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(54) **BRAIDING MACHINE**

(57) Comprising supply means (1) that move platens (2) on which there are arranged reel carrier mechanisms (3) and comprising: at least one figure-of-eight shaped guide (8) through the inside of which there moves a guide element (5) belonging to reel carrier mechanism (3), and a first axis (6) connected to the supply means, belonging to the platen, that ends up at the top in the first pinion (7) with which there meshes at least one satellite pinion (4) which in turn is meshed with a second pinion (9) belonging to reel carrier mechanism; wherein when the first axis rotates it rotates in turn the first pinion that drags the satellite pinion, moving it, dragging in turn said satellite pinion to the second pinion that moves the reel carrier mechanism according to the trajectory of the guide, with the same face of reel carrier mechanism ending up facing a predetermined reference point throughout the trajectory by guide.

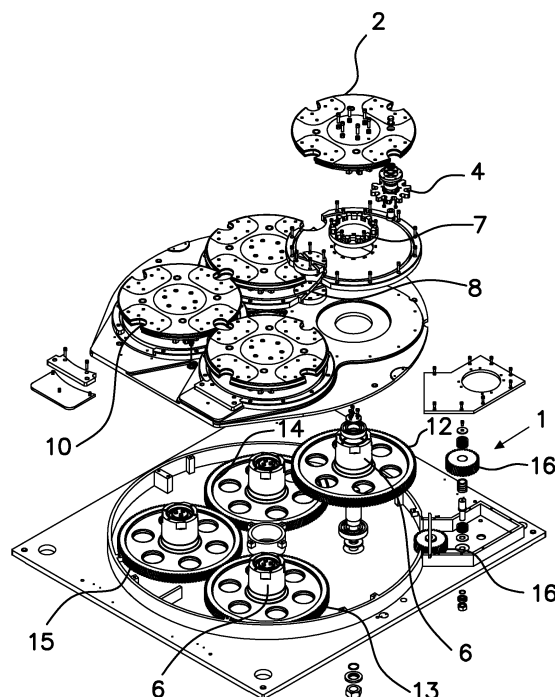


FIG. 2

Description

[0001] Braiding machine of the type comprising supply means that move platens on which there are arranged reel carrier mechanisms, characterised in that it comprises: at least one figure-of-eight shaped guide through the inside of which there moves a guide element belonging to the reel carrier mechanism, and a first axis connected to the supply means, belonging to the platen, which ends up at the top in a first pinion with which there meshes at least one satellite pinion which in turn is meshed with a second pinion belonging to the reel carrier mechanism, where when the first axis rotates it rotates in turn the first pinion that drags the satellite pinion moving it, dragging in turn said satellite pinion to the second pinion which moves the reel carrier mechanism along the trajectory of the guide, with the same face of the reel carrier mechanism also ending up facing a predetermined point of reference throughout the whole trajectory by the guide.

BACKGROUND TO THE INVENTION

[0002] In the state of the art different thread braiding machines are known.

[0003] So, under the state of the art there is Spanish Patent 200102142 (ES220647) "SISTEMA DE DESBOBINADO A TENSION CONSTANTE PARA MÁQUINAS TRENZADORAS", [CONSTANT TENSION UNWINDING SYSTEM FOR BRAIDING MACHINES], applied for in 2001, by the UNIVERSITAT POLITÈCNICA DE CATALUNYA, which relates to constant tension unwinding system for braiding machines, characterised by the installation of an electric C motor in each reel carrier A, a thread tension sensor B, a printed circuit with a microcontroller and the components needed to control the motor following a desired thread tension set point. Also characterized by the electric energy transmission system to each reel carrier A, constantly guaranteeing the supply to all of them along the trajectory, despite they pass by different driving rotary plates G. Said supply is achieved by means of rotary contacts L, the rotary tube K, the driving rotary plates G, the driving plates H and I thereof, and the contacts E of the couplings D of the reel carriers, with the springs F to ensure appropriate contact with the driving plaques of the driving rotary plates G.

[0004] Also Spanish Patent No. 2239359 (ES2545491) is known "DISPOSITIVO PARA LA FABRICACION DE UN PRODUCTO TRENZADO", [DEVICE FOR MAKING A BRAIDED PRODUCT], in the name of AUGUST HERZOG MASCHINENFABRIK GMBH & CO. KG, from the year 2010, which relates to a device for making a braided product with at least two curved trajectories that make up a sheath braiding circle, wherein some retained reels are guided by impellers, and with a reel housing arranged inside the sheath braiding circle, where other reels are retained, wherein the reel housing and at least one of the curved trajectories are joined together by a reel replacement facility and the reel housing

has at least one impeller arranged inside the sheath braiding circle, characterized in that the reel replacement facility has at least one rotary plate connected coaxially to the impeller, which has at least two sections of the curved trajectory arranged in mirror symmetry with an axial plane of the rotary plate, wherein each section of the curved trajectory is configured as an adjustment part for an interruption of the curved trajectory arranged in the sheath braiding circle.

[0005] Another patent that protects the same concept mentioned above is European Patent No. EP0483789 (ES2082096) "APARATO TRENZADOR CON PORTA-BOBINAS MEJORADO" [IMPROVED BRAIDING APPARATUS WITH REEL CARRIER], applied for in 2003 in the name of UNITED STATES SURGICAL CORPORATION, which describes an apparatus for braiding fine denier threads and forming a braided suture product, which includes a transporter box, a main support plaque for the transporter to guide several thread transporters along predetermined routes while supplying fine denier threads to a braiding area. Each thread transporter has a spindle for assembling a shaped reel, with one point of the spindle having a hollow that can couple to elastic leg areas of a reel element held down and assembled by means of a hinge to rotate with respect to the transporter box. The thread tension controls the rotary movement of the reel to supply the thread from it, and the tension of the finished braided suture product is controlled to form a product with a predetermined uniform appearance.

[0006] Finally, along the same line there is Spanish Utility Model No. 0217673 "MAQUINA DE TRENZAR PERFECCIONADA" [IMPROVED BRAIDING MACHINE], from the year 1975, in the name of Mr. Eliseo RATERA PORTELLA, which relates to an improved braiding machine, of the type comprising a series of bobbins provided with lower guiding means in the double sinuous and interlaced profile of a base plaque, and dragged by crisscrossed upper and lower platens associated to a platen carrier sleeve, characterised essentially in that each bobbin has built into its upper neck a hollow bushing with a radial opening for passing the thread that continues along the central bore of another tubular area arranged on said bushing and ending in a tail that extends along the profile that is also interlaced and has double sinuosity, of an upper plate, whereby the bobbins, being doubly guided and dragged, top and bottom can reach high speeds without any detriment to the materials that are under construction.

