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

(11) **EP 3 392 384 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.10.2018 Bulletin 2018/43

(51) Int Cl.:
D03D 47/36 *(2006.01)*

(21) Application number: **18161943.8**

(22) Date of filing: **15.03.2018**

(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

(30) Priority: **20.04.2017 IT 201700043202**

(71) Applicant: **L.G.L. Electronics S.p.A.**
24024 Gandino (Bergamo) (IT)

(72) Inventors:
- **BERTOCCHI, Giorgio**
  24026 LEFFE BG (IT)
- **ZENONI, Pietro**
  24026 LEFFE BG (IT)

(74) Representative: **Modiano, Micaela Nadia**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

(54) **WEFT BRAKING DEVICE FOR ACCUMULATOR YARN FEEDERS, AND FEEDER USING SUCH WEFT BRAKING DEVICE**

(57) A yarn feeder (10) provided with a drum (12) which supports, wound thereon, a yarn (Y) which can be unwound upon request of a downstream machine, an annular braking body (16) is coaxially pushed against an output end (12a) of the drum (12) by actuation means (18) which act axially; an articulated joint (24) is functionally interposed between the actuation means (18) and the braking body (16); the weight of the braking body (16) generates a torque about at least one articulation axis (X, Z) of the joint (24), against which elastic means (34) act which are functionally associated with the joint (24).

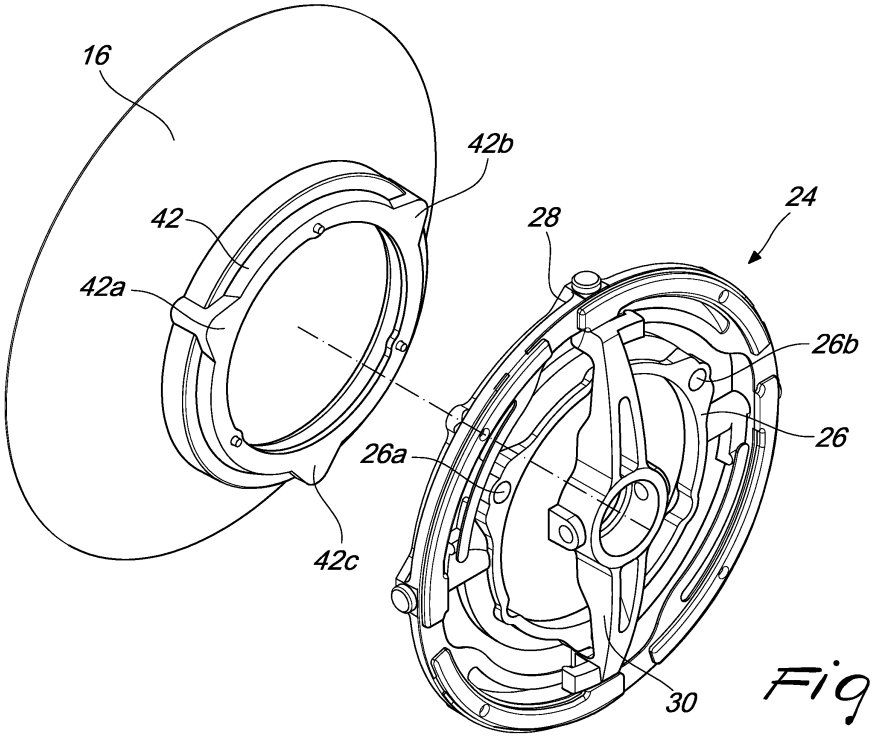

Fig. 2

EP 3 392 384 A1

Description

[0001] The present invention relates to a weft braking device for accumulator yarn feeders and a feeder using such weft braking device.

[0002] As is known, in weaving processes the yarn can be fed to a textile machine by an "accumulator" feeder.

