(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 985 152 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
12.07.2023 Bulletin 2023/28

(21) Application number: **19759630.7**

(22) Date of filing: **14.06.2019**

(51) International Patent Classification (IPC):
D04C 3/18 *(2006.01)* ***D04C 3/20*** *(2006.01)*
D04C 3/30 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D04C 3/18; D04C 3/20; D04C 3/30

(86) International application number:
PCT/ES2019/070418

(87) International publication number:
WO 2020/249832 (17.12.2020 Gazette 2020/51)

(54) **BRAIDING MACHINE**

FLECHTMASCHINE

TRESSEUSE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
20.04.2022 Bulletin 2022/16

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GB-A- 555 714 **GB-A- 611 071**

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Description

[0001] Braiding machine of the type comprising a series of plates arranged in a continuous order in a closed circuit, each plate comprising certain slots that accommodate spindles having a guide; at least a drive means for driving the plates; guide channels where the spindle guides run, and at least two diverter channels having two positions; a first one for continuous rotation by the same plate, and a second position for shifting the plate; characterized in that it comprises: a first group of plates having at least five plates, one of which plates is the driving plate, the first driving plate, arranged one after the other and defining two end plates, having at least four slots in each plate; a second group of plates having two plates, both driving plates, which are arranged after the two end plates, one for each end plate, having at least four slots and both plates, in the two plates; and a third group of plates having a plate that is arranged between the second driving plates, the third driving plate, which closes the circuit, and having at least two slots more than the plates in the second group of plates and, since the two diverter channels are located between the second group of plates and the third group of plates, they define a first operation position in which the third driving plate remains isolated from the circuit, and a second operation position in which the third driving plate is part of the circuit.

BACKGROUND OF THE INVENTION

[0002] Different thread braiding systems are known in the state of the art. A first system consists of production with machines that perform a round braiding with an even number of threads. These machines intertwine the threads in the coils by rotating the coils in one direction and rotating the coils in the opposite direction, thus forming what is known as a tubular braided structure. These braids are used for different purposes, for example, ropes for ships, for climbing, etc.

[0003] The second system consists of machines that produce a flat braiding, with an odd number of threads. Thus, state of the art is Spanish Patent n° 200002978 (ES2193817), "BRAIDING MACHINE", of 2000, owned by AMERICAN METRIC CORPORATION, concerning a braiding machine formed by a supporting table mounting a plurality of individual segments forming a bed having substantially circular tracking groove. Each segment comprises a segment groove which comprises a pair of opposed transfer openings formed through the outer wall, with the transfer openings of adjacent segments being in contact forming the tracking groove as an endless ring. The size of the endless ring is determined by the number and size of the segments used. The tracking groove may be coated with a selected material other than the material forming the segment.

[0004] The applicant company is the owner of Spanish Patent n° 201531634 (ES2612143-WO2017081338) "BRAIDING MACHINE", of 2015, which comprises supply means which move a number of plates on which spool-carrying mechanisms are disposed, and comprising at least one guide in the form of a figure of eight, inside which a guiding element belonging to the spool-carrying mechanism moves, and a first shaft connected to the supply means, belonging to the plate, and terminating at the top in a first pinion, to which at least one satellite pinion engages, which is in turn engaged with a second pinion belonging to the spool-carrying mechanism, wherein a rotation of the first shaft brings about the rotation of the first pinion, which blocks the satellite pinion, moving same and moves the spool-carrying mechanism according to the path of the guide, with the same face of the spool-carrying mechanism remaining facing a predetermined point of reference during the entire course of the guide.

[0005] In addition, this document cites German Patents DE616856 and DE102009020053 as reference, which respectively protect two systems of exchange of spindles among plates, through guide lanes, both patents being now in the public domain.

[0006] Further, British Patent GB611071 refers to a braiding machine wherein the wanderer spindles have a sinuous path imparted thereto by means of a series of driven rotatable notched discs located within an oil bath and having an intermittent change over guide track located at the junction of each disc for the purpose herein stated, and a switch operating device for stopping the operation of the machine in the event of a thread breaking.

[0007] Lastly, another British Patent GB555714 describes a circular braiding machine for making tubular fabric that is converted for making one or more selvedge widths of fabric by blocking one or more loops of its serpentine raceway, and so that the spacing of the driving units may remain uniform, the end driving unit which is provided with a greater number of driving notches than the remaining units is driven by compound gearing.

BRIEF DESCRIPTION OF THE INVENTION

[0008] The present invention belongs to the field of braiding machines.

[0009] The closest document is Spanish Patent n ° 200002978 (ES2193817). Such patent solves the problem of friction between drive gears. Yet, the patent has the problem, as all the machines existing at present in the market do, that in order to braid flat and round threads the machine has to be fully stopped and the machine become adapted by removing or adding plates. Consequently, it is not worth making a thread having one flat section, then a round section, then a flat one, then a round one, etc., because changing the configuration of the machine would be time consuming.

[0010] This invention solves this problem by enabling the switch from flat braiding to round braiding and vice versa almost automatically, and within a few seconds, just the time needed to synchronize flat and round, and

vice versa, thus avoiding thread splicing.

[0011] This in turn makes the manufacturing of a thread with different types of braiding convenient, which is very useful for such fields as surgery, where it may be of interest for achieving high standard stitching.

[0012] An object of the present invention is a braiding machine of the type comprising a series of plates arranged in a continuous manner in a closed circuit, each plate comprising a number of slots accommodating a number of spindles with a guide, at least one drive means for driving the plates, guide channels where the spindle guides run and at least two diverter channels having two positions, a first position for continuous rotation in one same plate and a second position, for switching plates; characterized in that it comprises: a first group of plates having at least five plates, where one of the plates is a driving plate, the first driving plate, arranged in a continuous manner and two end plates, having at least four slots in each plate, a second group of plates, having two plates, both of which are driving plates, second driving plates, which are located subsequent to the two end plates, one for each end plate, having at least four slots, in both plates and a third group of plates having one plate, fitted in between the second driving plates, driving plate, the third driving plate, closing the circuit, having at least two slots more than the plates of the first group, and because two diverter channels are located between the second and the third group of plates, they define a first operation position where the third driving plate is isolated from the circuit and a second operation position where the third driving plate is part of the circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In order to facilitate this explanation, the present description includes eight sheets with drawings representing a practical embodiment. Such embodiment is included by way of example, and shall not limit the scope of the present invention:

- Figure 1 is a general view of the object of the present invention showing a round braid configuration;
- Figure 2 is a bottom view of Figure 1, showing the engines and the gears;
- Figure 3 is an elevation view of the present invention with a flat braiding configuration;
- Figure 4 is an elevation view of Figure 3, without the spindles;
- Figure 5 is an elevation view of the present invention with a round braiding configuration;
- Figure 6 is a detailed view of an example of diverter channels;
- Figure 7 is a detailed view of the first driving plate having spindles and coils; and
- Figure 8 is a schematic view of three positions with flat braiding.

PRACTICAL EMBODIMENT OF THE PRESENT INVENTION

[0014] Figure 1 shows an end plate 5, second driving plates 6, 7, a third driving plate 8, drive means of a first driving plate 13, drive means of the second driving plates 14, 15, drive means of third driving plate 16, drive means of diverter channels 17,18 and a chassis 26.

[0015] Figure 2 includes a representation of the drive means of a first driving plate 13, drive means of second driving plates 14, 15, drive means of third driving plate 16, drive means of diverter channels 17,18, chassis 26, a first driving pinion 27, driven pinions 28,29 and end plate pinions 30,31.

[0016] Figure 3 shows first driving plate 1, driven plates 2,3, end plates 4,5 with their respective slots 9, all of which form the first group of plates, second driving plates 6,7 which form the second group of plates, third driving plate 8 with its respective slots 11 which forms the third group of plates, the first group of plates spindles 20, the second group of plates spindles 23 and switching spindles 24, 25.