BRIEF DESCRIPTION OF THE INVENTION

[0007] This application comes under the sector of thread braiding machines.

[0008] The closest document is European Patent No. 2239359 (ES2545491).

[0009] Said European patent solves the problem of setting up braiding and tying types by means of an external reel housing and an internal reel housing, connected by

a system of deviations.

[0010] The problem is that the moment when braiding the thread, to which we have to add the movement of the reel, means that the thread undergoes significant tension, and that one part of the thread is subject to tension while another part of it is hardly subject to any tension when braiding occurs, and this affects the thread quality and strength.

[0011] The inventor has developed a new invention that means that the thread does not undergo any tension changes, since the reel always keeps the same orientation, so that it is not necessary to compensate the movement of the reel carrier to always keep the same tension in the thread.

[0012] The proposed solution is essentially a mechanical solution, where the reel carrier moves along at least one figure-of-eight shaped circuit, wherein some pinion gears mesh with the reel carrier and maintain said reel carrier always with the appropriate tilt to prevent the thread tension varying as it moves.

[0013] An object of this invention is a braiding machine of the type comprising supply means that move some platens on which there are arranged reel carrier mechanisms characterized in that it comprises at least one figure-of-eight shaped guide through the inside of which there moves a guide element belonging to the reel carrier mechanism and a first axis connected to the supply means, belonging to the platen, and which ends up at the top in a first pinion gear in which there meshes at least one satellite pinion which in turn meshes with a second pinion gear belonging to the reel carrier mechanism, wherein when the first axis rotates it rotates in turn the first pinion that drags the satellite pinion, moving it, dragging said satellite pinion in turn to the second pinion that moves the reel carrier mechanism along the guide trajectory, with the same face of the reel carrier mechanism ending up facing a predetermined point of reference throughout the trajectory by the guide.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In order to facilitate understanding, seven pages of drawings are attached to this specification, representing a practical embodiment, as a non-limiting example of the scope of this invention:

- Figure 1 is a perspective elevation view of the object of this invention with two reel carriers in a different platen,
- Figure 2 is an explosion view, but without the reel carriers,
- Figure 3 is a plan view with some transparencies, and
- Figure 4 is a detail showing the arrangement of the different pinion gears,
- Figures 5 to 7 are plan views showing the movement of a thread carrier mechanism along the guide, and
- Figure 8 is a partial, perspective elevation view of the object of this invention with two reel carriers, one

in the exploded state.

SPECIFIC EMBODIMENT OF THIS INVENTION

[0015] So Figure 1 illustrates a supply means 1 with its motor 11, platens 2, guides 8, housings 10 and a reel carrier mechanism 3.

[0016] Figure 2 represents the supply means 1 with intermediate pinion gears 16, first axes 6, platen carrier pinions 12, 13, 14, 15 platens 2, housings 10, guides 8, first pinion 7 and a satellite pinion 4.

[0017] Figure 3 shows the supply means 1, guides 8, first axes 6, platens 2, housings 10, satellite pinions 4 and first pinions 7.

[0018] Figure 4 illustrates platens 2, guides 8, first pinion 7, a second pinion 9, first axis 6 and satellite pinion 4.

[0019] Figures 5, 6 and 7 illustrate platens 2, reel carrier mechanism 3 and guides 8.

[0020] Finally, Figure 8 represents the reel carrier mechanisms 3, platens 2, satellite pinion 4, first pinion 7, second pinions 9 and guide elements 5.

[0021] So, in a specific embodiment, the machine that is the object of this invention comprises supply means 1 that act by moving platens 2.

[0022] On said platens 2 reel carrier mechanisms 3 are arranged.

[0023] The machine also comprises a guide 8 which, in the embodiment, is a set of four figure-of-eight shaped guides that cross over one another, and even if we were to take an individual guide, it would adopt the shape of an uncrossed eight.

[0024] In the inside of the said guide 8 there is a guide element 5, belonging to the reel carrier mechanism 3, guiding the movement of the reel carrier mechanism 3 along the mentioned guide 8.

[0025] It also includes a first axis 6 which belongs to platen 2, which is linked or connected directly or indirectly (as in the embodiment) to supply means 1, so that when the supply means starts to move, they act on the first axis 6, rotating it.

[0026] The first axis 6 ends up on top in a first pinion 7, with which there meshes at least one satellite pinion 4, which is the one that moves along platen 2.

[0027] Satellite pinion 4 is meshed with a second pinion 9 belonging to the reel carrier mechanism 3, which means that the above-mentioned movement of the satellite pinion 4 acts on second pinion 9, moving or shifting reel carrier mechanism 3.

[0028] So, when the first axis 6 rotates due to the action of supply means 1, it rotates in turn first pinion 7 which drags satellite pinion 4, moving it.

[0029] This means that in turn it drags said satellite pinion 4 to second pinion 9 which, as indicated above, since it belongs to reel carrier mechanism 3, the movement on said second pinion 9 implies that it moves reel carrier mechanism 3 as well, as guide element 5 advances along the said guide 8.

[0030] This special configuration means that if we take

any reference point outside, reel carrier mechanism 3 will always have the same orientation throughout the trajectory of guide 8, which means that when braiding, the thread does not suffer any kind of tension as a result of rotating reel carrier mechanism 3.

[0031] Optionally, platen 2 comprises at least one housing 10 (in this embodiment four for each platen 2) wherein reel carrier mechanism 3 is positioned, facilitating the fitting of reel carrier mechanism 3 to platen 2 as it moves along said guide 8.

[0032] Constructively, it can be envisaged that first pinion 7, satellite pinion 4 and second pinion 9 are placed under platen 2. This has the advantage that platen 2 protects them, increasing their durability.

[0033] Also optionally, supply means 1 that move platens 2 include a motor 11 which meshes with some platen carrier pinions 12, 13, 14, 15. Said platen carrier pinions 12, 13, 14, 15 are integral with the respective first axes 6, with said first axis 6 rotating in the same rotary direction as the respective platen carrier pinion 12, 13, 14, 15.