[0003] An accumulator feeder is generally provided with a drum that supports, wound thereon, a plurality of yarn loops that are adapted to be unwound on request of the textile machine. As the yarn is unwound from the drum, it can be reloaded by a motorized arm which rotates like a swivel about an axis that is coaxial to the axis of the drum, or, in other types of feeders, by rotating the drum itself.

[0004] Before entering the textile machine, the yarn being unwound from the drum passes through a weft braking device which controls its tension.

[0005] The weft braking device can generally comprise a frustum-shaped hollow braking body which is pushed with its inner surface against the output end of the drum. Therefore, the yarn unwinding from the feeder slides pressed between the drum and the braking body, thus receiving a braking action by friction.

[0006] The braking body can be pushed against the drum by actuation means which are retroactively controlled by a control unit, on the basis of the signal received from a tension sensor which is arranged downstream of the weft braking device, so as to stabilize the tension of the unwinding yarn at a preset value.

[0007] To compensate any misalignments between the drum and the braking body, in some conventional solutions a radial system of springs may be interposed between the frustum-shaped braking body and the actuation means, with the inner ends of these springs anchored to the smaller base of the braking body, and their outer ends anchored to an annular support. The latter can slide on two lateral guides and is functionally connected to the actuation means in an intermediate eccentric position between the guides.

[0008] The foregoing configuration has the drawback that the thrust exerted in the eccentric position by the actuator on the annular support generates a torque that stresses the lateral guides, increasing wear and making frequent lubrication necessary.

[0009] Furthermore, the eccentricity of the thrust also indirectly influences the braking body, so as to compromise the evenness of the braking action along the circumference of contact between the braking body and the drum.

[0010] With the intention of overcoming the above mentioned drawbacks, it is known to press the braking body against the drum in the axial direction. To this end a linear actuator can be used which is provided with a hollow shaft, through which the yarn can pass, with a universal joint interposed between the braking body and the hollow shaft in order to compensate the misalignments. A solution of this type is described for example in EP0942892.

[0011] A drawback of conventional systems of the above type is that the weight of the braking body, which is supported in a cantilever fashion with respect to the articulation axes of the joint, has an unbalancing effect that compromises the evenness of the braking action along the circumference of contact between the braking body and the drum.

[0012] Other, similar solutions are known, for example from EP 49897 and EP 703869. These systems, however, add to the above mentioned drawback the fact that the two axes of the joint do not intersect and, therefore, the joint is not a ball joint. As is known, this further compromises the precision and evenness of the braking action.

[0013] Furthermore, in conventional systems, substitution of the frustum-shaped body is often an inconvenient and complicated operation.

[0014] Therefore, the main aim of the present invention is to provide a weft braking device for accumulator yarn feeders that overcomes the above mentioned drawbacks of conventional systems, so as to generate a more precise and even braking action along the circumference of contact between the braking body and the drum.

[0015] Another object of the invention is to simplify the operations of substitution of the braking body in the weft braking device.

[0016] This aim and these and other objects which will become better apparent hereinafter, are achieved by the weft braking device with the characteristics recited in claim 1, and by a feeder with the characteristics recited in claim 3, while the dependent claims define other characteristics of the invention which are advantageous, although secondary.

[0017] Now the invention will be described in more detail, with reference to some preferred, but not exclusive, embodiments thereof, which are illustrated for the purposes of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a partially cross-sectional side view of a portion of an accumulator yarn feeder provided with a weft braking device according to the invention;
Figure 2 is a perspective view of some disassembled components of the weft braking device in Figure 1;
Figure 3 is a perspective view that shows one of the components of the weft braking device in Figure 2 separately;
Figure 4 is an axial cross-sectional view of the component in Figure 3;
Figure 5 is a perspective view that shows an enlarged detail of the component in Figure 3;
Figure 6 is a perspective view that shows an alternative embodiment of the weft braking device according to the invention.

[0018] With initial reference to Figure 1, an accumulator yarn feeder 10 comprises a drum 12 which supports,

wound thereon, a yarn Y that is adapted to be unwound on request of a generic downstream machine (not shown).

