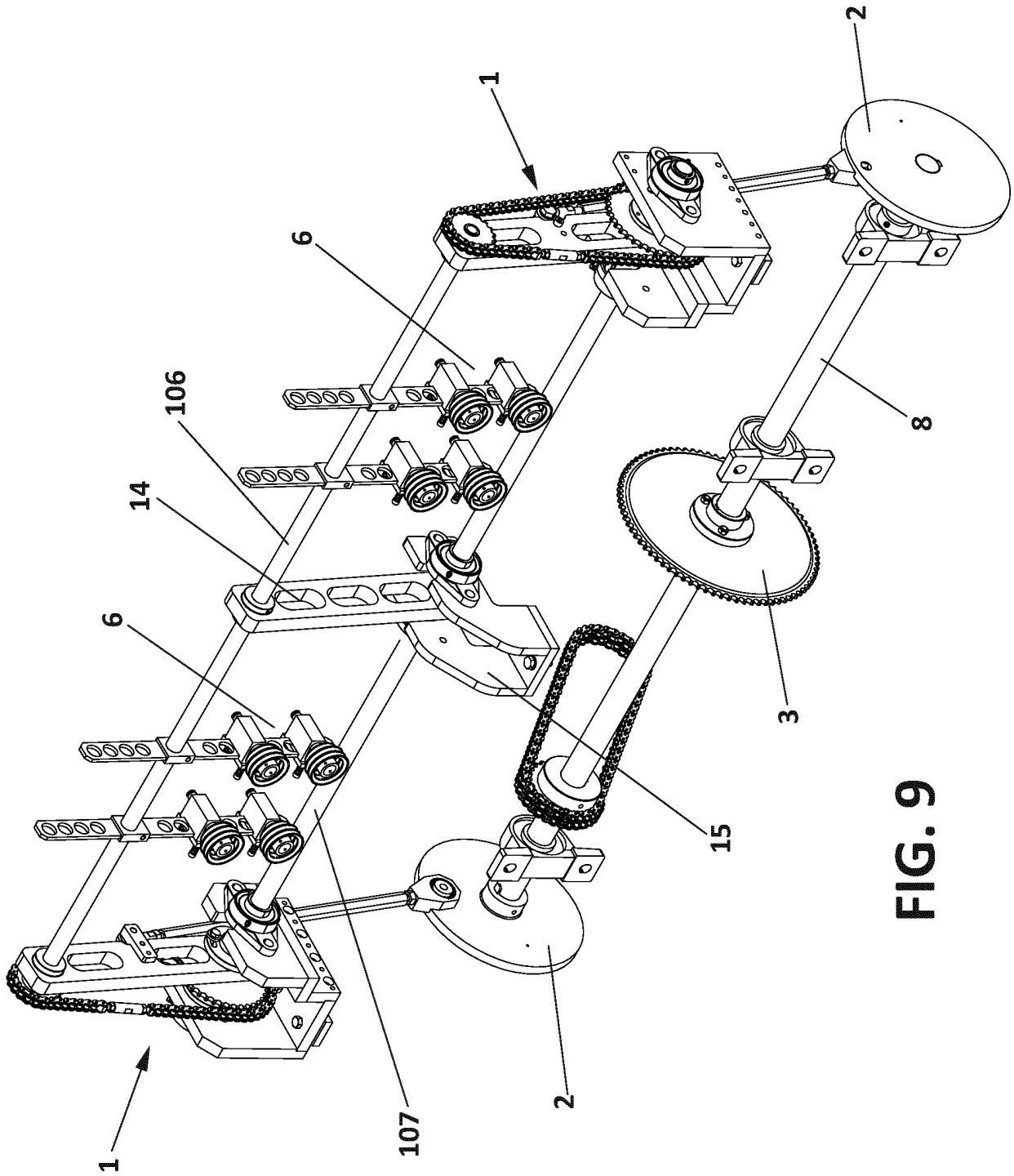

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2022/070517

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)
B31B, B65B

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)

EPODOC, INVENES, WPI, INTERNET

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	ES 1262405U U (TELESFORO GONZALEZ MAQU SLU) 11/03/2021, Description: Pág. 26, line 20 a Pág. 32, line 19. Figures: 2,7-9a,10-14	1-6
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A	ES 1254508U U (BOIX MAQUINARIA SPAIN SLU) 21/10/2020, Description. Figures: 1-4	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14/11/2022	**(15/11/2022)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer A. Garnelo Fernández Telephone No. 91 3495461

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
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INTERNATIONAL SEARCH REPORT

International application No.

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CLASSIFICATION OF SUBJECT MATTER

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B31B50/59 (2017.01)
B65B43/10 (2006.01)
B65B43/18 (2006.01)
B65B43/20 (2006.01)
B65B47/06 (2006.01)

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