[0017] Figure 4 shows the first driving plate 1, driven plates 2, 3, end plates 4, 5 with their slots 9, second driving plates 6, 7 with their slots 10, third driving plate 8 with its slots 11 and switching spindles 24, 25.

[0018] Figure 5 shows first driving plate 1, driven plates 2, 3, end plates 4, 5 with their slots 9, second driving plates 6, 7 with their slots 10, third driving plate 8 with its slots 11, first group of plates spindles 20, second group of plates spindles 23, third group of plates spindles 32 and switching spindles 24, 25.

[0019] Figure 6 shows second driving plates 6, 7, third driving plate 8, diverter channels 12, 19 and guide channels 22.

[0020] Figure 7 shows first driving plate 1, intersection channels 33, a spindle guide 21, first group of plates spindle 20 and guide channels 22.

[0021] Last, Figure 8 shows the end plate with its slots 9, which form the first group of plates, second driving plates 6, 7 with their slots 10 which form the second group of plates, second group of plates spindles 23 y switching spindles 24,25.

[0022] In a preliminary manner, Figure 6 illustrates the two positions of the diverter channels 12, 19, one in each position. This is aimed at facilitating the explanation that will be provided hereafter. In principle, when both diverter channels 12,19 operate, they should be arranged in the same position and not as shown in Figure 6, that is, the diverter channels should not be each in its own operating position and both should be in the same operating position. In other words, for round braiding, the two diverter channels should be positioned as shown in the diverter channel 12, and for the flat braiding both diverter channels should be positioned as they are shown in diverter channel 19.

[0023] Thus, the braiding machine of the present invention is formed by a series of plates 1-8 that are ar-

ranged in a continuous manner, one after the other, forming a closed circuit.

[0024] The plates 1-8 comprise slots 9, which is where the spindles 20 are accommodated with the braiding thread.

[0025] Each one of the spindles 20 has a guide 21, which is arranged inside the guiding channels 22, and the guides 21 move inside the guiding channels 22 (Figure 7).

[0026] The invention comprises at least one drive means that drives the plates 1-8, and at least two diverter channels 12,19 having two positions. This embodiment comprises two channels, but the number of channels may be increased if required, to adapt to particular structural needs.

[0027] The positions are: a first position for continuous rotation of the spindle in one same plate and a second position, for the spindle to switch plates; that is, in the first position the spindle keeps rotating within a same plate and in the second position the spindle switches plate.

[0028] The plates are grouped in three groups, having different purposes and different actions, according to whether the braiding is flat or round.

[0029] The first group of plates is made up of a minimum number of five plates 1, 2, 3, 4, 5. One of the plates is a driving plate, the first driving plate 1, that is, this driving plate 1 transmits motion to the other plates; driven plates 2, 3 and end plates 4, 5. Plates 1, 2, 3, 4, 5 are arranged in a continuous manner and they define the two end plates 4, 5, which are also driven plates. In addition, plates 1, 2, 3, 4, 5 include at least four slots 9 in each of plates 1, 2, 3, 4, 5.

[0030] The second group of plates is made up of two plates 6, 7, both of which are driving plates, which will hereafter be referred to as second driving plates 6, 7. Both second driving plates are positioned after the two end plates 4, 5, one for each end plate. The same as the plates of the first group, also the plates of the second group comprise at least four slots 10, in both plates 6, 7.

[0031] The last group of plates, the third group, is made up of just one plate, a driving plate, the third driving plate 8, which is positioned in between the second driving plates 6, 7, that is, closing the circuit.

[0032] The third driving plate 8 includes at least two slots 11 more than the plates of the first group of plates.

[0033] In addition, the two diverter channels 12, 19 are positioned between the second group of plates and the third group of plates. The two diverter channels define a first operation position wherein the third driving plate 8 is isolated from the circuit, consistently with the flat braiding and the position shown in the diverter channel 19, that is, it will not carry any spindles; and a second operation position wherein the third driving plate 8 is part of the circuit, consistently with the round braiding, the diverter channel is positioned as shown in the diverter channel 12 and therefore conveys the spindles.

[0034] Optionally, plates 1, 2, 3, 4, 5 of the first group of plates and plates 6, 7 of the second group of plates include four slots, and plate 8 of the third group of plates includes six slots.

[0035] Another configuration is possible wherein each driving plate 1, 6, 7, 8 is an independent drive means 13, 14, 15, 16, for example, a servo driver for each driving plate 1, 6, 7, 8.

[0036] As in the previous paragraph, the machine can be configured so that each diverter channel 12, 19 comprises an independent drive means 17, 18, for example, servo drivers, that is, to drive the diverter channels 12, 19 between the first operation position and the second operation position and vice versa, as above explained.

[0037] The possibility has been provided that, when in the round braiding position, the third driving plate 8 rotates at a lower speed than the second driving plates 6, 7 and the first driving plate 1.

[0038] In the configuration explained before, where plates 1, 2, 3, 4, 5 of the first group of plates and plates 6, 7 of the second group of plates have four slots, and plate 8 of the third group of plates has six slots, it is provided that the third driving plate 8 rotates at 2/3 the speed of the speed of second driving plates 6, 7.

[0039] Similarly, the possibility is provided that in a flat braiding position, during rotation, second driving plates 6, 7 include at some time a spindle 23, 24 in each slot 10 (Figure 8).

[0040] Similarly, in the flat braiding position, second driving plates 6, 7 move forwards and backwards, as will explained more in detail bellow, and which is illustrated in the three positions in Figure 8.

[0041] Also in Figure 8, in the flat braiding position, when second driving plates 6, 7 switch one of their spindles 24 with end plates 4, 5 of the first group (Figure 8A), the plates keep moving forward by the effect of the inertia and then go back to receive spindle 25 from end plates 4, 5 (Figure 8B), whereas end plates 4, 5 continue in the same rotation direction and the second driving plates 6, 7 switch their rotation direction, first going forward, then going backwards and the forward again.

[0042] Two configurations are possible as regards the third flat plate 8 when in the flat braiding position: in a first configuration, the third driving plate 8 does not rotate, is stopped while the other plates rotate, and in a second configuration the third driving plate 8 rotates as an idle plate, that is, without intervening in the braiding.

[0043] Continuing with the examples, in yet another embodiment, both in the round braiding position and in the flat braiding position, seventeen spindles are included: 20, 23, 24, 25. As a result, a braiding machine can be configured so that eight spindles rotate in one direction and nine spindles rotate in the opposite direction. That is, even in round braiding, braids of an odd number of threads can be produced, whereas round braids are usually made only with an even number of threads.

[0044] Differing from the machines known in the art, in this case the third driving plate 8 can be configured so that the diameter of the third driving plate 8 is the same

as the second driving plates 6, 7 and the same diameter as the plates in the first group 1-5.

[0045] To facilitate the braiding, both round and flat braiding, plates 1 -8 are arranged in a circle. Thus, in a practical embodiment, the operator will firstly set the control panel (not shown, commonly known and not part of the claims hereof) according to the type of braiding the machine is to perform. If the operator choses a round braiding, as in Figures 1, 2, 5, 6 and 7, the process will be as follows:

The starting point is that plates 1-7 have four slots in each plate and six slots in the third driving plate 8. The number of slots 11 in the third driving plate 8 may vary according to the number of slots in the remaining plates 1 - 7 and of the particular needs, but the minimum number of slots must be two more slots that in the second driving plates 6, 7.

[0046] The slot configuration also relates to the rotation speed of the third driving plate 8 which, having second driving plates 6, 7 with four slots each, and third driving plates 8 with six slots 11 each, that is in a 2/3 ratio, in turn defines that the rotation speed of the third driving plate 8 is 2/3 the speed of the second driving plates 6, 7, and therefore the ratio is the same ratio between the slots of the second driving plates 6, 7 and the third driving plate 8.

[0047] In this way, the configuration of the round braiding in this embodiment includes eight plates. These eight plates include four driving plates, first driving plate 1, which drives the plates in the first group of plates by means of a gear system (Figure 2), and second driving plates 6, 7 and third driving plate 8.