[0019] As the yarn Y is unwound from the drum 12, a motorized arm that rotates in the manner of a swivel (not shown) winds new yarn, taking it from a distaff upstream (not shown). Alternatively, the yarn could be rewound by rotating the drum 12 which, in such case, would need to be motorized.

[0020] Such aspects, which are part of the normal knowledge of the person skilled in the art, will not be discussed further here since they lie outside the aims and objects of the invention.

[0021] The yarn Y being unwound from the drum 12 passes through a weft braking device 14 which controls its mechanical tension.

[0022] The weft braking device 14 comprises an annular braking body 16 which is coaxially pushed against the output end 12a of the drum by actuation means that act axially, advantageously, a linear actuator 18 using permanent magnets. In this embodiment, the braking body 16 is constituted by a hollow frustum-shaped membrane, which is conventional.

[0023] In a way that is known per se, the linear actuator 18 is retroactively controlled by a control unit CU, on the basis of the signal received from a tension sensor 19 which is arranged downstream of the weft braking device 14, so as to stabilize the tension of the yarn Y dispensed by the feeder 10 at a preset value.

[0024] The linear actuator 18 is supported by an arm 20, which is integral with the body of the feeder 10 and which extends parallel to the axis of the drum 12, and is provided with a hollow shaft 22 through which passes the yarn Y that is unwound from the drum 12.

[0025] Interposed between the braking body 16 and the drum 12 is an articulated joint 24.

[0026] With particular reference now to Figures 2-5, the articulated joint 24 comprises an internal annular support 26 to which the frustum-shaped body 16 is coaxially connected, an external annular support 28 which is pivoted to the internal annular support 26 about a first articulation axis X, and a supporting arm 30 which is pivoted to the external annular support 28 about a second articulation axis Z which is perpendicular to and intersects with the first axis X at a point P that is arranged along the geometric axis of the braking body 16. The arm 30 is provided with a central hole 32 through which it is connected coaxially to the operational end 22a of the hollow shaft 22 (Figure 1).

[0027] The articulated joint 24 kinematically provides a ball joint that is capable of compensating any misalignments between the braking body 16 and the drum 12.

[0028] Since the braking body 16 is supported in a cantilever fashion by the internal annular support 26, a torque is generated about the axis X which presses the internal annular support 26 to rotate in the direction indicated by the arrow R in Figure 3. As is known, such circumstance would cause an uneven pressure of the braking body 16 on the drum 12 along the circumference of contact.

[0029] According to the invention, in order to prevent such unwanted effect, the articulated joint 24 is functionally associated with elastic means which act against the torque generated by the weight of the braking body 16 in order to balance it.

[0030] In the embodiment described herein, the elastic means comprise an annular lamina 34 which is fixed coaxially to the external annular support 28. The annular lamina 34 is provided with four elastic wings 34a, 34b, 34c, 34d with an elongated profile, which extend circumferentially inside the annular extension of the lamina in equally-spaced angular positions and which have one end connected monolithically to the annular body of the lamina 34, and an opposite, free end.

[0031] The first two mutually opposite wings 34a, 34b of the four elastic wings urge, in mutually opposing directions, with their free ends, on two respective first levers 35a, 35b which are integral with the internal annular support 26, so as to generate two mutually opposing elastic torques on the internal annular support 26 which act against the rotation about the first axis X.

[0032] The second two mutually opposite wings 34c, 34d of the four elastic wings urge, in mutually opposing directions, with their free ends, on two respective second levers 35c, 35d which are integral with the arm 30, so as to generate two mutually opposing elastic torques on the arm 30 which act against the rotation about the second axis Z.

[0033] The levers 35a, 35b and 35c, 35d have respective protruding ends that are shaped so as to preload the wings 34a, 34b and 34c, 34d. Therefore these wings, with the articulated joint 24 in the assembled configuration, are not coplanar with the annular body of the lamina 34.