[0034] So, the machine would operate as follows. Supply means 1 would be started up, in this embodiment, by a motor 11 which, through some intermediate pinions 16, would transmit movement to one of the platen carrier pinions 12.

[0035] In this embodiment we can see that the example has four platen carrier pinions 12, 13, 14, 15, which generate four crossed figure-of-eight guides 8.

[0036] So when platen carrier pinion 12 that receives the movement from intermediate pinion 16 rotates in one direction, the two platen carrier pinions 13, 14 which mesh with it will rotate in the opposite direction and the last of the platen carrier pinions 15, will rotate in the same direction as the first platen carrier pinion 12.

[0037] The direction of movement that is transmitted to platen carrier pinions 12 is also transmitted to the first axis 6, and in the same way the direction of movement in platen carrier pinions 13, 14, 15 is the same as the respective first pinion 6 in each one.

[0038] As indicated above first axis 6 ends up on the top in first pinion 7 which rotates in the same direction as first axis 6.

[0039] Said first pinion 7 meshes with satellite pinion 4 which, as you can see in Figure 3, can be several satellite pinions 4 (four for example) for each first pinion 7.

[0040] Also, said satellite pinion 4 meshes with second pinion 9 belonging to reel carrier mechanism 3, so that when satellite pinion 4 is moving, it drags with its movement reel carrier mechanism 3 which, in turn, follows guide 8 thanks to guide element 5.

[0041] If there were the option of housing 10, reel carrier mechanism 3 would be located in said housing until platen 2 abandons.

[0042] Once reel carrier mechanism 3 has completed the trajectory given in one of the platens 2, the actual satellite pinion 4, together with the trajectory of the guide 8 means that reel carrier mechanism 3 moves towards another platen 2, following a figure-of-eight, but without

crossing over itself.

[0043] In the following platen 2, reel carrier mechanism 3 interacts equally with the different elements.

[0044] As can be seen in Figures 5 to 7, at all times reel carrier mechanism 3 is orientated always towards the same point, so that thread tensions are avoided, since it always maintains the same orientation.

[0045] If we start with Figure 5 where reel carrier mechanism 3 would be in an initial position, when moving and reaching the position in Figure 6, which is when said reel carrier mechanism 3 is transferred from one platen 2 to another, the orientation that said reel carrier mechanism 3 has, is the same, so that the thread does not undergo any kind of tension due to the fact that reel carrier mechanism 3 could pull it in a rotational and translational traction movement.

[0046] In Figure 7 it can be observed that the orientation of reel carrier mechanism 3 is the same as that in Figures 5 and 6, and this is thanks to the mechanism explained above which would be described for Figures 1 to 4.

[0047] This way, when the thread has been braided in the reel (not shown), the thread has not tensions derived from the rotational movement of reel carrier mechanism 3 because this does not rotate, or hardly rotates.

[0048] This is particularly important when it is a question of producing safety material, where the tensions of braided threads can affect the quality, and therefore the safety of the braided rope.

[0049] This invention describes a new braiding machine. The examples mentioned herein do not limit this invention, therefore it will be able to have different applications and/or adaptations, all within the scope of the following claims.

Claims

1. Braiding machine of the type comprising supply means (1) that move some platens (2) on which there are arranged reel carrier mechanisms (3) **characterized in that** it comprises:

- at least one figure-of-eight guide (8) through the inside of which there moves a guide element (5) belonging to reel carrier mechanism (3), and
- a first axis (6) connected to supply means (1), belonging to platen (2), which ends up on top in a first pinion (7) with which there meshes at least one satellite pinion (4) which in turn is meshed with a second pinion (9) belonging to reel carrier mechanism (3).

wherein when first axis (6) rotates it rotates in turn first pinion (7) that drags satellite pinion (4) moving it, dragging in turn said satellite pinion to second pinion (9) which moves reel carrier mechanism (3) according to the trajectory of guide (8), with the same

face of reel carrier mechanism (3) ending up facing a predetermined reference point throughout the trajectory by guide (8).

2. Machine, according to claim 1, **characterized in that** platen (2) comprises at least one housing (10) wherein reel carrier mechanism (3) is positioned. 5
3. Machine, according to claim 1 or 2, **characterized in that** first pinion (7), satellite pinion (4) and second pinion (9) are placed under platen (2). 10
4. Machine, according to claim 3, **characterized in that** supply means (1) that move platens (2) comprise a motor (11) that meshes with a platen carrier pinion (12) which, in turn, links with other platen carrier pinions (13, 14, 15) with said platen carrier pinions (12, 13, 14, 15) being integral with the respective first axes (6), with said first axis (6) rotating in the same direction of rotation as the respective platen carrier pinion (12). 15
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4. Machine, according to claim 3, **characterized in that** supply means (1) that move platens (2) comprise a motor (11) that meshes with a platen carrier pinion (12) which, in turn, links with other platen carrier pinions (13, 14, 15) with said platen carrier pinions (12, 13, 14, 15) being integral with the respective first axes (6), with said first axis (6) rotating in the same direction of rotation as the respective platen carrier pinion (12).

Amended claims under Art. 19.1 PCT

1. Braiding machine of the type comprising supply means (1) that move some platens (2) on which there are arranged reel carrier mechanisms (3): 25

- at least one figure-of-eight guide (8) through the inside of which there moves a guide element (5) belonging to reel carrier mechanism (3), and 30
- a first axis (6) connected to supply means (1), belonging to platen (2), provided by a first pinion (7) with which there meshes at least one satellite pinion (4) which in turn is meshed with a second pinion (9) belonging to reel carrier mechanism (3), 35

which moves reel carrier mechanism (3) according to the trajectory of guide (8), with the same face of reel carrier mechanism (3) ending up facing a predetermined reference point throughout the trajectory by guide (8) 40

characterized in that it comprises: 45
the first axis (6) which ends up on top in a first pinion (7) and wherein when first axis (6) rotates it rotates in turn first pinion (7) that drags satellite pinion (4) moving it, dragging in turn said satellite pinion to second pinion (9). 50

2. Machine, according to claim 1, **characterized in that** platen (2) comprises at least one housing (10) wherein reel carrier mechanism (3) is positioned. 55

3. Machine, according to claim 1 or 2, **characterized in that** first pinion (7), satellite pinion (4) and second pinion (9) are placed under platen (2).