[0048] The closed circuit in this example, formed by eight plates 1-8, comprises seventeen spindles 20, 23, 24, 25, 32, nine rotating in one direction and eight rotating in the opposite direction. The same number of spindles is used in both the configuration for round braiding and the configuration for flat braiding.

[0049] Still referring to round braiding, when first driving plate 1 rotates in one direction, the two driven plates 2, 3 that follow the first driving plate 1 rotate in the opposite direction and end plates 4, 5 rotate in the same direction as the first driving plate 1.

[0050] All the plates are connected by gears (Fig. 2) that allow that when first driving plate 1 rotates, this makes all the plates to rotate by effect of the movement that the first driver pinion 27 connected to the first driving plate 1 generates when actuating the two driven pinions 28, 29 that are connected to driven plates 2, 3; and these are connected to end plate pinions 30, 31, which in turn are connected to end plates 4, 5, which are made to rotate.

[0051] Second driving plates 6, 7 are not geared to the first group of plates. Thus, when the machine has to go from round braiding to flat braiding and vice versa, this system allows the plates to be synchronized, as will be explained more in detail.

[0052] Similarly, third driving plate 8 is neither geared to second driving plates 6, 7 so as to allow imparting a different speed and to be able to synchronize with second driving plates 6, 7, or to stop at the flat braiding, and such third driving plate 8 is not engaged.

[0053] Thus, when spindle 24 from end plate 4 reaches the intersection channels 33, such spindle 24 switches plate, passes to the second driving plate 6 and stays therein until it reaches the diverter channel 12.

[0054] The diverter channel 12 is in the switching position, so that the spindle 24 will stay in the third driving plate 8 and then will continue to the second driving plate 7.

[0055] As third driving plate 8 moves at a lower speed than second driving plates 6, 7, at 2/3 the speed of second driving plates 6,7, then third driving plate 8 needs to have more slots 11 (1/3 more slots than the slots in second driving plates 6, 7); consequently, if the slots 10 in second driving plates 6, 7 were four in number, the slots 11 in the third driving plate 8 would be six, if the speed of second driving plates 6, 7 were x rpm, the speed of third driving plate would be 2/3 of X rpm. This is done in this way in order to allow aggregating more spindles 32 in the third driving plate 8 and being able to produce a round braiding.

[0056] If, for production needs, the operator should decide that the braiding should be flat, the operator could change the configuration and the machine would start synchronizing the spindles.

[0057] In so doing, the third driving plate 8, eject its spindles 32 towards the second driving plates 6, 7. The drawings show four spindles 32. Once this is done, said third driving plate 8 may be stopped or set to an idle position, since said third driving plate 8 does not affect the braiding.

[0058] In addition, the two diverter channels change the configuration to the configuration shown in Figure 6 bearing reference number 19, so that the spindle will rotate and will not switch to the third driving plate 8, but will continue to rotate around the second driving plates 6,7.

[0059] The closed circuit in this configuration is made up of seven plates 1 - 7.

[0060] Essentially, the spindle in a flat braiding would move in a similar manner as the round braiding until reaching second driving plates 6, 7.

[0061] In the configurations for flat braiding known in the art, the last plates, in the spot where the second driving plates 6, 7 are arranged, these plates have one slot more than the other plates. In this case, the number of slots is the same.

[0062] In order to be able to maintain the same number of spindles as in the round braiding without stopping the machine, the machine must be able to operate with two slots less than second driving plates 6, 7.

[0063] The solution is provided in Figure 8. The spindle 24 of second driving plate 7 is switched in slot 9 which is available at the end plate 5, leaving slot 10 in the second driving plate 7 unengaged (Figure 8A).

[0064] At the same time, the end plate 5 maintains the same speed and has one spindle 25 to switch with the

second driving plate 7 which; if end plate 5 continues rotating, spindle 23 of the second driving plate 7 would face spindle 25 of end plate 5 (Figure 8B).

[0065] In order to use free slot 10, second driving plate 7 must stop and go backwards until making free slot 10 match the moment in which spindle 25 from end plate 5 is switched to second driving plate 7 (Figure 8C).

[0066] Continuity is achieved in this way, allowing using plates that have the same number of slots for all plates, when performing the flat braiding.

[0067] Thus, a same machine may be used for both flat braiding and round braiding or vice versa, without the need to stop the machine and waste time in its configuration by simply switching the position of diverter channels 12, 19, and achieving the synchronization of the plates and thus allowing the respective braiding, resuming at a high speed.

[0068] This machine allows braiding threads alternating sections of round braiding and flat braiding which, as it has been explained, provides a very interesting product for high precision surgery stitching.

[0069] This invention describes a new braiding machine. The examples provided herein are not limitative of the present invention and shall therefore have different applications and/or adaptations, all of which within the scope of the following claims.

Claims

1. Braiding machine of the type comprising a series of plates (1-8) arranged in a continuous manner in a closed circuit, each plate comprising a number of slots (9), that accommodate spindles (20) having a guide (21), at least one drive means that drives the plates (1-8), guide channels (22) wherein the spindle guides (21) run and at least two diverter channels (12, 19) having two positions, a first position for continuous rotation of the spindle in one same plate and a second position for the spindle to switch the plate, **characterized in that** it comprises:

   - a first group of plates having at least five plates (1, 2, 3, 4,5), where one of the plates is a first driving plate (1); these plates are arranged in a continuous manner and define two end plates (4, 5), having at least four slots (9) in each plate (1, 2, 3, 4, 5);
   - a second group of plates, having two plates (6, 7), both of which are second driving plates (6, 7), which are located subsequent to the two end plates (4, 5), one for each end plate, having at least four slots (10), in the two plates (6, 7) and
   - a third group of plates having one third driving plate (8), located in between the second driving plates (6, 7), closing the circuit and having at least two slots (11) more than the plates in the first group;

   and in having two diverter channels (12, 19) located between the second and the third group of plates, defining a first operation position wherein the third driving plate (8) is isolated from the circuit and a second operation position wherein the third driving plate (8) is part of the circuit.

2. The machine according to claim 1, **characterized in that** plates (1, 2, 3, 4, 5) of the first group of plates and plates (6, 7) of the second group of plates have four slots, and plate (8) of the third group of plates has six slots.

3. The machine according to claims 1 or 2 **characterized in that** each driving plate (1, 6, 7, 8) has an independent drive means (13, 14, 15, 16).

4. The machine according to claim 3 **characterized in that** each diverter channel (12, 19) comprises an independent drive means (17, 18) that drives it between the first operation position and the second operation position, and vice versa.

5. The machine according to claim 1, **characterized in that**, when in the second operation position, the third driving plate (8) rotates at a lower speed than the speed of the second driving plates (6, 7) and the speed of the first driving plate (1).

6. The machine according to claims 2 and 5, **characterized in that** the third driving plate (8) rotates at 2/3 the speed of the second driving plates (6, 7).

7. The machine according to claim 1, **characterized in that**, when in the first operation position, the second driving plates (6, 7) when rotating, comprise a spindle (23, 24) in each slot (10) at a given time.

8. The machine according to claim 7, **characterized in that** the second driving plates (6, 7) have a forwards and backwards movement.

9. The machine according to claim 8, **characterized in that** when in the first operation position, when second driving plates (6, 7) exchange one of their spindles (24) with end plates (4, 5) of the first group, the second driving plates (6, 7) then go backwards to receive the spindle (25) from end plates (4, 5), and end plates (4, 5) maintain their rotating direction while the second driving plates (6, 7) shift the direction and move backwards.

10. The machine according to claim 9, **characterized in that**, when in the first operation position, third driving plate (8) does not rotate.

11. The machine according to claim 9, **characterized in that**, when in the first operation position, third driving

plate (8) rotates in an idle mode.

12. The machine according to claims 2 and 9, **characterized in that**, both in the first operation position and in the second operation position, the machine comprises seventeen spindles (20, 23, 24, 25).

