



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.10.2022 Bulletin 2022/40

(51) International Patent Classification (IPC):
D04B 15/02 (2006.01) **D04B 9/40** (2006.01)

(21) Application number: **22164457.8**

(52) Cooperative Patent Classification (CPC):
D04B 9/40; D04B 15/02

(22) Date of filing: **25.03.2022**

(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
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **31.03.2021 TW 110203485 U**

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(54) **SOCK-PICKING STRUCTURE**

(57) A sock-picking structure includes a sock-picking needle disk, the sock-picking needle disk includes: a disk body defining an accommodating space, an axial center and a radial direction; plural pushing members disposed in the accommodating space and movable along the radial direction; an actuating disk coaxially disposed with the disk body, rotatable with respect to the disk body, and including plural first guiding holes, the first guiding holes each include a first hole end and a second hole end which is farther to the axial center than the first hole end; a fixed disk locked to the disk body and including plural second guiding holes, positions of the second guiding holes correspond to that of the first guiding holes, and the second guiding holes each include a first end and a second end; plural bolts inserted in the first and second guiding holes and locked to the pushing members.

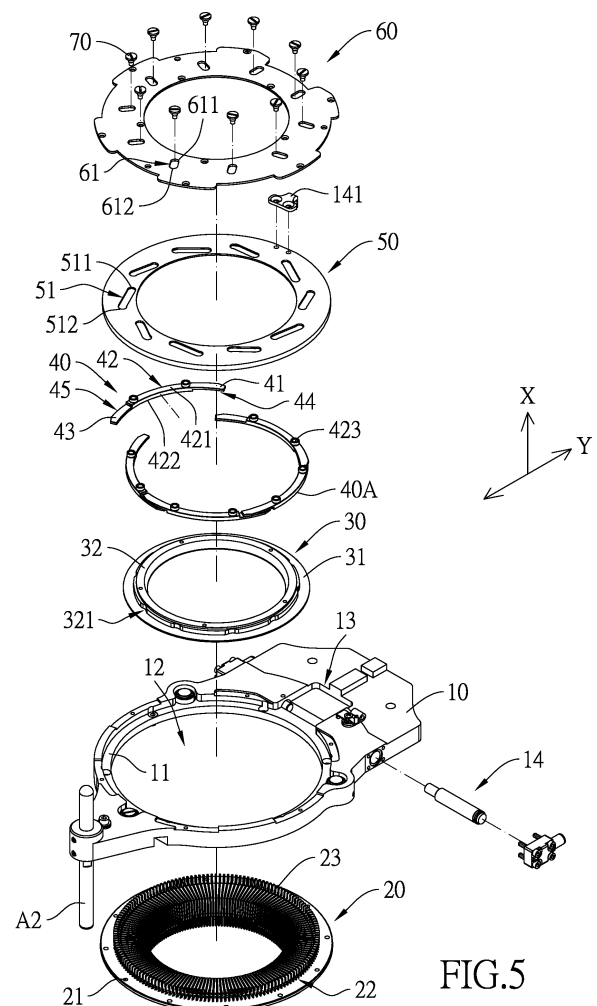


FIG.5

Description

BACKGROUND

Field of the Invention

[0001] The present invention relates to a sock-picking structure capable of simultaneously radially moving a plurality of sock-picking needles.

Description of Related Art

[0002] A plurality of longitudinally extending elements (such as sock-picking needles), which are arranged in a circular manner and move radially, can be used in various fields. For example, they can be used to transfer knitting needles arranged in a circular manner in a circular knitting machine to another workstation.

[0003] Tubular textile products such as socks are knitted and manufactured in a circular knitting machine, the textile product has two open ends, one of which is moved away from the knitting needle of the knitting machine, and sent to the toe stitching station for stitching. For example, the automatic mechanism described in EP2377979 can be used to transfer tubular textile products from a knitting machine to a toe stitching station.

[0004] In one of the conventional technologies, such as Patent Publication No. TW202009335, please refer to FIGS. 1 and 2, which discloses a gripping mechanism 80 comprising an actuator 81 for driving a driving ring 82 to rotate, and the driving ring 82 includes a plurality of driving grooves 83 for accommodating a pushing portion 91 of a connecting rod 90, and then driving the connecting rod 90 to swing. The connecting rod 90 contacts with a driving portion 93 and drives the driving portion 93 to rotate together, and the driving portion 93 includes an integrally formed driven portion 94. When the driven portion 94 rotates, it will enter or leave a cam groove K1 of a cam ring K, and then the driving portion 93 will move in the radial direction, so that the outer surface 931 of each driving portion 93 pushes the sock-picking needles N to move away from the axial center.

[0005] However, in the abovementioned patent, the driven portion 94 is only driven to rotate through the connecting rod 90, and then the driving portion 93 is driven to move in the radial direction. However, the mechanism for the driving portion 93 to drive the sock-picking needles N is such that the driven portion 94 pushes against the cam groove K1 of the cam ring K to drive the driving portion 93 to move away from the center and close to each of the sock-picking needles N, so as to further push the sock-picking needles N. Please refer to FIG. 2, when the driven portion 94 is disengaged from the cam groove K1, it will press tightly against the outer peripheral edge K2 of the cam ring K. However, only the driven portion 94 of the entire driving portion 93 presses against the outer peripheral edge K2 of the cam ring K, so magnitudes of the reaction forces obtained are not the same,

the pushing force corresponding to the position of the driven portion 94 is larger, and the pushing force at other positions is smaller, which in turn causes the forces of pushing the sock-picking needles N to be uneven, so that the sock-picking needles are difficult to be pushed out or retracted synchronously, resulting in a wave-like shape (please refer to FIG. 2), which makes it impossible for the knitting needles of the knitting machine to be aligned, as a result, some loops cannot be moved from the knitting needles to the sock-picking needles, causing missed needle, etc. In addition, since the conventional technology uses the connecting rod 90 to cause motion, there will be a torque problem, which requires a large force. For this reason, there is a need for a device that can push the sock-picking needles N synchronously so that the force of each of the sock-picking needles N is evenly applied.

SUMMARY

[0006] One objective of the present invention is to provide a sock-picking structure which is capable of making the force of each sock-picking needle evenly applied.

[0007] To achieve the above objective, a sock-picking structure comprises at least one sock-picking needle disk, the sock-picking needle disk is used to accommodate an upper sock-picking needle or a lower sock-picking needle, the sock-picking structure is characterized in that: the sock-picking needle disk comprises:

a disk body defines an accommodating space, an axial center and a radial direction;

a plurality of pushing members are disposed in the accommodating space and movable along the radial direction;

an actuating disk is coaxially disposed with the disk body and rotatable with respect to the disk body, and the actuating disk includes a plurality of first guiding holes, the first guiding holes each include a first hole end and a second hole end opposite to each other, and the first hole end is closer to the axial center than the second hole end;

a fixed disk is locked to the disk body and includes a plurality of second guiding holes, positions of the second guiding holes correspond to that of the first guiding holes, the first guiding holes extend in different directions from the second guiding holes, and the second guiding holes each include a first end and a second end;

a plurality of bolts, each of which is inserted through a corresponding one of the second guiding holes and a corresponding one of the first guiding holes and is locked to a corresponding one of the pushing members;

the actuating disk rotates and drives the bolts to move along the first guiding holes and the second guiding holes, and drives the pushing members to approach or move away from the axial center, when the bolts move from the first hole end to the second hole end, and from the first end to the second end, the pushing members pushes the upper sock-picking needle or the lower sock-picking needle to move away from the axial center.