[0034] Figure 5 shows a detail of the wing 34d which, with its protruding end 34d', acts on the end of the lever 35d which is integral with the arm 30.

[0035] The annular lamina 34 is advantageously made of metallic material, e.g., steel for springs, and is co-molded together with the external annular support 28.

[0036] As illustrated in Figure 4, the arm 30 is pivoted to the external annular support 28 by way of a pair of pivots 38a, 38b which are inserted under pressure into respective holes which are provided in the two sides.

[0037] A similar connection (not shown) is provided between the external annular support 28 and the internal annular support 26.

[0038] With particular reference to Figure 3, it should be noted that, in order to compensate the torque generated by the weight of the braking body 16, the action of the wing 34a alone on the lever 28a about the axis X would be sufficient.

[0039] However, the use of four wings that act in opposition in pairs about the two axes X, Z is advantageous, in that it makes it possible to compensate the torque generated by the weight of the braking body even when the axis X of the articulated joint 24 is not horizontal, for ex-

ample because the feeder 10 is arranged obliquely. Furthermore, the presence of four wings makes it possible to transmit an even elastic force on the circumference of contact.

[0040] As illustrated in Figure 2, the braking body 16 is connected to the internal annular support 26 by way of a ring 42 coupled to the smaller base of the braking body 16. A first triplet of permanent magnets (not shown) are embedded in respective protruding tabs 42a, 42b, 42c of the ring 42, and are in a relationship of magnetic attraction with a second triplet of permanent magnets 26a, 26b, 26c (Figures 3 and 4) which are mounted on the internal annular support 26.

[0041] It has been found that the weft braking device 14 according to the invention fully achieves the set aims. In fact, by inserting elastic means into the articulated joint 24 to oppose the torque generated by the weight of the braking body 16, the braking action is precise and even along the circumference of contact between the braking body 16 and the drum 12.

[0042] Furthermore, the magnetic coupling between the braking body 16 and the internal annular support 26 makes the operations to substitute the braking body 16 easy and rapid.

[0043] Figure 6 shows an alternative embodiment of the invention, which differs from the previous one only in the actuation means. In particular, the arm 130 of the articulated joint 124 is connected coaxially to one end 122a of a hollow stem 122 which is provided with an external flange 122b. A slider 142 is fitted slideably over the hollow stem 122 and is connected to the shaft 118a of a stepper linear actuator 118. A spring 146 is functionally interposed between the flange 122b and the slider 142.

[0044] In operation, adjusting the position of the slider 142 by way of the stepper linear actuator 118 adjusts the axial force exerted by the braking body 116 on the drum and, as a consequence, the braking force.

[0045] In a further embodiment (not shown), the position of the slider can be manually adjusted. For example, the stepper linear actuator can be substituted by manual means of stressing, e.g., a leadscrew transmission that can be actuated with a knob; or, by making the hollow stem threaded, the slider can be substituted by a simple threaded ferrule screwed onto the stem and acting on the spring in place of the slider.

[0046] Some preferred embodiments of the invention have been described, but obviously the person skilled in the art may make various modifications and variations within the scope of the appended claims.

[0047] For example, although without changing the kinematic arrangement of the system, the arrangement of the elements of the articulated joint could be inverted; that is to say, the braking body could be connected to the external annular support and the arm to the internal annular support.

[0048] Moreover, the annular shape of the supports of the joint is advantageous in terms of structural rigidity and for mating with the other elements of the weft braking device, but such form is not indispensable; for example, the external annular support could be substituted by a cross-shaped support.

[0049] The elastic means in the articulated joint could also be provided differently from the embodiment described; e.g., helical springs or other types of springs could be functionally interposed between the elements of the articulated joint.

[0050] The braking body, which in the embodiment described herein is constituted by a frustum-shaped membrane, could also be substituted by a different type of annular element, e.g., a brush.

[0051] The disclosures in Italian Patent Application No. 102017000043202 from which this application claims priority are incorporated herein by reference.