13. The machine according to claim 12, **characterized in that** eight spindles rotate in one direction and nine spindles rotate in the opposite direction.

14. The machine according to claim 1, **characterized in that** the diameter of the third driving plate (8) is the same diameter as the second driving plates (6, 7) and as the plates of the first group (1-5).

15. The machine according to claim 1, **characterized in that** the arrangement of the plates (1-8) is circular.

Patentansprüche

1. Flechtmaschine des Typs, der eine Reihe von Scheiben (1-8) umfasst, die kontinuierlich in einem geschlossenen Kreislauf angeordnet sind, wobei jede Scheibe eine Anzahl von Schlitzen (9) hat, die Spindeln (20) mit einer Führung (21) aufnehmen, mindestens einen Antrieb, der die Scheiben (1-8) antreibt, Führungsbahnen (22), in denen die Spindelführungen (21) verlaufen, und mindestens zwei Umlenkbahnen (12, 19) mit zwei Positionen, einer ersten Position für eine kontinuierliche Drehung der Spindel in einer gleichen Scheibe und einer zweiten Position, in der die Spindel die Scheibe wechselt, **dadurch gekennzeichnet, dass** sie folgende Bestandteile hat:

- eine erste Gruppe von Scheiben mit mindestens fünf Scheiben (1, 2, 3, 4, 5), bei der eine der Scheiben die erste Antriebsscheibe ist (1). Diese Scheiben sind durchgehend angeordnet und bilden zwei Endscheiben (4, 5), die jeweils mindestens vier Schlitze (9) aufweisen (1, 2, 3, 4, 5);
- eine zweite Gruppe von Scheiben mit zwei Scheiben (6, 7), die beide zweite Antriebsscheiben (6, 7) sind, die nach den beiden Endscheiben (4, 5) angeordnet sind, jeweils eine für jede Endscheibe, mit mindestens vier Schlitzen (10) in den beiden Scheiben (6, 7), und
- eine dritte Gruppe von Scheiben mit einer dritten Antriebsscheibe (8), die zwischen den zweiten Antriebscheiben (6, 7) angeordnet ist, die den Kreislauf schließt und mindestens zwei Schlitze (11) mehr als die Scheiben der ersten Gruppe aufweist;

und **dadurch gekennzeichnet, dass** zwei Umlenkbahnen (12, 19) zwischen der zweiten und der dritten Scheibengruppe angeordnet sind, die eine erste Betriebsposition, in der die dritte Antriebsscheibe (8) vom Kreislauf isoliert ist, und eine zweite Betriebsposition, in der die dritte Antriebsscheibe (8) Teil des Kreislaufs ist.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Scheiben (1, 2, 3, 4, 5) der ersten Scheibengruppe und die Scheiben (6, 7) der zweiten Scheibengruppe vier Schlitze und die Scheibe (8) der dritten Scheibengruppe sechs Schlitze aufweisen.

3. Maschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** jede Antriebsscheibe (1, 6, 7, 8) mit einem unabhängigen Antrieb (13, 14, 15, 16) ausgestattet ist.

4. Maschine nach Anspruch 3, **dadurch gekennzeichnet, daß** jede Umlenkbahn (12, 19) einen unabhängigen Antrieb (17, 18) hat, der sie zwischen der ersten Betriebsposition und der zweiten Betriebsposition und umgekehrt antreibt.

5. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sich die dritte Antriebsscheibe (8) in der zweiten Betriebsposition mit einer geringeren Geschwindigkeit dreht als die zweiten Antriebsscheiben (6, 7) und die erste Antriebsscheibe (1).

6. Maschine nach den Ansprüchen 2 und 5, **dadurch gekennzeichnet, daß** die dritte Antriebsscheibe (8) mit 2/3 der Geschwindigkeit der zweiten Antriebsscheiben (6, 7) rotiert.

7. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die zweiten Antriebsscheiben (6, 7) zu einem bestimmten Zeitpunkt bei der Rotation in der ersten Betriebsposition in jedem Schlitz (10) mit einer Spindel (23, 24) ausgestattet sind.

8. Maschine nach Anspruch 7, **dadurch gekennzeichnet, dass** sich die zweiten Antriebsscheiben (6, 7) vorwärts und rückwärts drehen.

9. Maschine nach Anspruch 8, **dadurch gekennzeichnet, dass** die zweiten Antriebsscheiben (6, 7) in der ersten Betriebsposition eine ihrer Spindeln (24) mit den Endscheiben (4, 5) der ersten Gruppe austauschen, sich anschließend rückwärts bewegen, wenn damit die Spindel (25) von den Endscheiben (4, 5) aufgenommen wird, und die Endscheiben (4, 5) ihre Drehrichtung während der Richtungsänderung und Rückwärtsbewegung der zweiten Antriebsscheiben (6, 7) beibehalten.

10. Maschine nach Anspruch 9, **dadurch gekennzeich-**

net, dass die dritte Antriebsscheibe (8) in der ersten Betriebsposition nicht rotiert.

11. Maschine nach Anspruch 9, **dadurch gekennzeichnet, dass** die dritte Antriebsscheibe (8) in der ersten Betriebsstellung im Leerlauf rotiert.

12. Maschine nach einem der Ansprüche 2 und 9, **dadurch gekennzeichnet, dass** die Maschine sowohl in der ersten als auch in der zweiten Betriebsposition mit siebzehn Spindeln (20, 23, 24, 25) ausgestattet ist.

13. Maschine nach Anspruch 12, **dadurch gekennzeichnet, dass** sich acht Spindeln in einer Richtung und neun Spindeln in der entgegengesetzten Richtung drehen.

14. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** der Durchmesser der dritten Antriebsscheibe (8) der gleiche ist wie der Durchmesser der zweiten Antriebsscheiben (6, 7) und der Scheiben der ersten Gruppe (1-5).

15. Maschine nach Anspruch 1, **dadurch gekennzeichnet, daß** die Scheiben (1-8) kreisförmig angeordnet sind.

Revendications

1. - Machine de tressage du type comprenant une série de disques (1-8) agencés de manière continue en circuit fermé, chaque disque comprenant un certain nombre d'encoches (9), qui accueillent des broches (20) dotées d'un guide (21), au moins un moyen d'entraînement qui entraîne les disques (1-8), des canaux de guide (22) dans lesquels circulent les guides de broche (21) et au moins deux canaux de déflection (12, 19) dotés de deux positions, une première position permettant la rotation continue de la broche dans un même disque et une seconde position permettant à la broche de changer de disque, **caractérisée en ce qu'**elle comprend

- un premier groupe de disques comprenant au moins cinq disques (1, 2, 3, 4, 5), où un des disques est le premier disque d'entraînement (1), ces disques étant agencés de manière continue et définissant deux disques d'extrémité (4, 5) et chaque disque (1, 2, 3, 4, 5) étant doté d'au moins quatre encoches (9),
- un deuxième groupe de disques comprenant deux disques (6, 7), tous les deux étant des deuxièmes disques d'entraînement (6, 7) qui sont situés derrière les deux disques d'extrémité (4, 5), un pour chaque disque d'extrémité, et chacun des deux disques (6, 7) ayant au moins quatre encoches (10) et
- un troisième groupe de disques comprenant un troisième disque d'entraînement (8) situé entre les deuxièmes disques d'entraînement (6, 7), fermant le circuit et ayant au moins deux encoches (11) de plus que les disques du premier groupe,

et **en ce qu'**elle a deux canaux de déflection (12, 19) situés entre le deuxième et le troisième groupe de disques, définissant une première position de fonctionnement dans laquelle le troisième disque d'entraînement (8) est isolé du circuit et une seconde position de fonctionnement dans laquelle le troisième disque d'entraînement (8) fait partie du circuit.