[0008] As can be seen from the foregoing, the present invention drives the bolts to move through the first guiding holes of the actuating disk and the second guiding holes of the fixed disk, which further synchronously drives the pushing members to approach or move away from the axial center, so that the force of the pushing members to push the upper sock-picking needle or the lower sock-picking needle can be the same and even, and the force can be evenly applied to the sock-picking needles.

[0009] In addition, since the design of connecting rod is not adopted in this invention, there is no problem of torque. Compared with the prior art, the amount of applied force can be reduced, and the horsepower requirement of the corresponding motor can be reduced accordingly, thereby reducing the cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is an exploded view of a conventional sock-picking needle disk;
 FIG. 2 is an illustrative view of a conventional sock-picking needle disk;
 FIG. 3 is a perspective view of the sock-picking structure of the invention;
 FIG. 4 is a magnified view of a part of the sock-picking disk of the invention;
 FIG. 5 is an exploded view of the sock-picking disk of the invention;
 FIG. 6 is an illustrative view of the sock-picking disk of the invention;
 FIG. 7 is an illustrative view of the first state of the sock-picking disk of the invention;
 FIG. 8 is an illustrative view of the second state of the sock-picking disk of the invention;
 FIG. 9 is an illustrative view of the second state of the sock-picking disk of the invention; and
 FIG. 10 is an illustrative view of another embodiment of the sock-picking disk of the invention.

DETAILED DESCRIPTION

[0011] The present invention provides a sock-picking structure A, which is used to hold/carry a sock-picking needle structure B. The aforementioned sock-picking needle structure B can be an upper sock-picking needle B1 or a lower sock-picking needle B2. Please refer to

FIGS. 3 to 4, the sock-picking structure A includes two sock-picking needle disks A1, and the two sock-picking needle disks A1 are defined as an upper sock-picking needle disk A11 and a lower sock-picking needle disk A12. The upper sock-picking needle disk A11 is used to accommodate the upper sock-picking needle B1, and the lower sock-picking needle disk A12 is used to accommodate the lower sock-picking needle B2. The upper sock-picking needle disk A11 and the lower sock-picking needle disk A12 are connected to each other by an alignment pin A2, whereby the upper sock-picking needle disk A11 and the lower sock-picking needle disk A12 can be used in alignment. Since the two sock-picking needle disks A1 are identical in structure, we take one sock-picking needle disk A1 as an illustration. The sock-picking needle disk A1 is generally circular. Please refer to FIGS. 4 to 9, the sock-picking needle disk A1 comprises: a disk body 10, a needle holder 20, a carrier ring 30, a plurality of pushing members 40, an actuating disk 50, a fixed disk 60 and a plurality of bolts 70.

[0012] The disk body 10 is annular and includes a stepped annular portion 11 on an inner surface thereof. The disk body 10 defines an accommodating space 12. In this embodiment, one end of the disk body 10 extends out to form a block 13, an actuator 14 is disposed in the block 13. The actuator 14 includes a locking portion 141, the disk body 10 defines an axial center O, the axial center O is located in the center of the accommodating space 12, and the disk body 10 defines a radial direction Y.

[0013] In other embodiments, please refer to FIG. 10, the actuator 14 is located on a peripheral edge of the disk body 10.

[0014] The needle holder 20 is disposed to one side of the disk body 10 and is coaxially arranged with the disk body 10. The needle holder 20 includes a plurality of needle-holder connecting holes 21 which are aligned and connected with corresponding connecting holes (not shown) of the disk body 10 by a connecting unit (not shown), such as a bolt. The needle holder 20 further includes an inner annular portion 22, and the inner annular portion 22 is disposed in the accommodating space 12 and includes a plurality of guiding channels 23 extending along the radial direction Y.

[0015] The carrier ring 30 is disposed on the needle holder 20 and located in the accommodating space 12, and the carrier ring 30 is coaxially arranged with the disk body 10. The carrier ring 30 includes a first lateral surface 31, the first lateral surface 31 includes a protruding annular blocking portion 32, so that the carrier ring 30 has a stepped structure. The lateral surface of the annular blocking portion 32 includes a plurality of accommodating grooves 321, and the accommodating grooves 321 are generally semi-circular.

[0016] The plurality of pushing members 40, which are arc-shaped disks, are disposed on the first lateral surface 31 of the carrier ring 30. The pushing members 40 can be displaced along the radial direction Y, and each include a pushing surface 40A which is a side surface fac-

ing away from the axial center O, and the pushing surface 40A is used for pushing against the upper sock-picking needle B1 or the lower sock-picking needle B2. In this embodiment, each of the pushing members 40 includes an upper extending portion 41, a connecting portion 42 and a lower extending portion 43 connected in sequence. The upper extending portion 41 extends from one end of the connecting portion 42, and the lower extending portion 43 extends from the other end of the connecting portion 42. The connecting portion 42 includes a top surface 421 and a bottom surface 422 opposite to each other. An extending direction between the top surface 421 and the bottom surface 422 is an axial direction X, a length of the upper extending portion 41 and a length of the lower extending portion 43 in the axial direction X are smaller than a length of the connecting portion 42 in the axial direction X. The upper extending portion 41 is connected to the top surface 421, so that a first stepped space 44 is formed between the upper extending portion 41 and the connecting portion 42. The lower extending portion 43 is connected to the bottom surface 422, so that a second stepped space 45 is formed between the lower extending portion 43 and the connecting portion 42. The first stepped space 44 is used to accommodate the lower extending portion 43 of another pushing member 40, and the second stepped space 45 is used for accommodating the upper extending portion 41 of another pushing member 40. The connecting portion 42 includes a through hole 423.

[0017] The actuating disk 50 is annularly-shaped and coaxially disposed in the accommodating space 12 of the disk body 10, and the actuating disk 50 is disposed on the stepped annular portion 11. The actuating disk 50 includes a plurality of first guiding holes 51. The first guiding holes 51 penetrate through the actuating disk 50, and the first guiding holes 51 are symmetrically located on two opposite sides of the actuating disk 50. The first guiding holes 51 each are elongated and extend in an inclined manner, and an extending direction of each of the first guiding holes 51 has a component along the radial direction Y. In this embodiment, the aforementioned inclination refers to an inclination relative to the radial direction Y. The extending direction of each of the guiding holes 51 is different from the radial direction Y. The first guiding holes 51 each include a first hole end 511 and a second hole end 512 opposite to each other, and the first hole end 511 is closer to the axial center O than the second hole end 512. The locking portion 141 of the actuator 14 is locked to the actuating disk 50.

[0018] The fixed disk 60 is locked to another side of the disk body 10 and covers the actuating disk 50. The fixed disk 60 is locked to the annular blocking portion 32 of the carrier ring 30 and includes a plurality of second guiding holes 61. The second guiding holes 61 penetrate the fixed disk 60 and are symmetrically located on two opposite sides of the fixed disk 60. Each of the second guiding holes 61 is elongated and extends in an inclined manner. The length of each of the second guiding holes

61 is shorter than that of the first guiding holes 51, and the number of the second guiding holes 61 is the same as that of the first guiding holes 51. The positions of the second guiding holes 61 correspond to that of the first guiding holes 51, and the first guiding holes 51 extend in different directions from the second guiding holes 61. The second guiding holes 61 each include a first end 611 and a second end 612, and the first end 611 is closer to the axial center O than the second end 612. In this embodiment, each of the second guiding holes 61 extends along the radial direction Y, but the extending directions of the second guiding holes 61 are not limited to this embodiment.

[0019] Each of the bolts 70 is inserted through a corresponding one of the second guiding holes 61 and a corresponding one of the first guiding holes 51 and is locked to the through hole 423 of the connecting portion 42 of a corresponding one of the pushing members 40. Preferably, the through hole of each pushing member 40 The number of the through holes 423 is two, and the two through holes 423 are located at the symmetrical positions of the pushing member 40. Each pushing member 40 corresponds to two bolts 70, and the two bolts 70 are respectively inserted through the two through holes 423 of each pushing member 40, so that the pushing members 40 can move more smoothly.