[0052] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A weft braking device for a yarn feeder (10) provided with a drum (12) adapted to support, wound thereon, a yarn (Y) which can be unwound upon request of a downstream machine, which comprises:

   - an annular braking body (16), which is coaxially pushed against an output end (12a) of the drum (12) by actuation means (18) which act axially, and
   - an articulated joint (24), which is functionally interposed between said actuation means (18) and said braking body (16), the weight of said braking body (16) generating a torque about at least one articulation axis (X, Z) of said joint (24),

   characterized in that it comprises elastic means (34) which are functionally associated with said joint (24) and which act against said torque.

2. The weft braking device according to claim 1, **characterized in that** said joint (24) is articulated about two articulation axes (X, Z) which are mutually perpendicular and intersecting at a point (P) that is arranged along the geometric axis of the braking body (16), and it comprises a first support (26) to which said braking body (16) is connected, a second support (28) which is pivoted to the first support (26) about a first one of said articulation axes (X), and a third support (30) which is pivoted to the second support (28) about a second one of said articulation axes (Z).

3. The weft braking device according to claim 2, **characterized in that** said elastic means comprise at least one elastic wing (34a, 34b, 34c, 34d), which is functionally interposed between said second support (28) and respectively either said first support (26) or said third support (30).

4. The weft braking device according to claim 3, **characterized in that** said elastic wing (34a, 34b, 34c, 34d) has an end fixed to said second support (28) and urges, with an opposite free end thereof, on a respective lever (35a, 35b, 35c, 35d) which is integral with respectively either said first support (26) or said third support (30), said lever (35a, 35b, 35c, 35d) being shaped so as to preload the respective elastic wing (34a, 34b, 34c, 34d).

5. The weft braking device according to claim 3 or 4, **characterized in that** said elastic wing (34a, 34b, 34c, 34d) extends monolithically from an annular lamina (34) which is coaxially fixed to said second support (28).

6. The weft braking device according to claim 5, **characterized in that** said annular lamina (34) is made of metallic material and is co-molded together with the external annular support (28).

7. The weft braking device according to one or more of the preceding claims, **characterized in that** it comprises at least one pair of said elastic wings (34a, 34b, 34c, 34d) which act in opposite directions so as to generate two mutually opposite elastic torques about a respective one of said two axes (X, Z).

8. The weft braking device according to one or more of the preceding claims, **characterized in that** said first support (26) and said second support (28) have annular profiles and one is inserted into the other.

9. The weft braking device according to one or more of the preceding claims, **characterized in that** said braking body (16) is connected to said first support (26) by way of magnetic connection means (40a, 40b, 40c).

10. The weft braking device according to one or more of the preceding claims, **characterized in that** said actuation means comprise a linear actuator (18) with permanent magnets, which is provided with a hollow shaft (22) which is passed through by the yarn (Y) and is retroactively controlled by a control unit (CU) on the basis of the signal received from a tension sensor (19) which is arranged downstream of the weft braking device, so as to stabilize the tension of the yarn dispensed by the feeder at a preset value.

11. The weft braking device according to one or more of the preceding claims, **characterized in that** the actuation means comprise a hollow stem (122) which is connected to the shaft (118a) of adjustable actuation means (118) with the interposition of further elastic means (146).

12. The weft braking device according to claim 11, **characterized in that** said adjustable actuation means comprise a stepper linear actuator (118).

13. A yarn feeder provided with a drum (12) adapted to support, wound thereon, a yarn (Y) which can be unwound upon request of a downstream machine, which comprises a weft braking device provided with an annular braking body (16) which is coaxially pushed against an output end (12a) of the drum (12) by actuation means (18) which act axially, and an articulated joint (24), which is functionally interposed between said actuation means (18) and said braking body (16), the weight of said braking body (16) generating a torque about at least one articulation axis (X, Z) of said joint (24), **characterized in that** it comprises elastic means (34) which are functionally associated with said joint (24) and act against said torque.