2. - Machine selon la revendication 1, **caractérisée en ce que** les disques (1, 2, 3, 4, 5) du premier groupe de disques et les disques (6, 7) du deuxième groupe de disques ont quatre encoches et le disque (8) du troisième groupe de disques a six encoches.

3. - Machine selon les revendications 1 ou 2, **caractérisée en ce que** chaque disque d'entraînement (1, 6, 7, 8) a un moyen d'entraînement indépendant (13, 14, 15, 16).

4. - Machine selon la revendication 3, **caractérisée en ce que** chaque canal de déflection (12, 19) comprend un moyen d'entraînement indépendant (17, 18) qui l'entraîne entre la première position de fonctionnement et la seconde position de fonctionnement et vice-versa.

5. - Machine selon la revendication 1, **caractérisée en ce que**, dans la seconde position de fonctionnement, le troisième disque d'entraînement (8) tourne à une vitesse inférieure à la vitesse des deuxièmes disques d'entraînement (6, 7) et à la vitesse du premier disque d'entraînement (1).

6. - Machine selon les revendications 2 et 5, **caractérisée en ce que** le troisième disque d'entraînement (8) tourne aux 2/3 de la vitesse des deuxièmes disques d'entraînement (6, 7).

7. - Machine selon la revendication 1, **caractérisée en ce que**, dans la première position de fonctionnement, les deuxièmes disques d'entraînement (6, 7), lorsqu'ils tournent, contiennent une broche (23, 24) dans chaque encoche (10) à un moment donné.

8. - Machine selon la revendication 7, **caractérisée en ce que** les deuxièmes disques d'entraînement (6, 7) ont un mouvement vers l'avant et vers l'arrière.

9. - Machine selon la revendication 8, **caractérisée en ce que**, dans la première position de fonctionne-

ment, lorsque les deuxièmes disques d'entraînement (6, 7) échangent une de leurs broches (24) avec les disques d'extrémité (4, 5) du premier groupe, les deuxièmes disques d'entraînement (6, 7) reviennent en arrière pour recevoir la broche (25) des disques d'extrémité (4, 5) et les disques d'extrémité (4, 5) conservent leur direction de rotation tandis que les deuxième disques d'entraînement (6, 7) changent de direction et reviennent en arrière.

10. - Machine selon la revendication 9, **caractérisée en ce que**, dans la première position de fonctionnement, le troisième disque d'entraînement (8) ne tourne pas.

11. - Machine selon la revendication 9, **caractérisée en ce que**, dans la première position de fonctionnement, le troisième disque d'entraînement (8) tourne dans un mode de repos.

12. - Machine selon les revendications 2 et 9, **caractérisée en ce que**, aussi bien dans la première position de fonctionnement que dans la deuxième position de fonctionnement, cette machine comprend dix-sept broches (20, 23, 24, 25).

13. - Machine selon la revendication 12, **caractérisée en ce que** huit broches tournent dans une direction et neuf broches tournent dans la direction opposée.

14. - Machine selon la revendication 1, **caractérisée en ce que** le diamètre du troisième disque d'entraînement (8) est identique au diamètre des deuxièmes disques d'entraînement (6, 7) et des disques du premier groupe (1-5).

15. - Machine selon la revendication 1, **caractérisée en ce que** l'agencement des disques (1-8) est circulaire.