[0020] The above is the configuration description of the main components of the embodiments of the present invention. As for the operation mode and effect of the present invention, the description is as follows:

[0021] When the sock-picking needle disk A1 of the present invention is in a first state, please refer to FIGS. 6 and 7, the actuator 14 moves in a first direction D1. According to the content disclosed in the drawing, the first direction D1 is the counterclockwise direction, the actuator 14 drives the actuating disk 50 to rotate in the first direction D1 synchronously, and then drives the bolts 70 to move along the extending directions of the first guiding holes 51 and the second guiding holes 61 to move gradually from the second hole end 512 to the first hole end 511, and move gradually from the second end 612 to the first end 611, and then drives the pushing members 40 to gradually approach the axial center O until the bolts 70 are located at the first hole end 511 of the first guiding holes 51 and the first end 611 of the second guiding holes 61. At this time, the pushing members 40 are abutted against the annular blocking portion 32 and the bolts 70 are accommodated in the accommodating grooves 321, and the upper extending portion 41 of one of the pushing members 40 is substantially completely overlapped with the lower extending portion 43 of an adjacent pushing member 40. In the first state, the pushing members 40 are further away from the upper sock-picking needle B1 or the lower sock-picking needle B2, so that the sock-picking needle disk A1 is in a closed state.

[0022] When the sock-picking needle disk A1 is in a second state, please refer to FIGS. 8 and 9, the actuator 14 moves in a second direction D2. According to the con-

tent disclosed in the drawing, the second direction D2 is a clockwise direction, the actuator 14 drives the actuating disk 50 to rotate in the second direction D2 synchronously, and then drives the bolts 70 to move along the extending directions of the first guiding holes 51 and the second guiding holes 61 to move gradually from the first hole end 511 to the second hole end 512, and from the first end 611 to the second end 612, and then drives the pushing members 40 to gradually move away from the axial center O until the bolts 70 are located at the second hole end 512 of the first guiding holes 51 and at the second end 612 of the second guiding holes 61. The upper extending portion 41 of one of the pushing members 40 is only partially overlapped with the lower extending portion 43 of an adjacent pushing member 40. At this time, the pushing surfaces 40A of the pushing members 40 are abutted against the upper sock-picking needle B1 or the lower sock-picking needle B2, so that the upper sock-picking needle B1 or the lower sock-picking needle B2 is away from the axial center O, and at this time, the sock-picking needle disk A1 is in an open state.

Claims

1. A sock-picking structure comprising at least one sock-picking needle disk (A1), the sock-picking needle disk (A1) being used to accommodate an upper sock-picking needle (B1) or a lower sock-picking needle (B2), the sock-picking structure being **characterized in that**: the sock-picking needle disk (A1) comprises:

a disk body (10) defines an accommodating space (12), an axial center (O) and a radial direction (Y);

a plurality of pushing members (40) are disposed in the accommodating space (12) and movable along the radial direction (Y);

an actuating disk (50) is coaxially disposed with the disk body (10) and rotatable with respect to the disk body (10), and the actuating disk (50) includes a plurality of first guiding holes (51), the first guiding holes (51) each include a first hole end (511) and a second hole end (512) opposite to each other, and the first hole end (511) is closer to the axial center (O) than the second hole end (512);

a fixed disk (60) is locked to the disk body (10) and includes a plurality of second guiding holes (61), positions of the second guiding holes (61) correspond to that of the first guiding holes (51), the first guiding holes (51) extend in different directions from the second guiding holes (61), and the second guiding holes (61) each include a first end (611) and a second end (612);

a plurality of bolts (70), each of which is inserted through a corresponding one of the second guid-

ing holes (61) and a corresponding one of the first guiding holes (51) and is locked to a corresponding one of the pushing members (40);

a carrier ring (30) is coaxially arranged with the disk body (10), the pushing members (40) are disposed at one side of the carrier ring (30);

the actuating disk (50) rotates and drives the bolts (70) to move along the first guiding holes (51) and the second guiding holes (61), and drives the pushing members (40) to approach or move away from the axial center (O), when the bolts (70) move from the first hole end (511) to the second hole end (512), and from the first end (611) to the second end (612), the pushing members (40) pushes the upper sock-picking needle (B1) or the lower sock-picking needle (B2) to move away from the axial center (O).

2. The sock-picking structure as claimed in claim 1, **characterized in that** one end of the disk body (10) extends out to form a block (13), an actuator (14) is disposed in the block (13), and the actuator (14) is locked to the actuating disk (50) to drive the actuating disk (50) to rotate.
3. The sock-picking structure as claimed in claim 1, **characterized in that** the carrier ring (30) includes a first lateral surface (31), the first lateral surface (31) includes a protruding annular blocking portion (32) protruding from the first lateral surface (31), so that the carrier ring (30) is has a stepped shape, and the pushing members (40) are disposed to the first lateral surface (31) of the carrier ring (30).
4. The sock-picking structure as claimed in claim 1, **characterized in that** each of the pushing members (40) includes an upper extending portion (41), a connecting portion (42) and a lower extending portion (43) connected in sequence, the upper extending portion (41) extends from one end of the connecting portion (42), the lower extending portion (43) extends from another end of the connecting portion (42), the connecting portion (42) includes a top surface (421) and a bottom surface (422) opposite to each other, an extending direction between the top surface (421) and the bottom surface (422) is an axial direction (X), a length of the upper extending portion (41) and a length of the lower extending portion (43) in the axial direction (X) are smaller than a length of the connecting portion (42) in the axial direction (X), the upper extending portion (41) is connected to the top surface (421), a first stepped space (44) is formed between the upper extending portion (41) and the connecting portion (42), the lower extending portion (43) is connected to the bottom surface (422), a second stepped space (45) is formed between the lower extending portion (43) and the connecting portion

(42), the first stepped space (44) is used to accommodate the lower extending portion (43) of another pushing member (40), and the second stepped space (45) is used for accommodating the upper extending portion (41) of another pushing member (40). 5