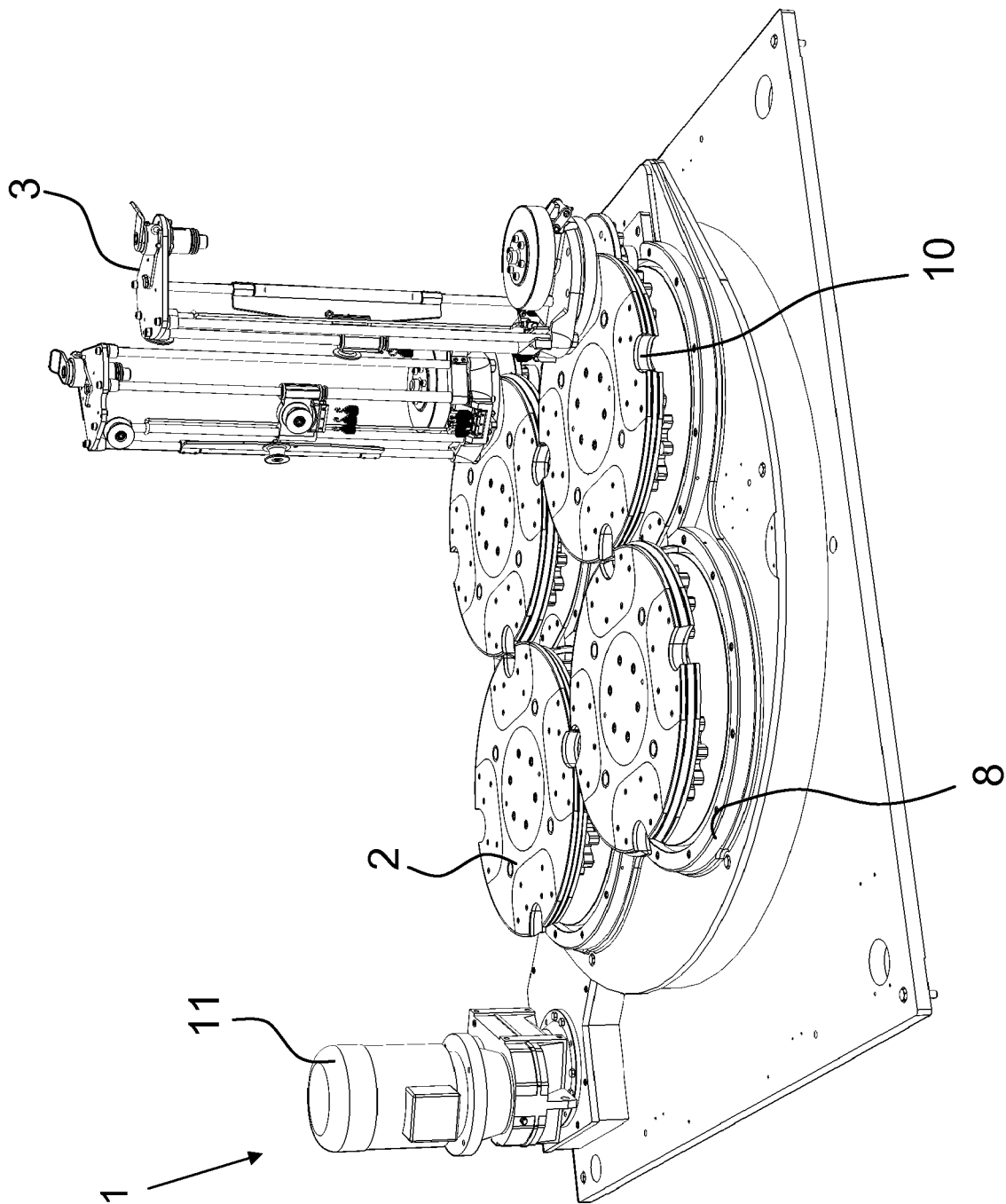


FIG. 1

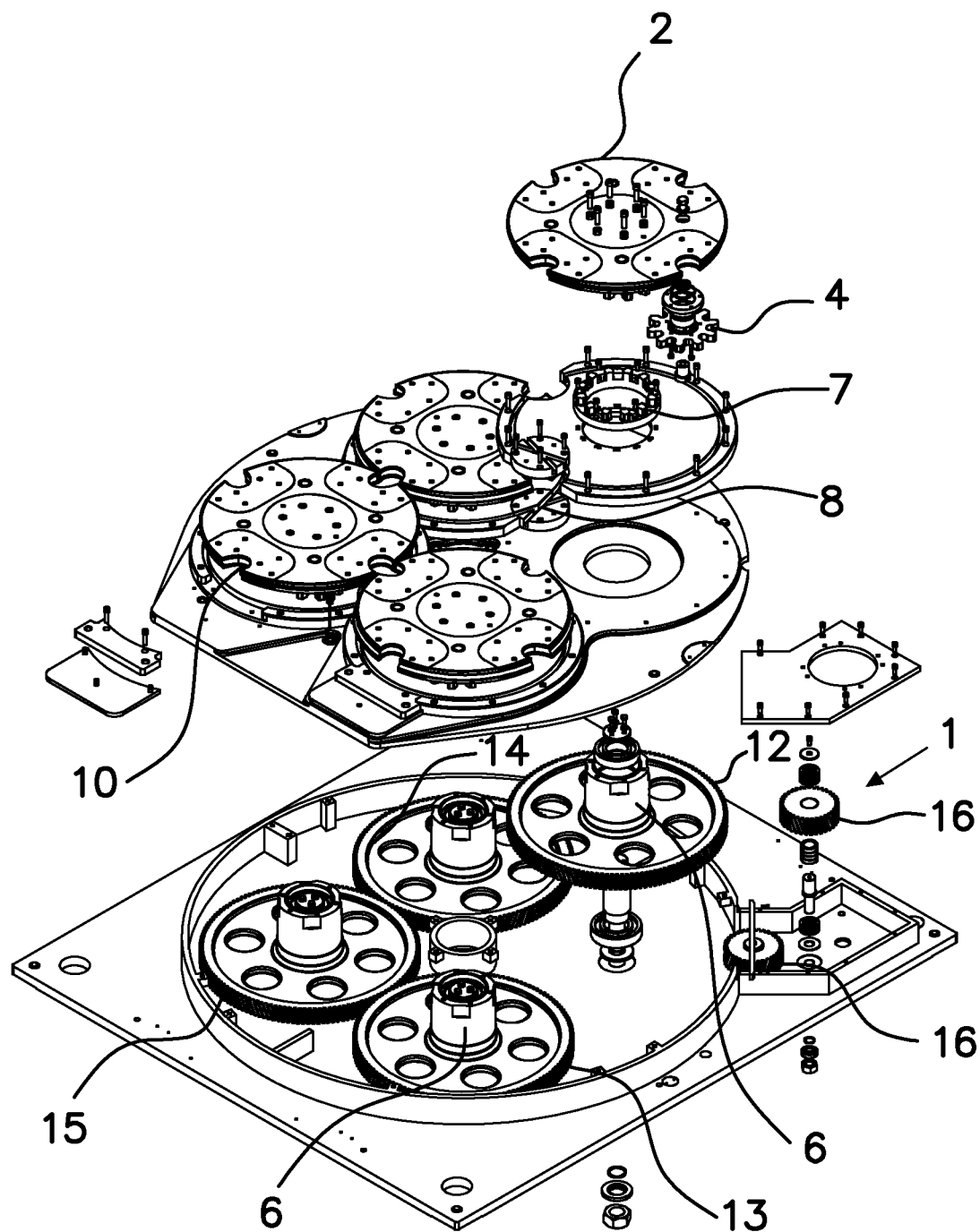


FIG. 2

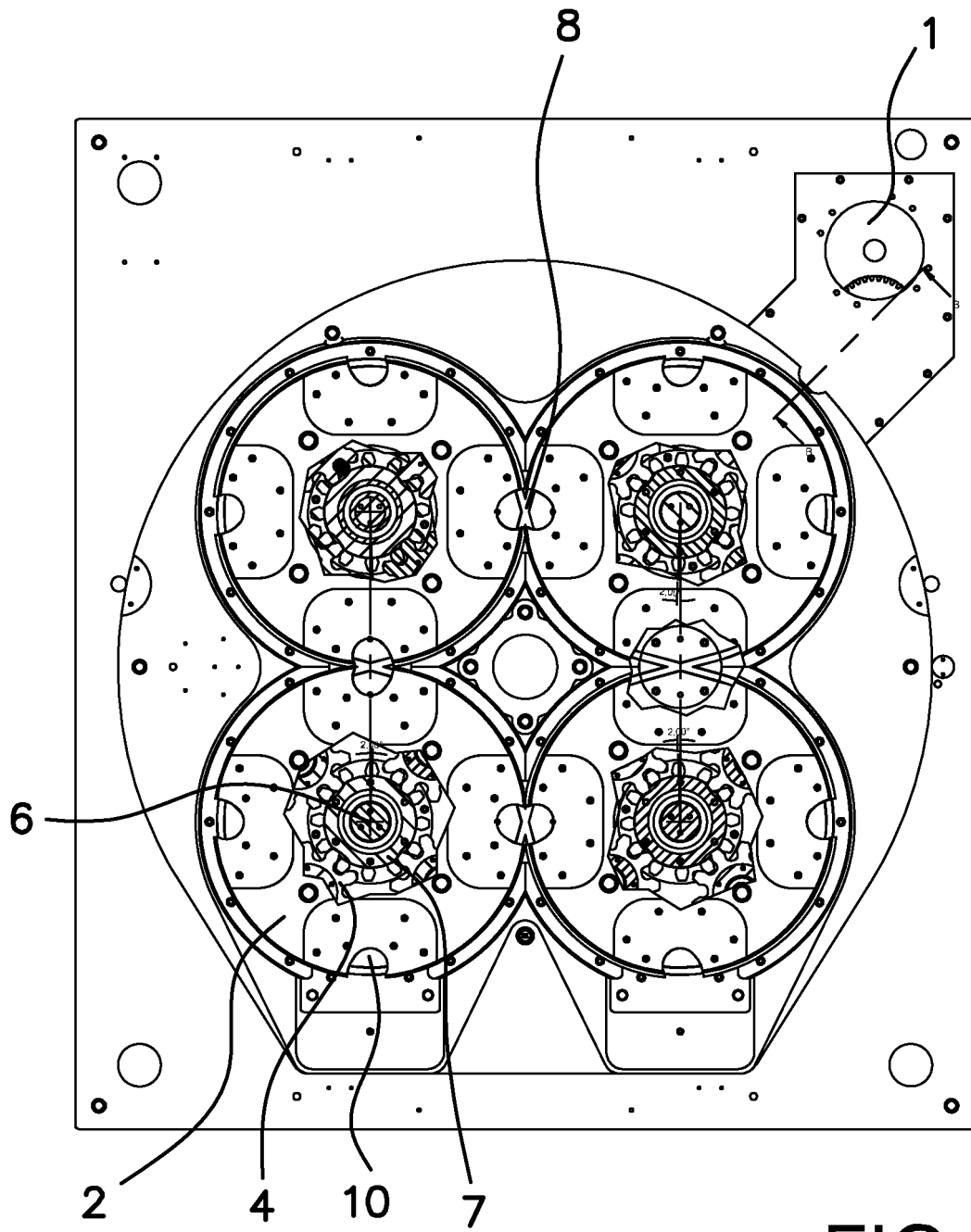


FIG. 3

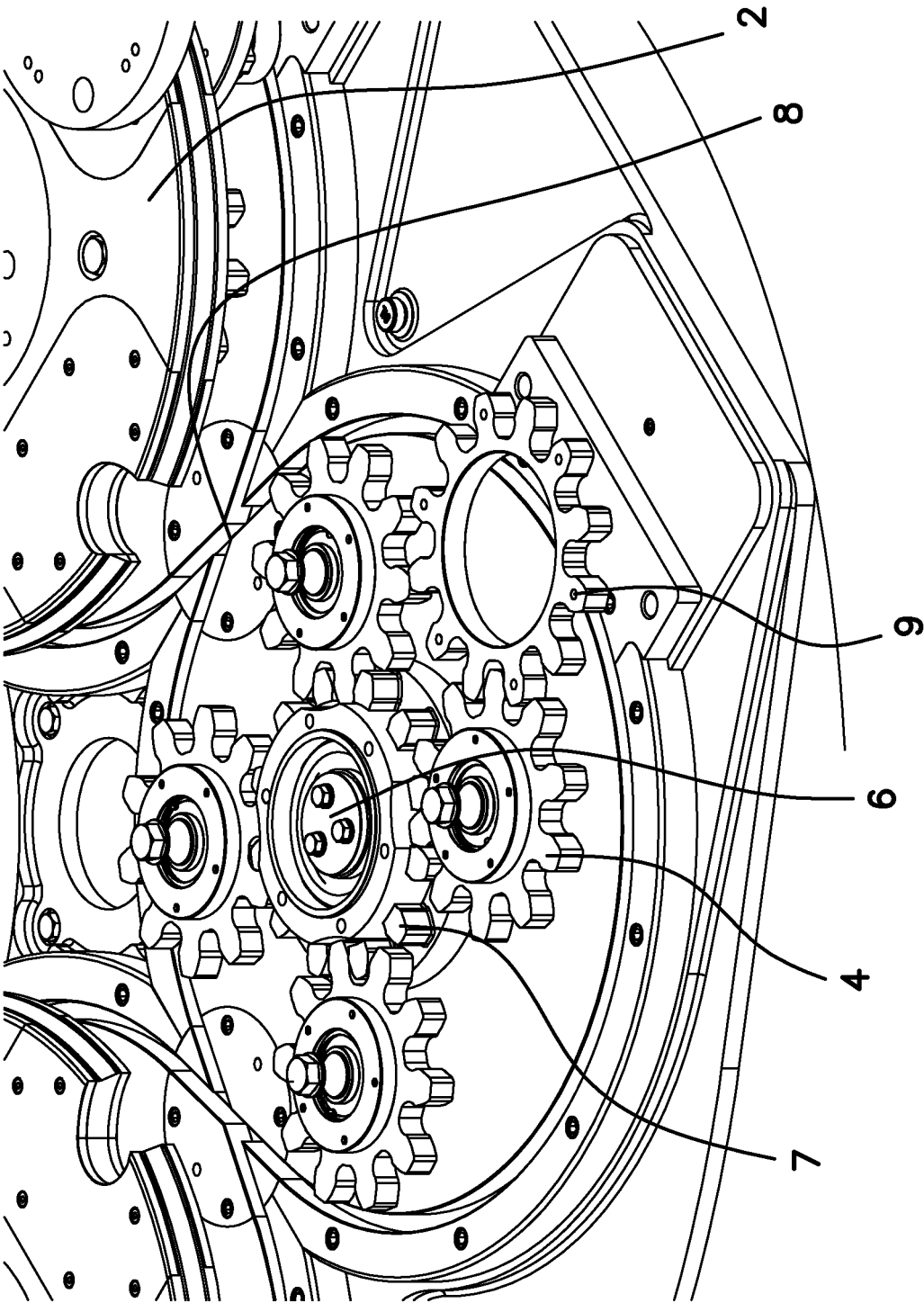


FIG. 4

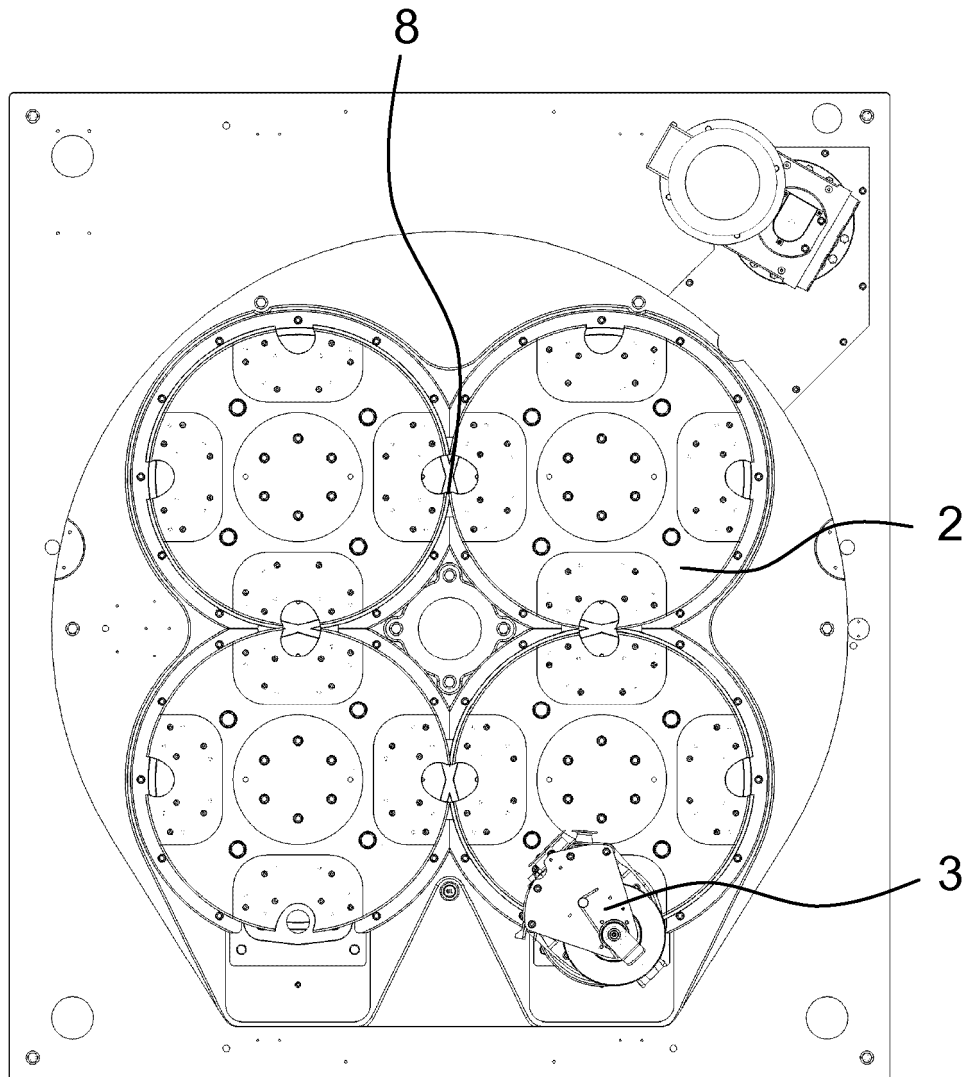


FIG. 5

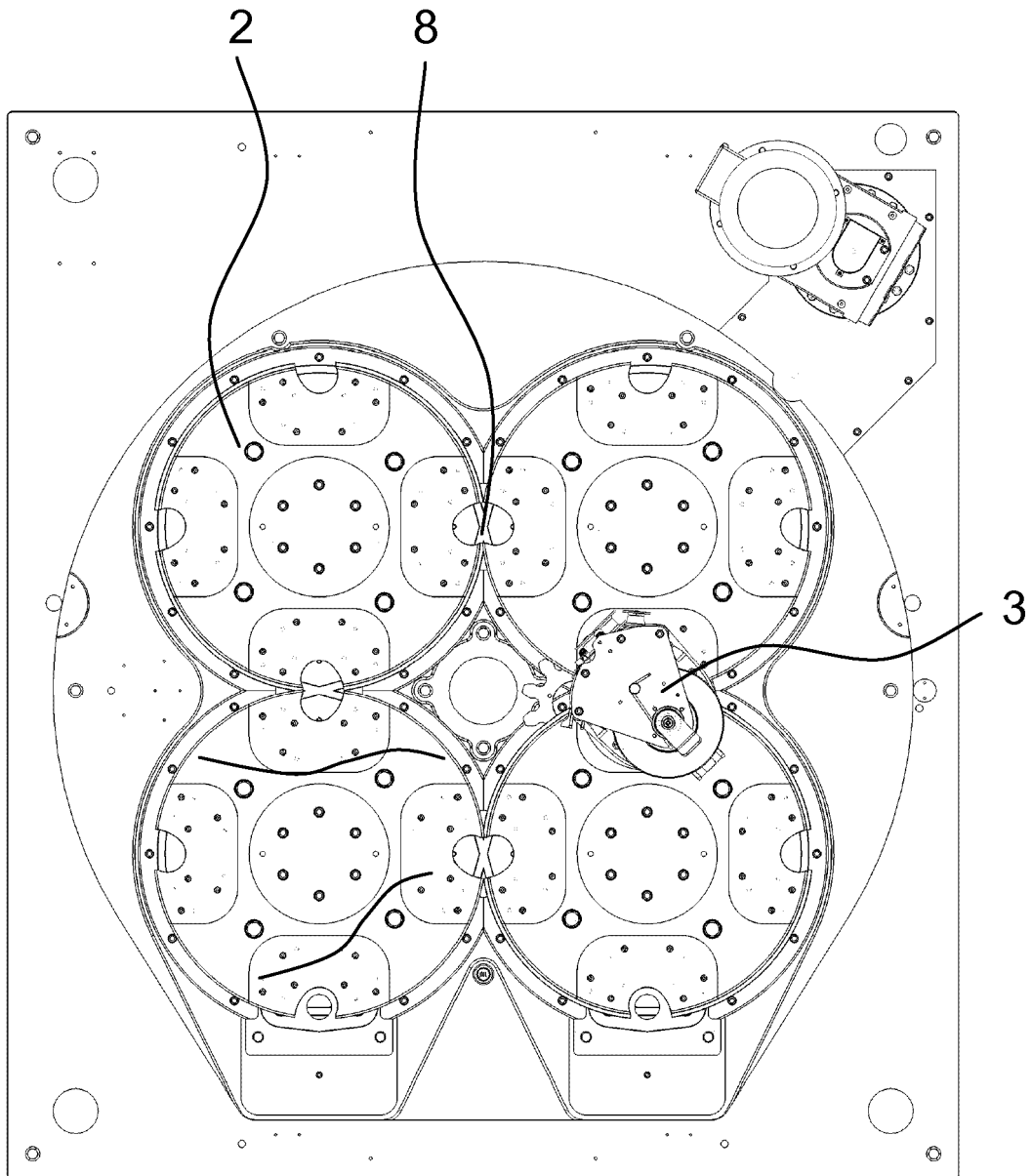


FIG. 6