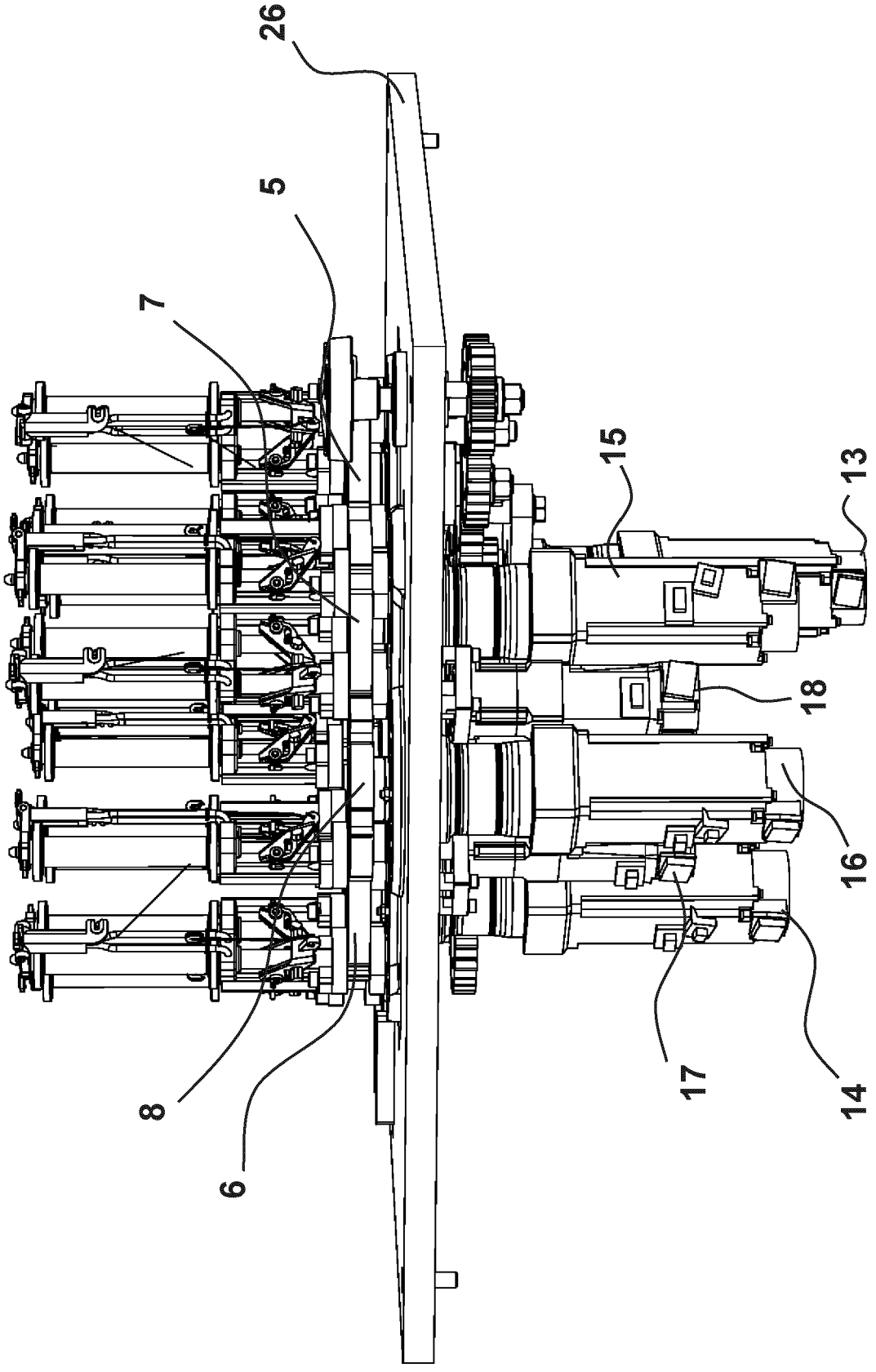


FIG. 1

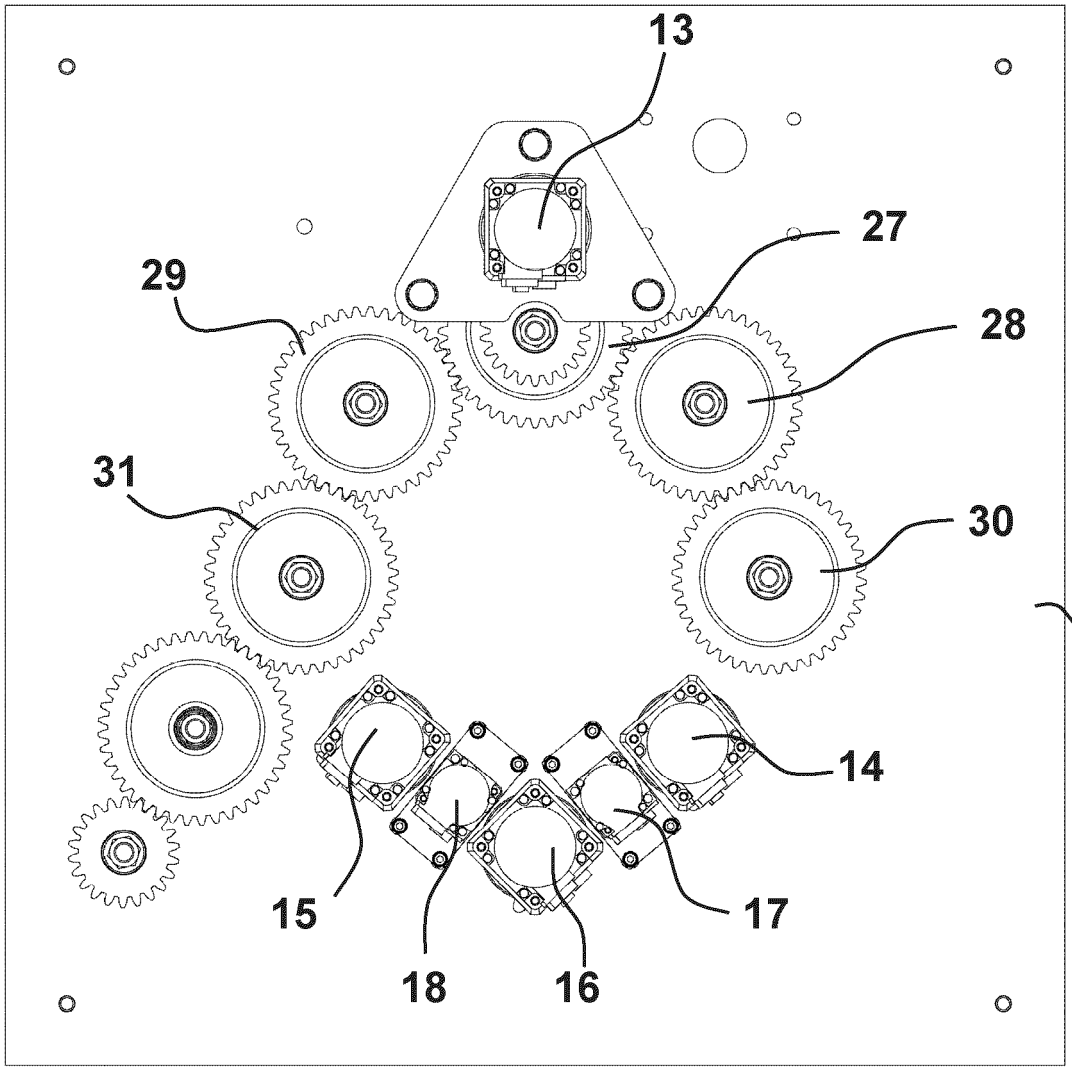


FIG. 2

FIG. 3