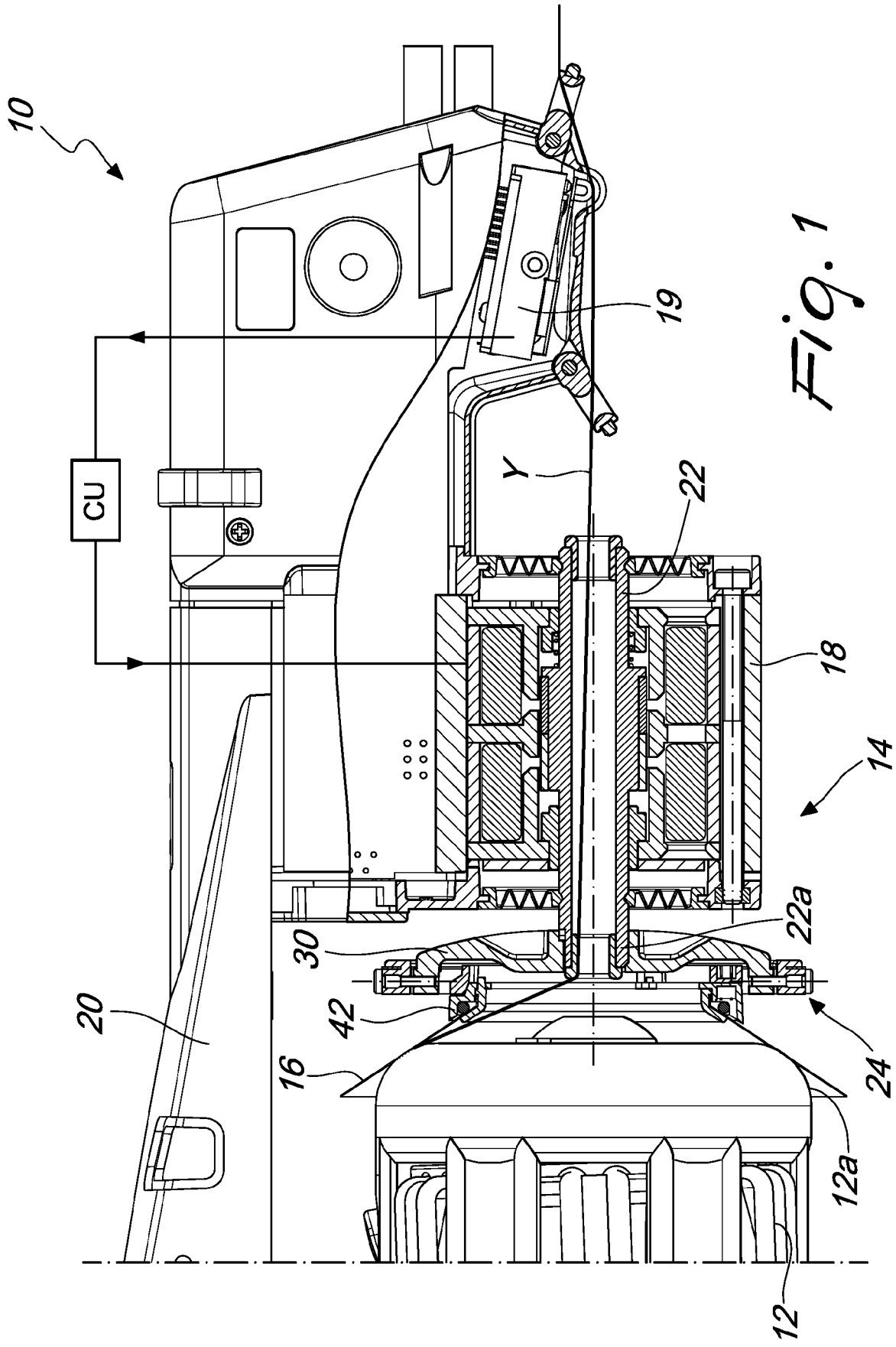

Fig. 1