5. The sock-picking structure as claimed in claim 1, **characterized in that** each of the first guiding holes (51) is elongated and extends in a direction different from the radial direction (Y), and the extending direction of each of the first guiding holes (51) has a component along the radial direction (Y). 10
6. The sock-picking structure as claimed in claim 1, **characterized in that** each of the connecting portions (42) includes a through hole (423), and each of the bolts (70) is locked to a corresponding one of the through holes (423). 15
7. The sock-picking structure as claimed in claim 1, **characterized in that** the fixed disk (60) covers the actuating disk (50), and the fixed disk (60) is locked to the annular blocking portion (32) of the carrier ring (30). 20
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8. The sock-picking structure as claimed in claim 1, **characterized in that** each of the second guiding holes (61) is elongated, a length of each of the second guiding holes (61) is shorter than that of the first guiding holes (51), and the second guiding holes (61) are equal in quantity to the first guiding holes (51). 30
9. The sock-picking structure as claimed in claim 1, **characterized in that** the first guiding holes (51) are symmetrically located on two opposite sides of the actuating disk (50), and the second guiding holes (61) are symmetrically located on two opposite sides of the fixed disk (60). 35
10. The sock-picking structure as claimed in claim 1, further comprising a needle holder (20) disposed to the disk body (10), the needle holder (20) is used to accommodate the upper sock-picking needle (B1) or the lower sock-picking needle (B2), the number of the at least one sock-picking needle disk (A1) is two, the two sock-picking needle disks (A1) are an upper sock-picking needle disk (A11) and a lower sock-picking needle disk (A12), the upper sock-picking needle disk (A11) is used to accommodate the upper sock-picking needle (B1), and the lower sock-picking needle disk (A12) is used to accommodate the lower sock-picking needle (B2). 40
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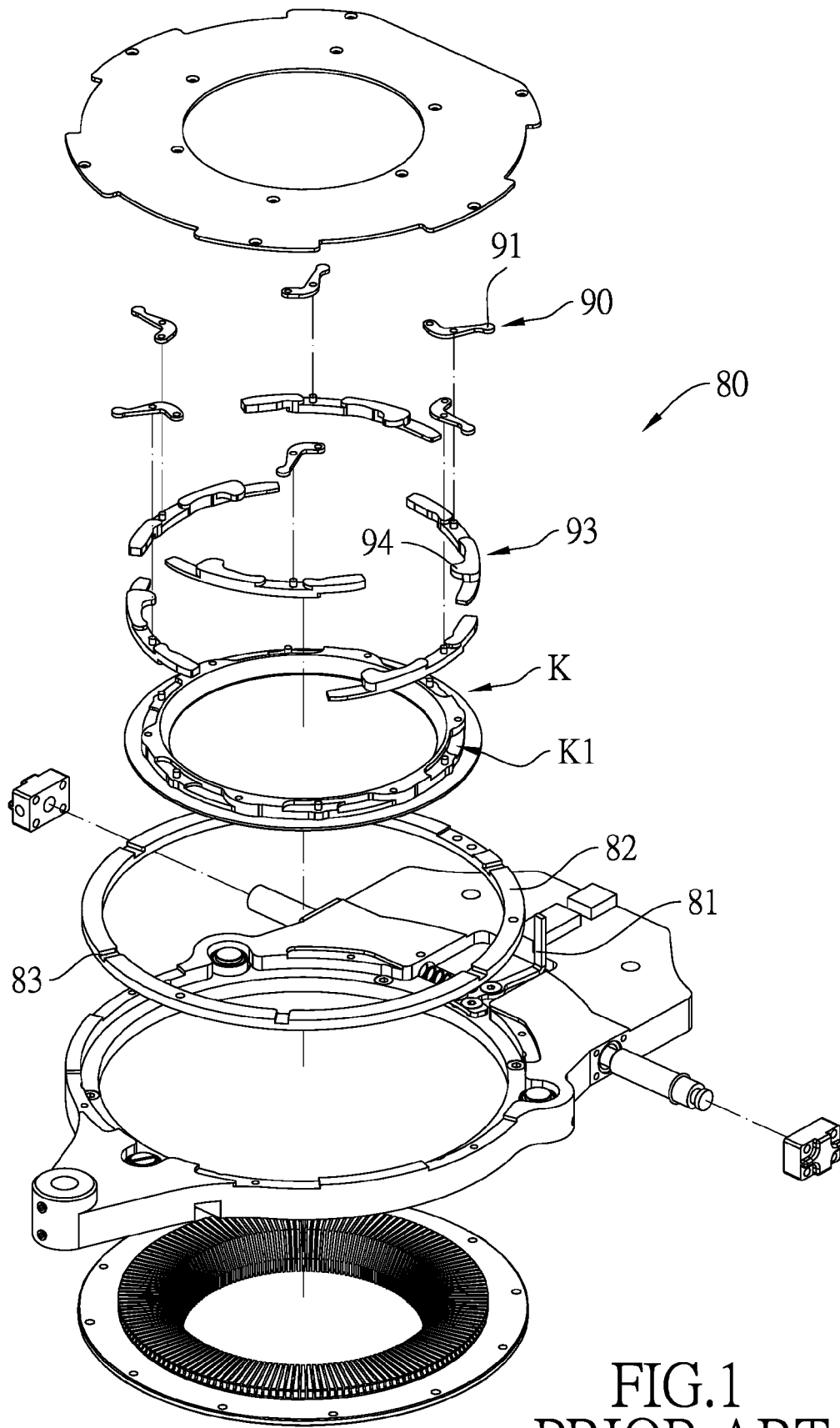