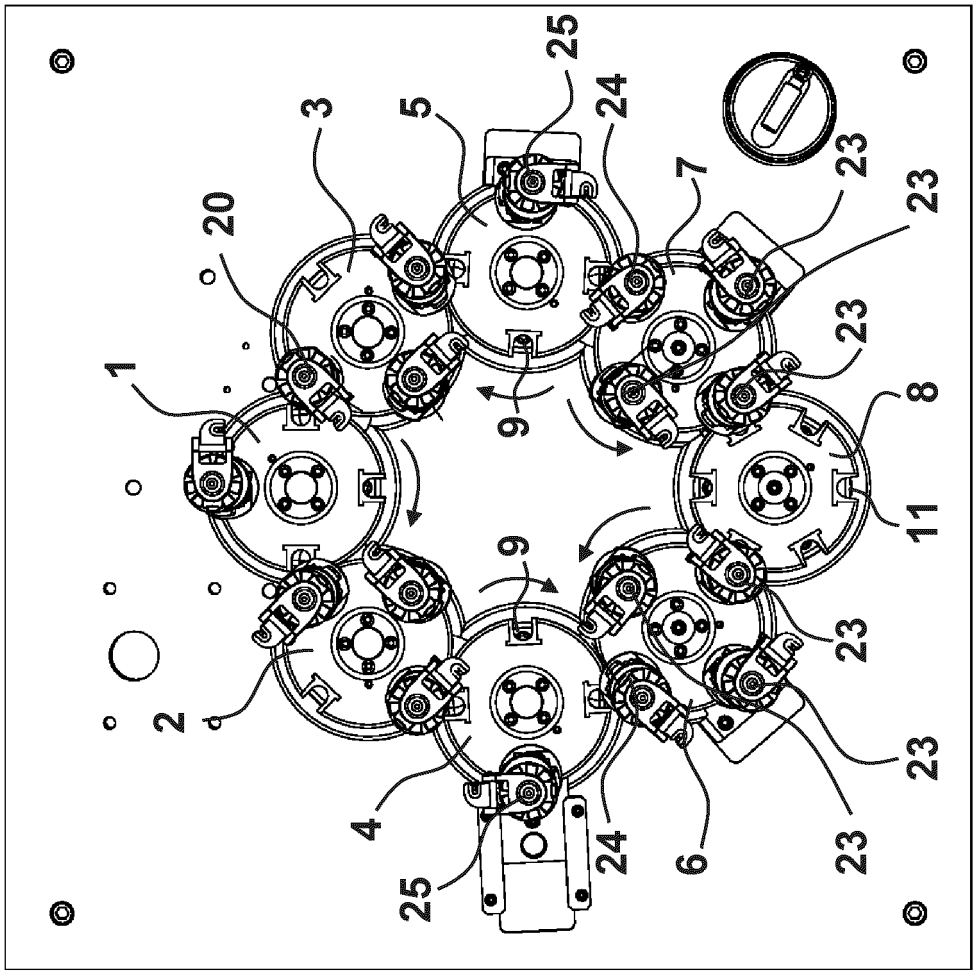


FIG. 4

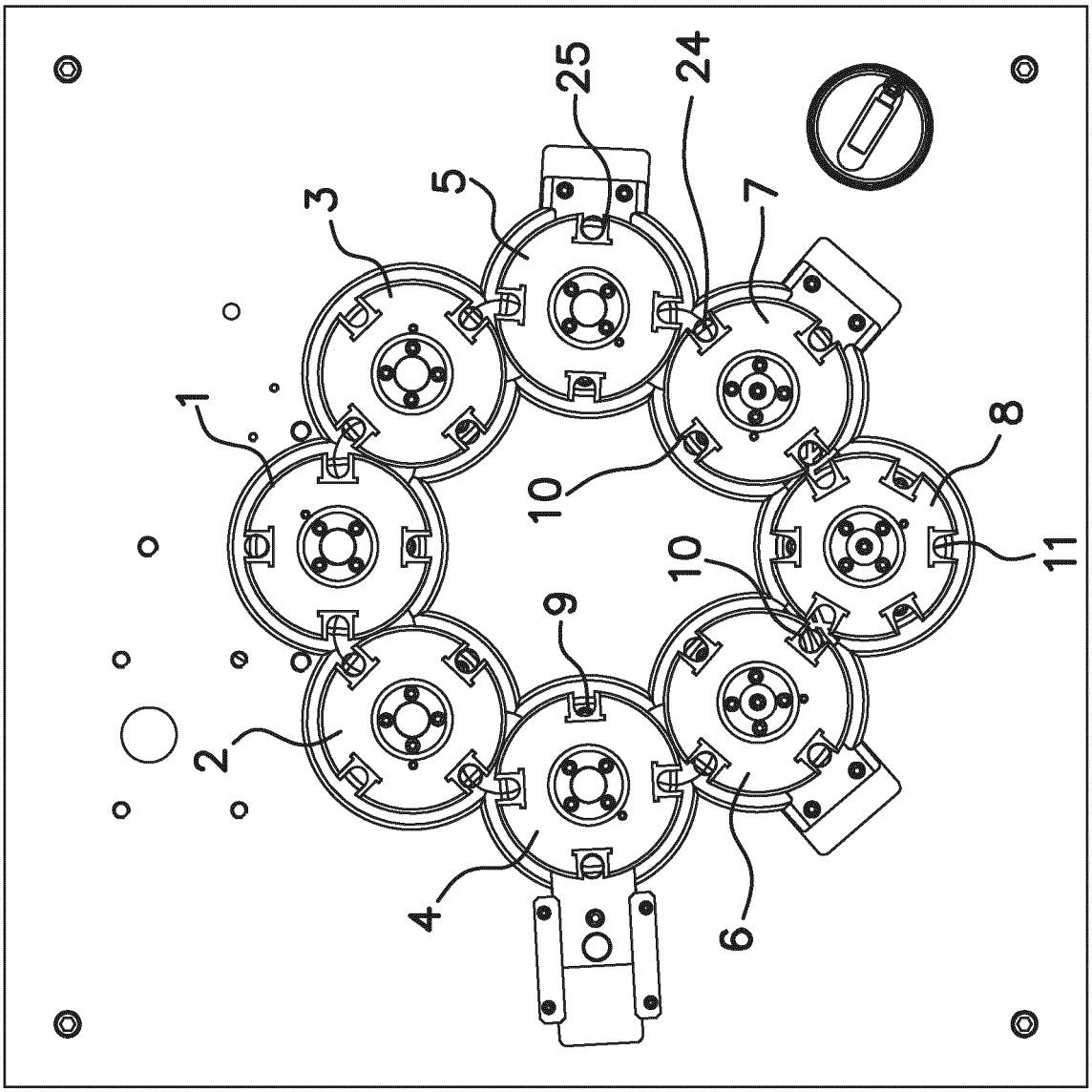
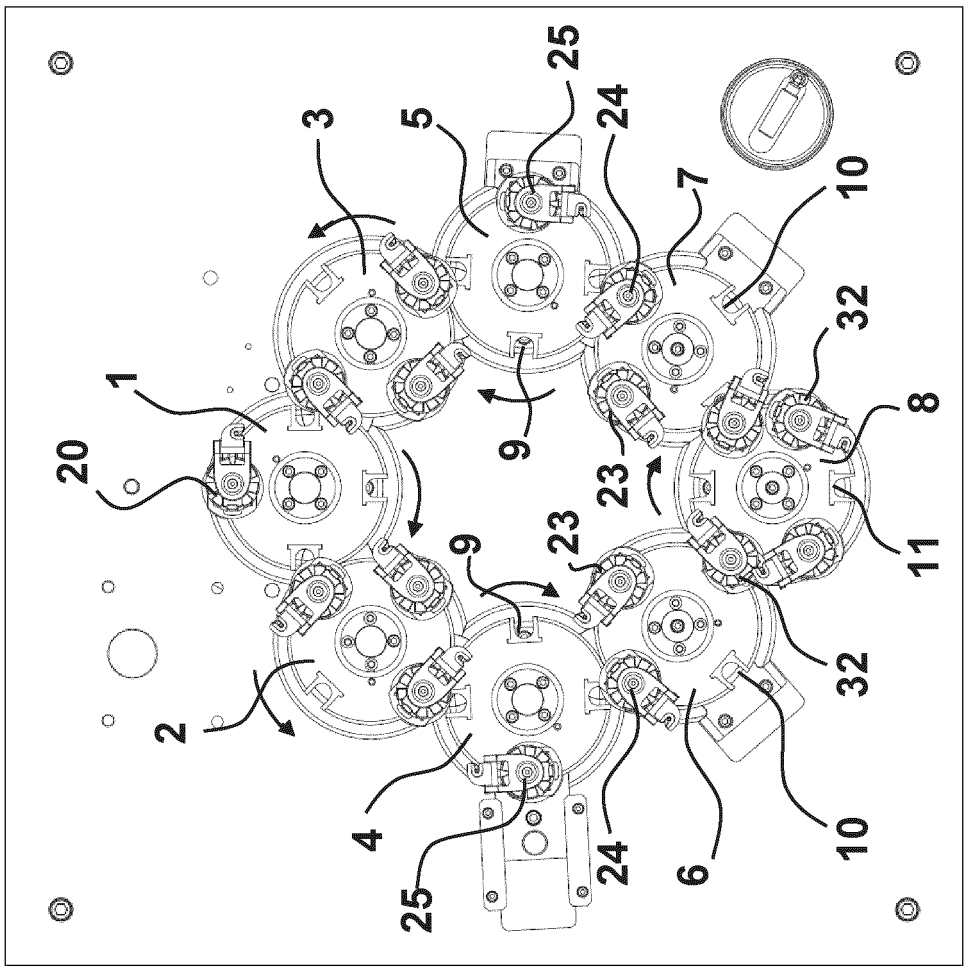