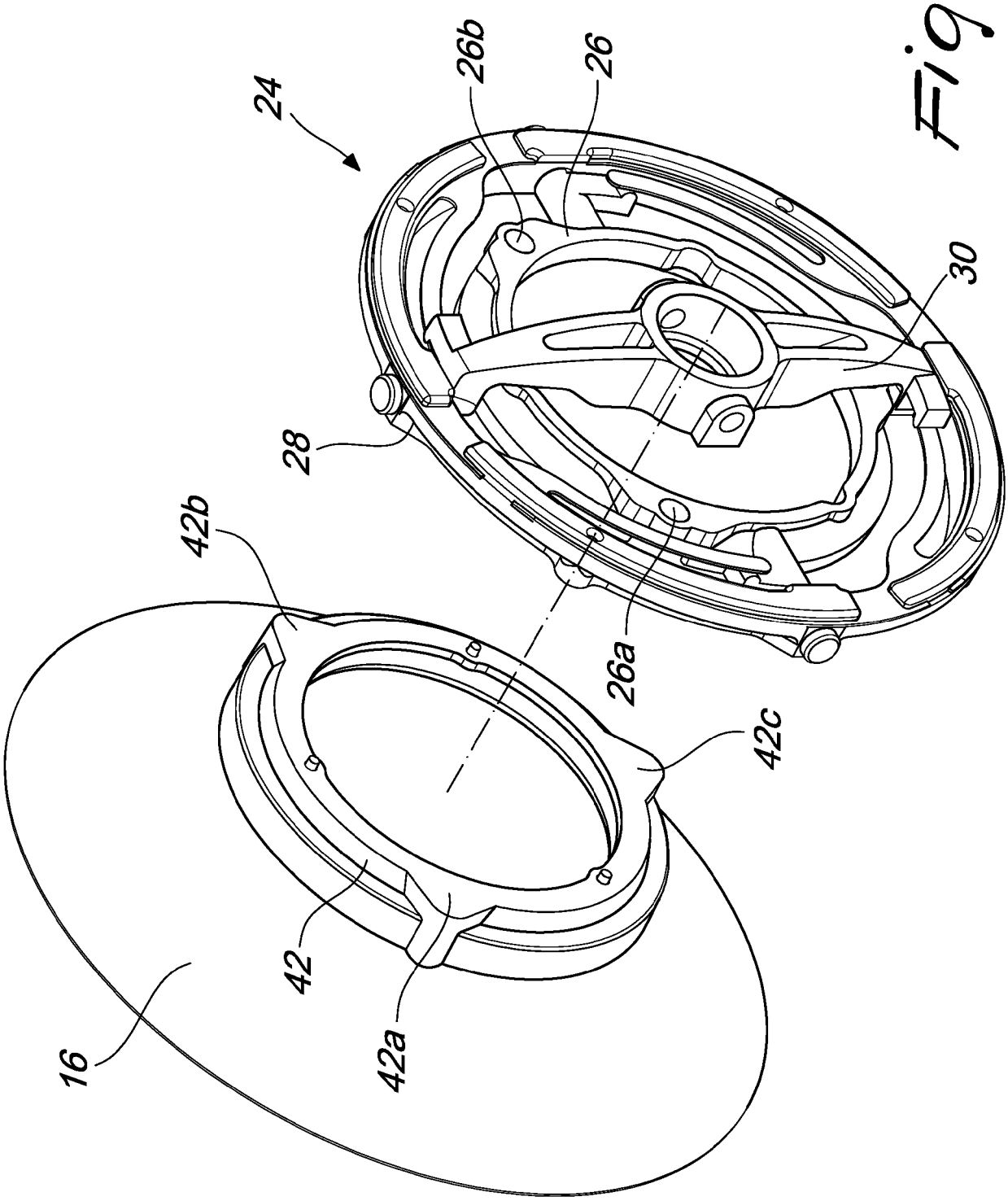

Fig. 2