FIG.1
PRIOR ART

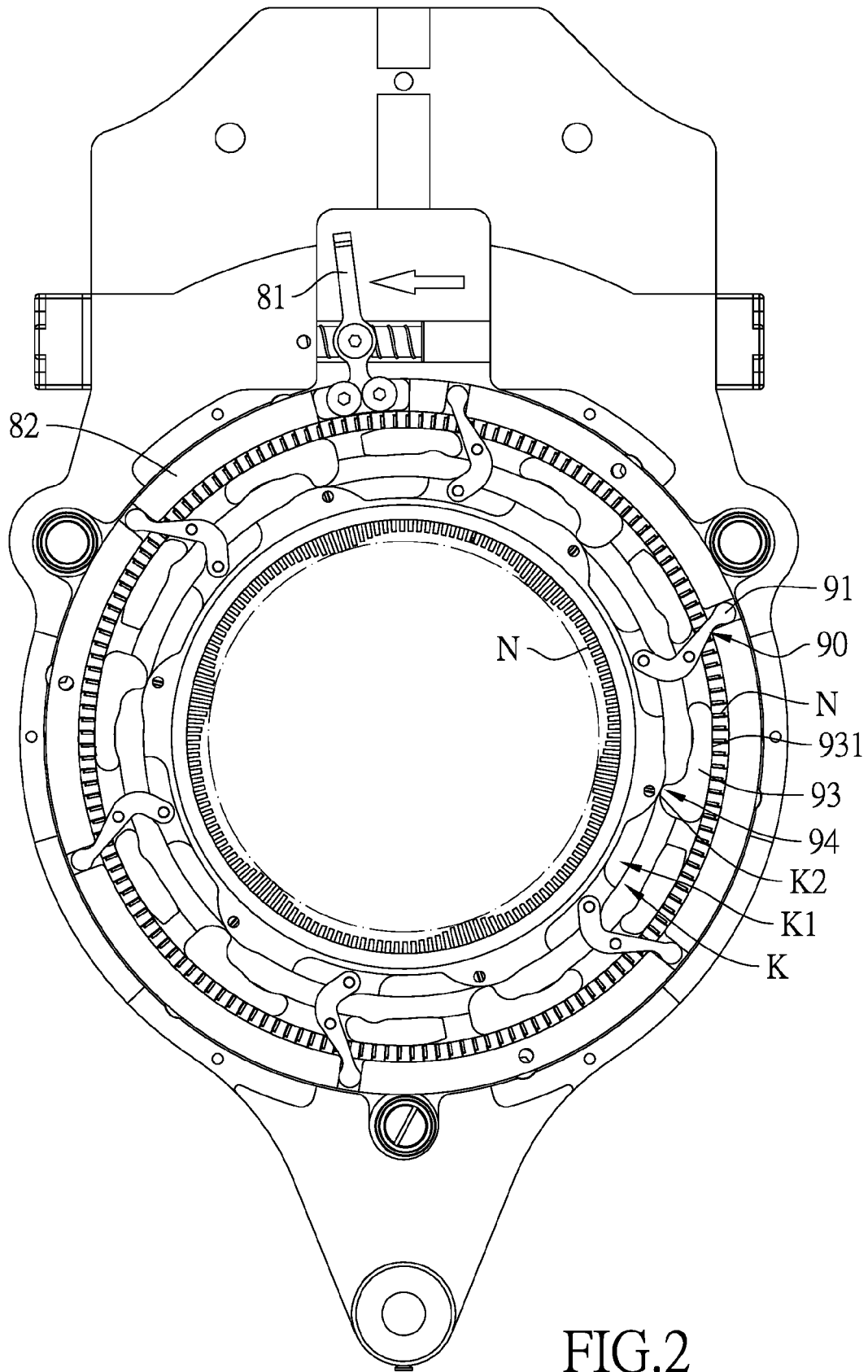
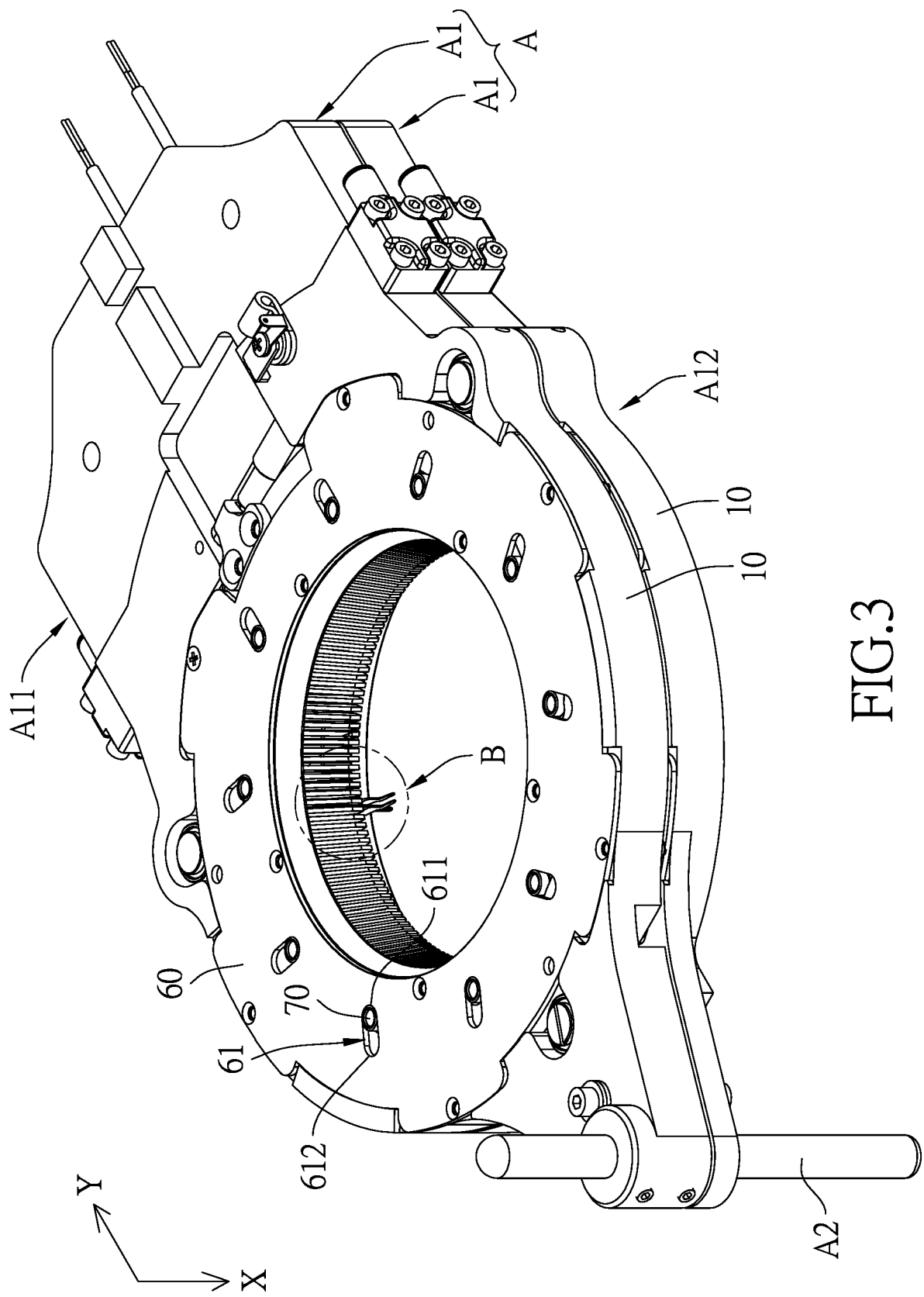