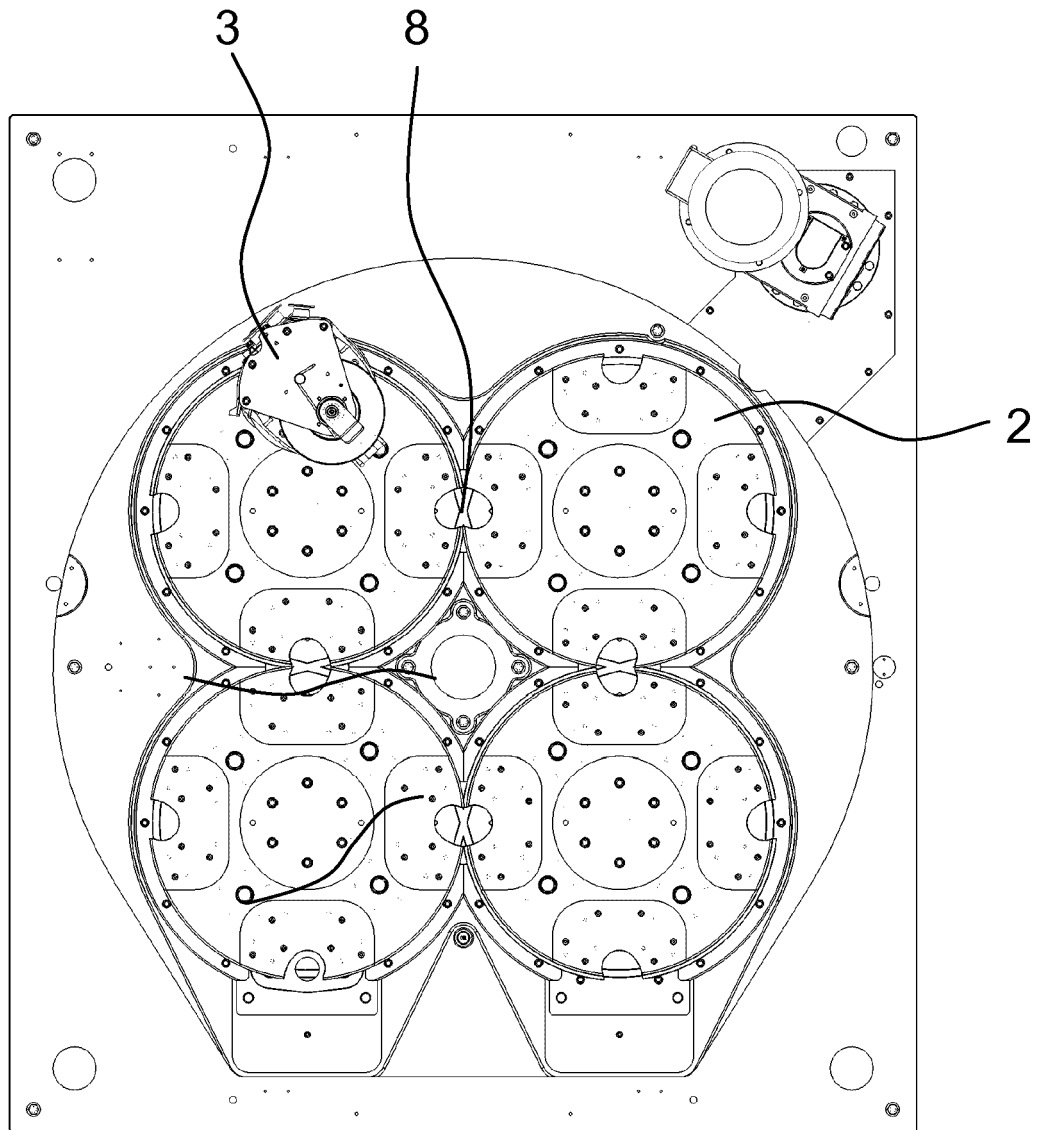


FIG. 7

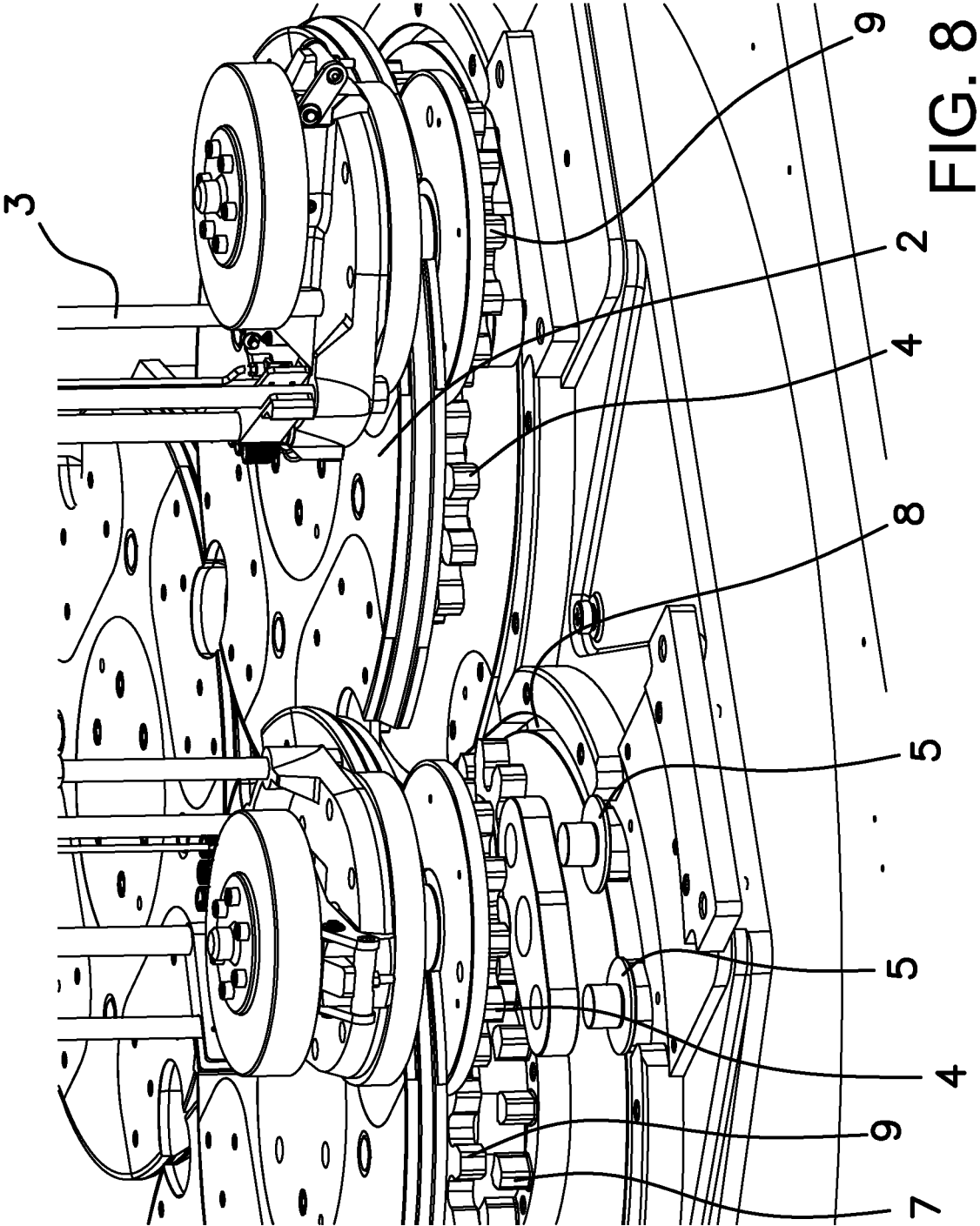


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No

PCT/ES2016/070135

A. CLASSIFICATION OF SUBJECT MATTER

INV. D04C3/38
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D04C

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 371 573 A (YOSHIKI KOREKI ET AL) 5 March 1968 (1968-03-05) column 2, line 19 - column 3, line 74; claims 1, 2; figures 1-4, 11 -----	1-4
A	US 5 085 121 A (RICHARDSON DONALD [US]) 4 February 1992 (1992-02-04) column 5, line 26 - column 8, line 55; claims 5, 6; figures 1-7 -----	1-4

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

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Date of the actual completion of the international search

9 September 2016

Date of mailing of the international search report

16/09/2016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/ES2016/070135

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3371573	A	05-03-1968	NONE
US 5085121	A	04-02-1992	NONE

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- ES 200102142 [0003]
- ES 2239359 [0004]
- ES 2545491 [0004] [0008]
- EP 0483789 A [0005]
- ES 2082096 [0005]
- ES 0217673 [0006]
- EP 2239359 A [0008]