FIG. 5



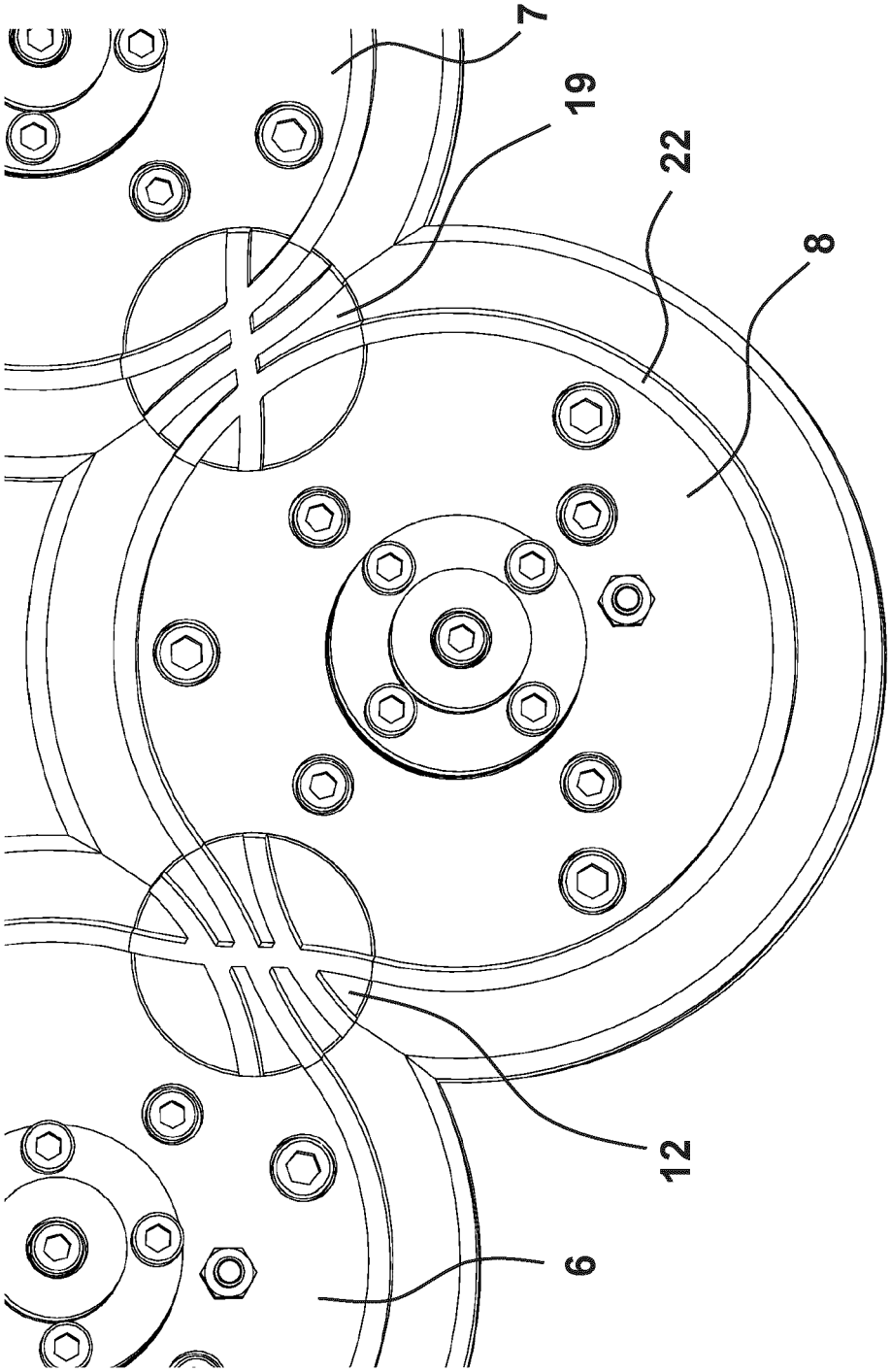


FIG. 6

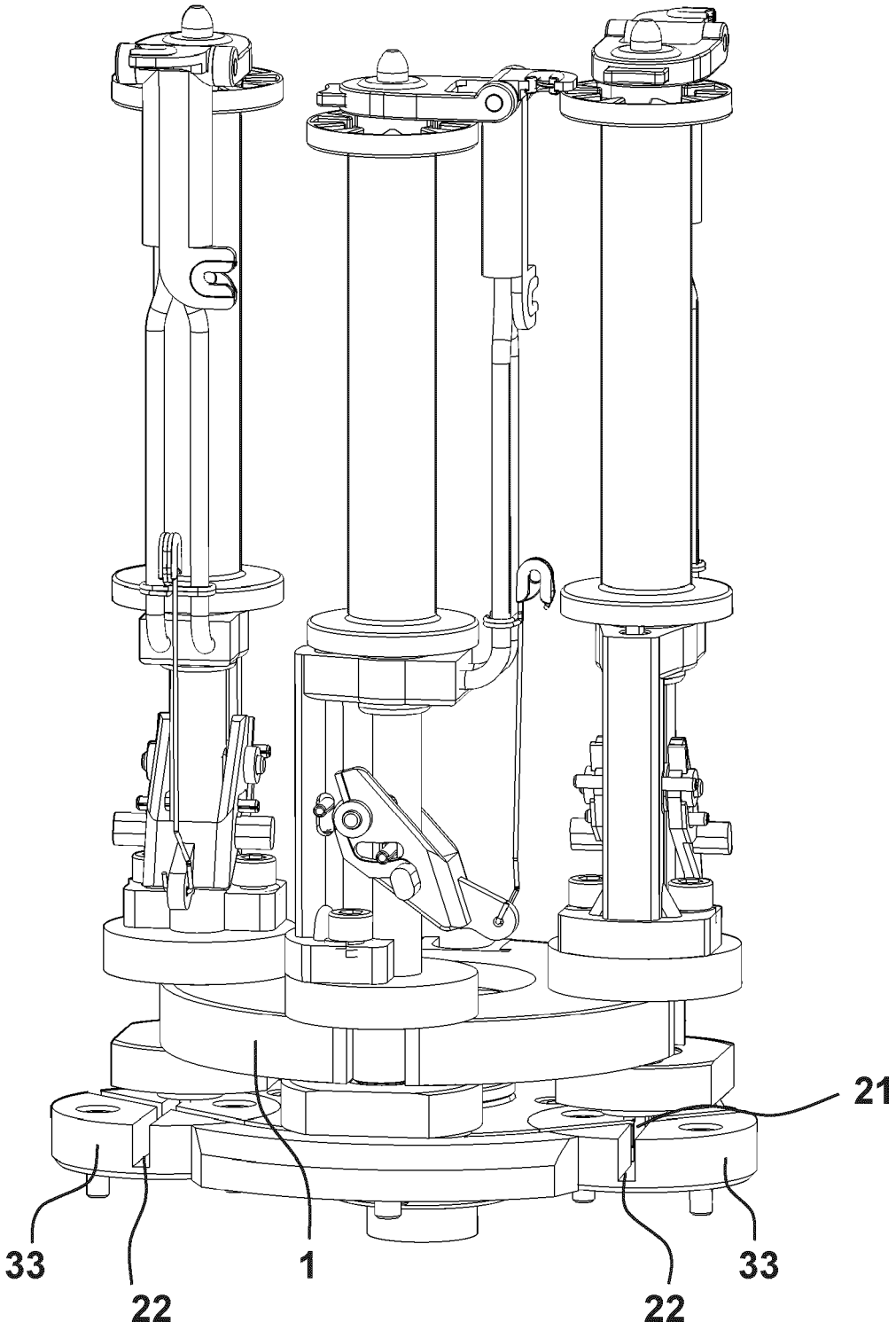


FIG. 7

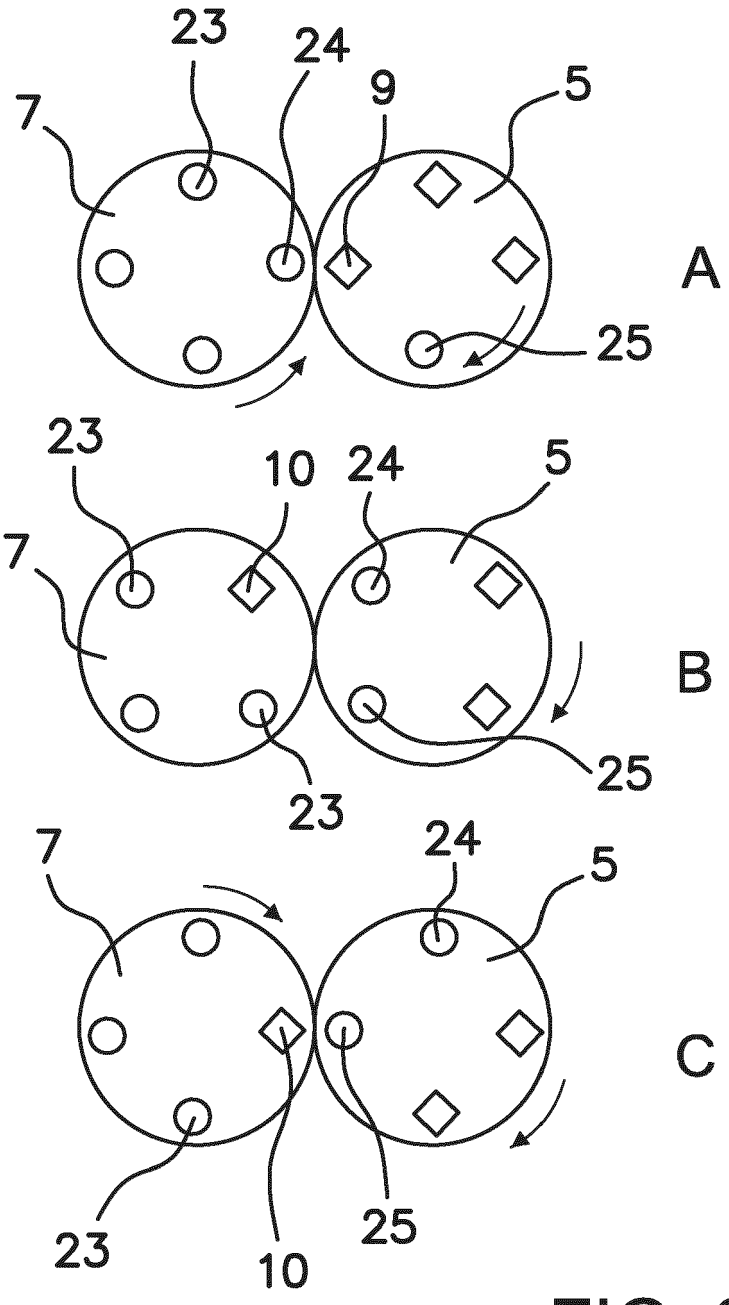


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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