FIG.2
PRIOR ART



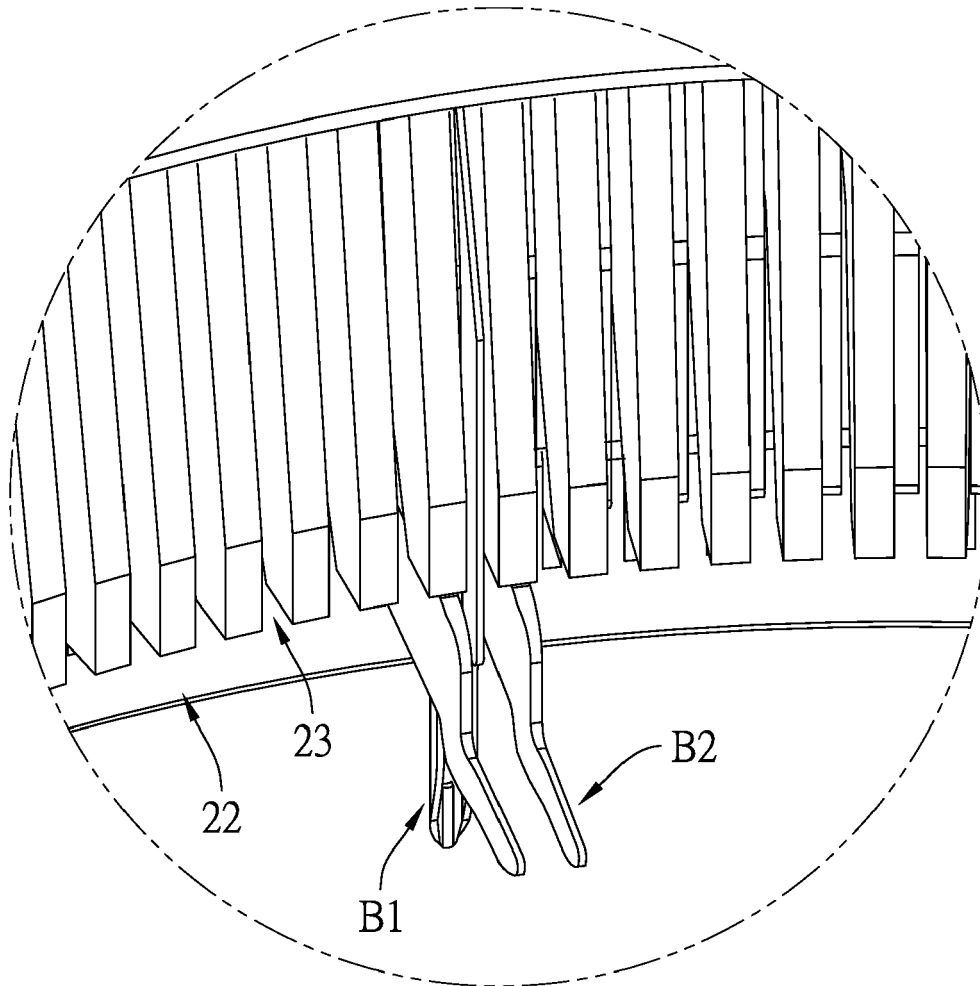


FIG.4

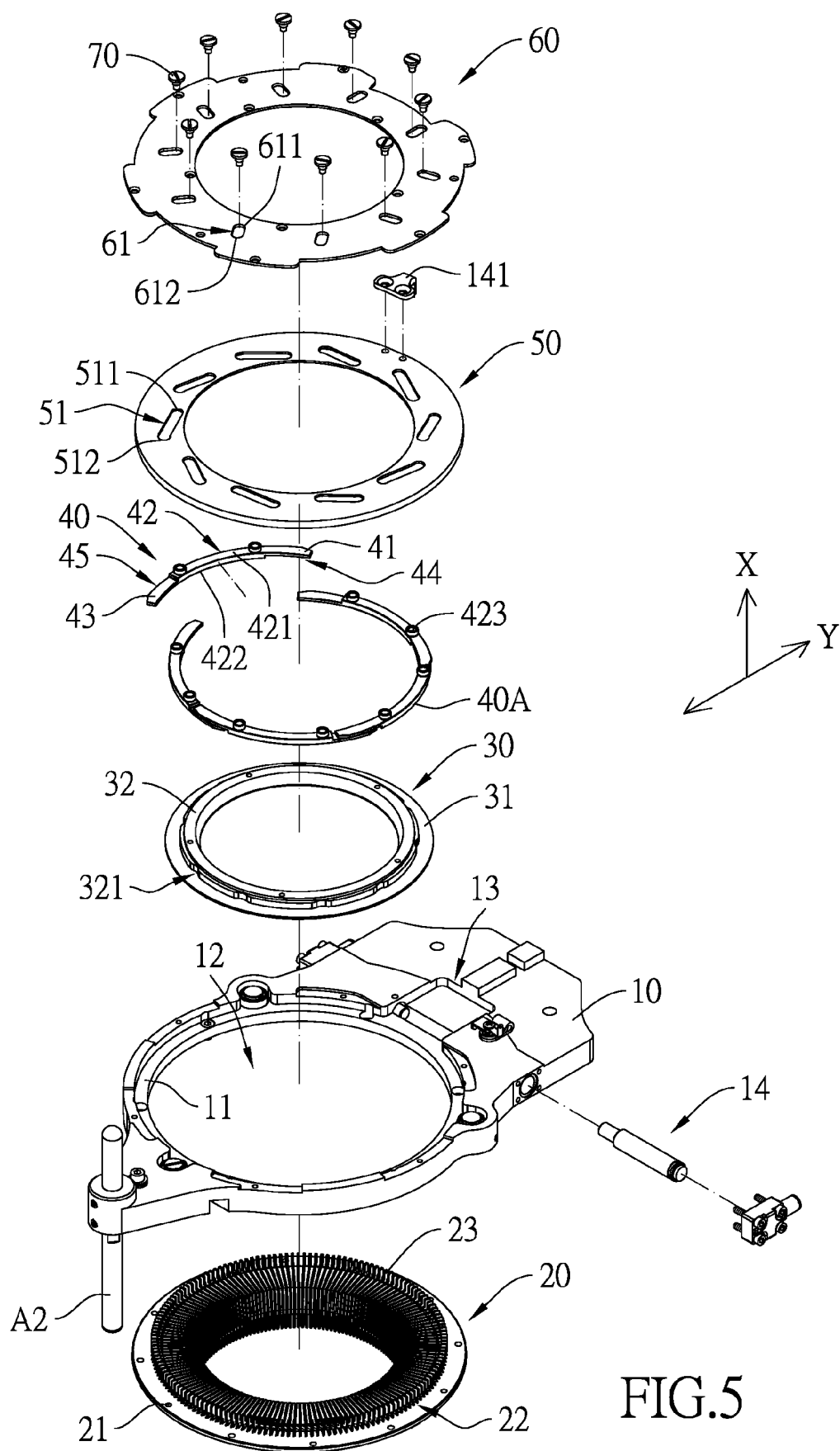
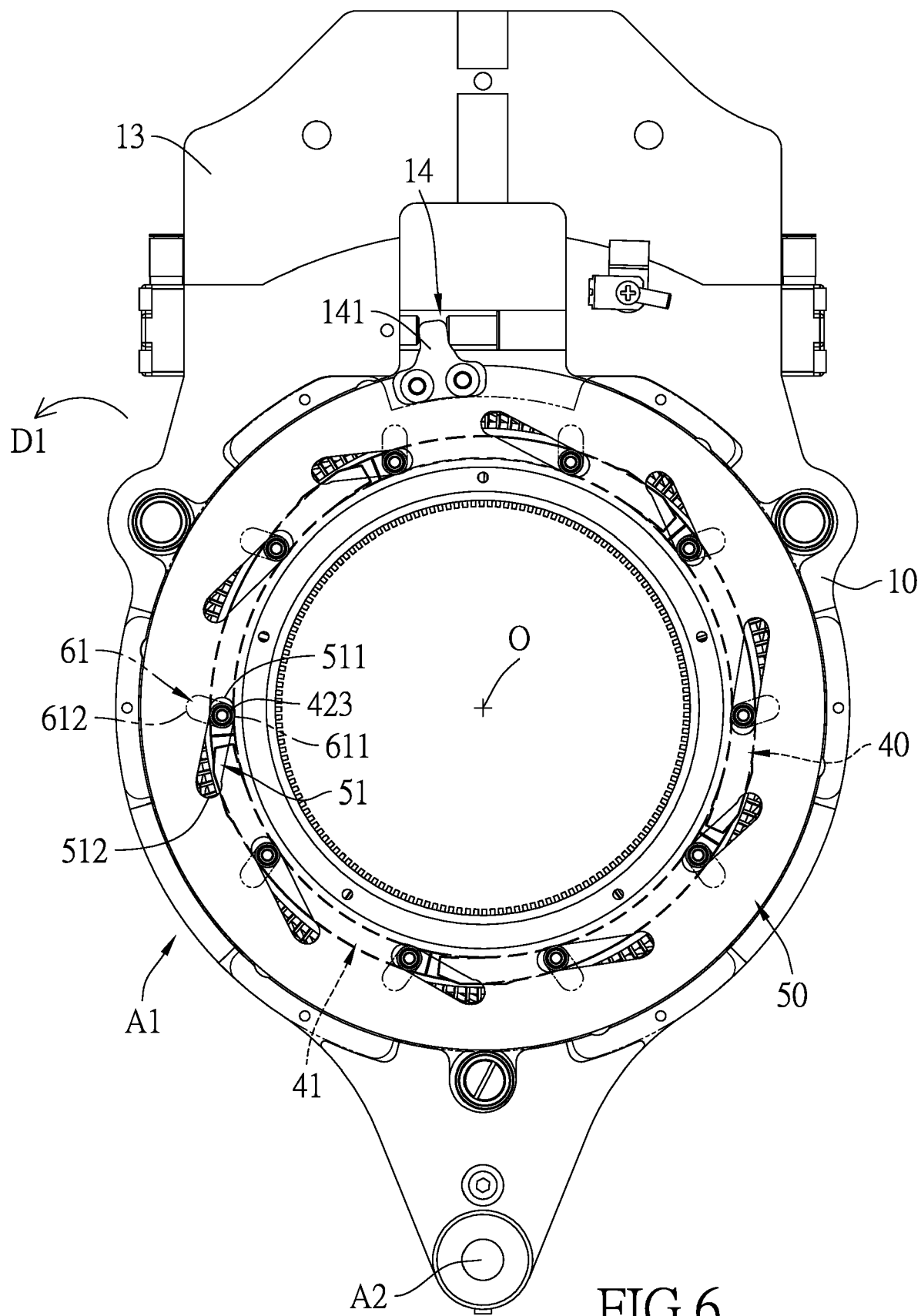
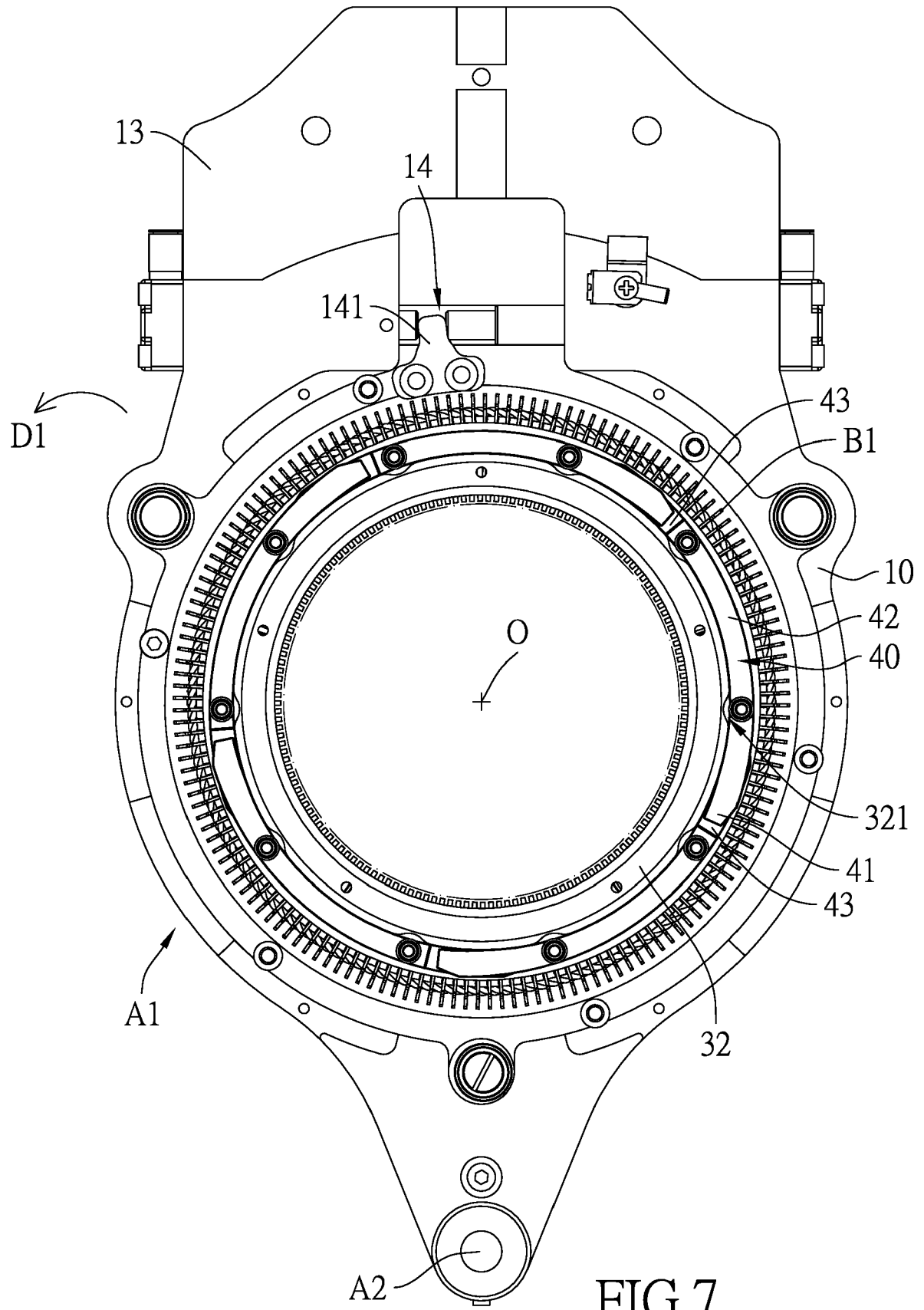


FIG.5





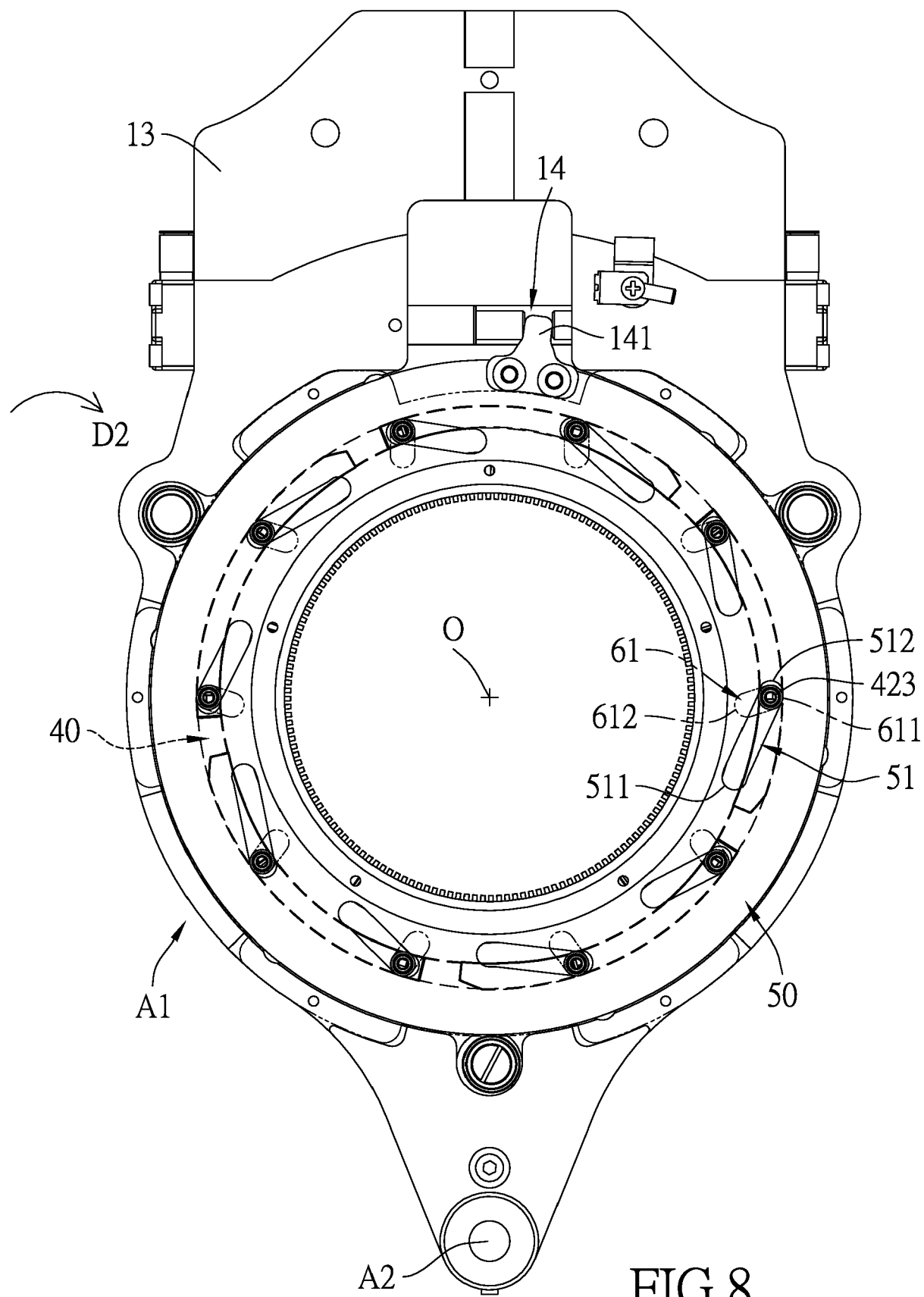


FIG.8

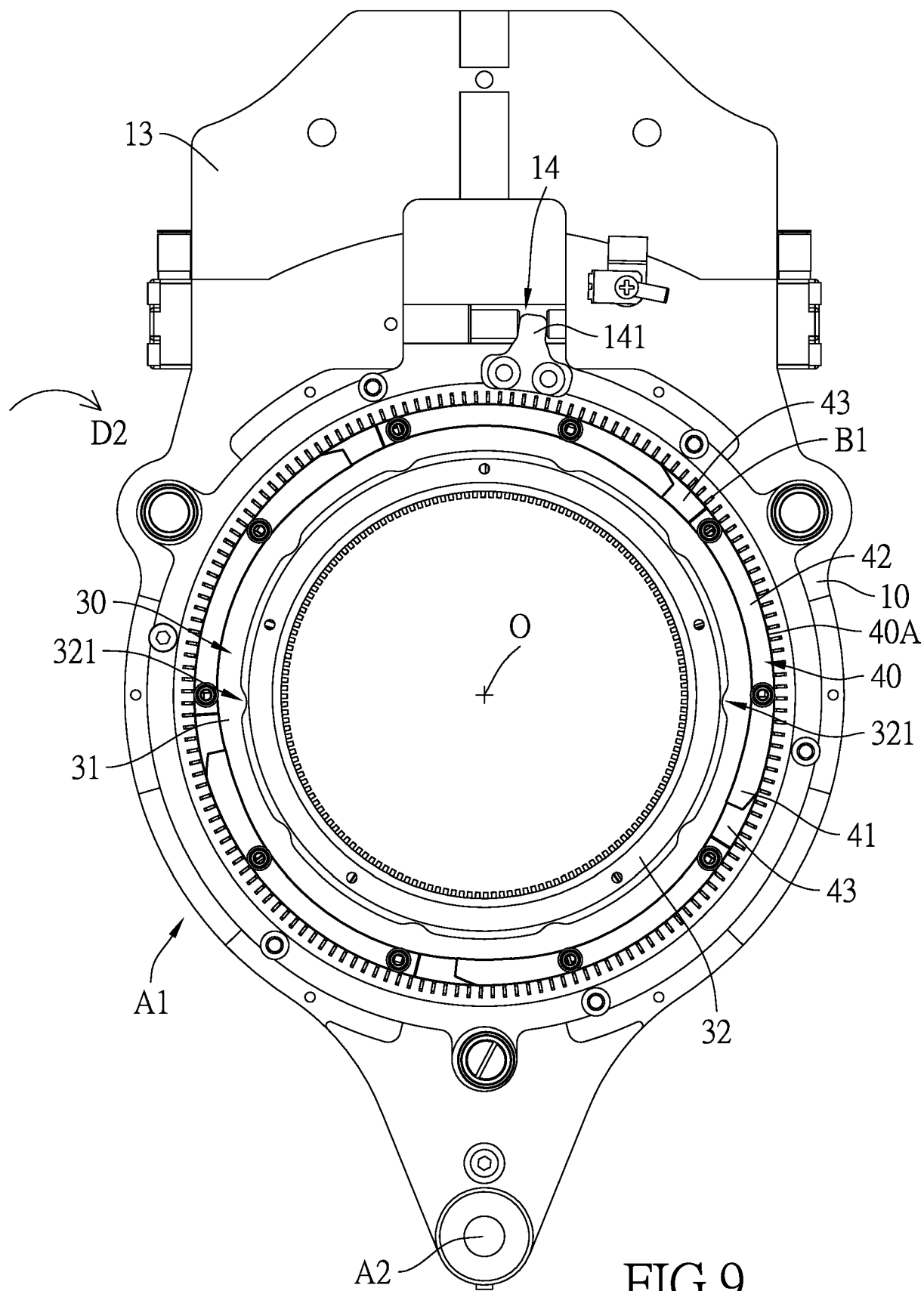


FIG.9

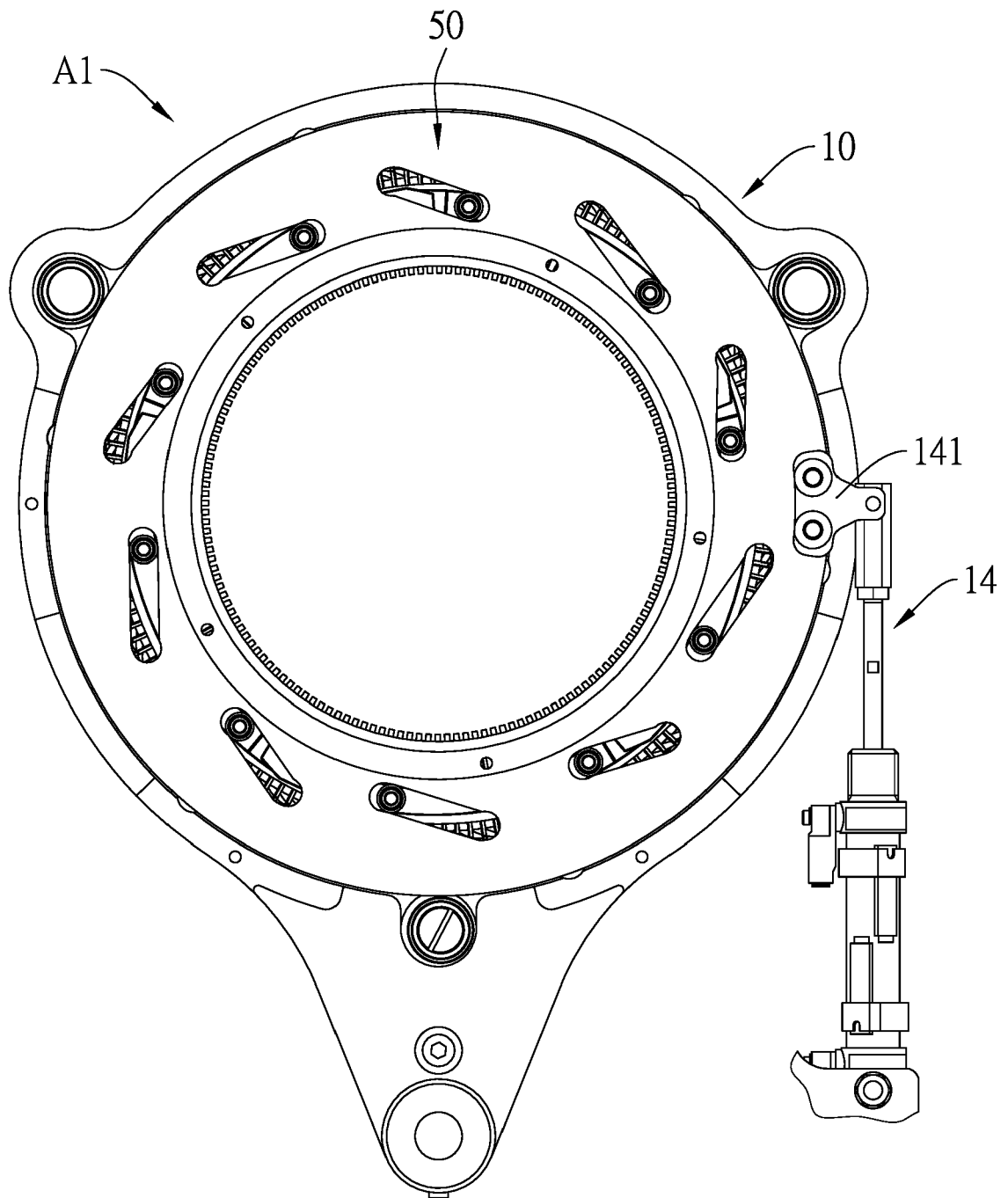


FIG.10



EUROPEAN SEARCH REPORT

Application Number

EP 22 16 4457

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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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		11 August 2022	Messai, Sonia
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 22 16 4457

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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