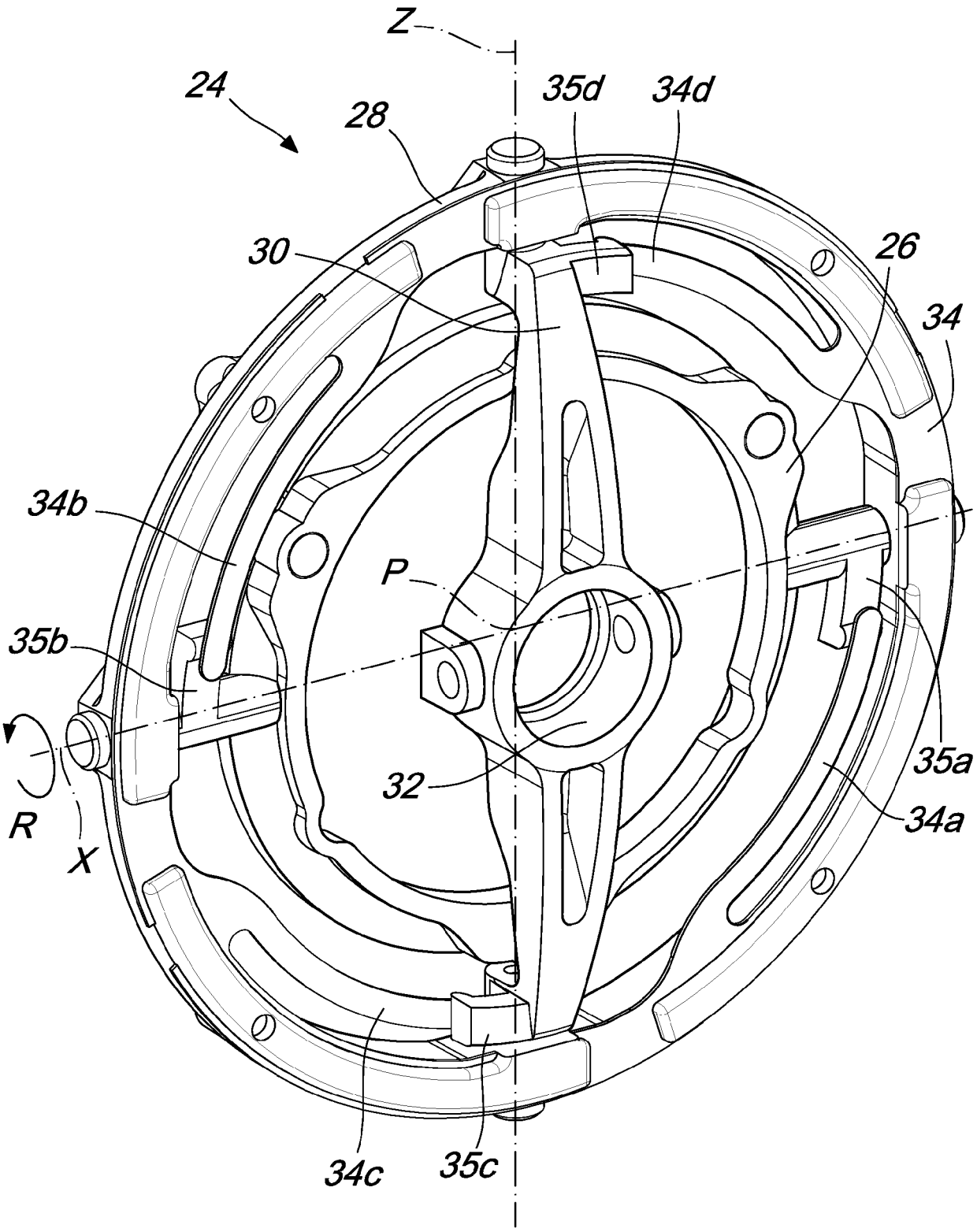

Fig. 3

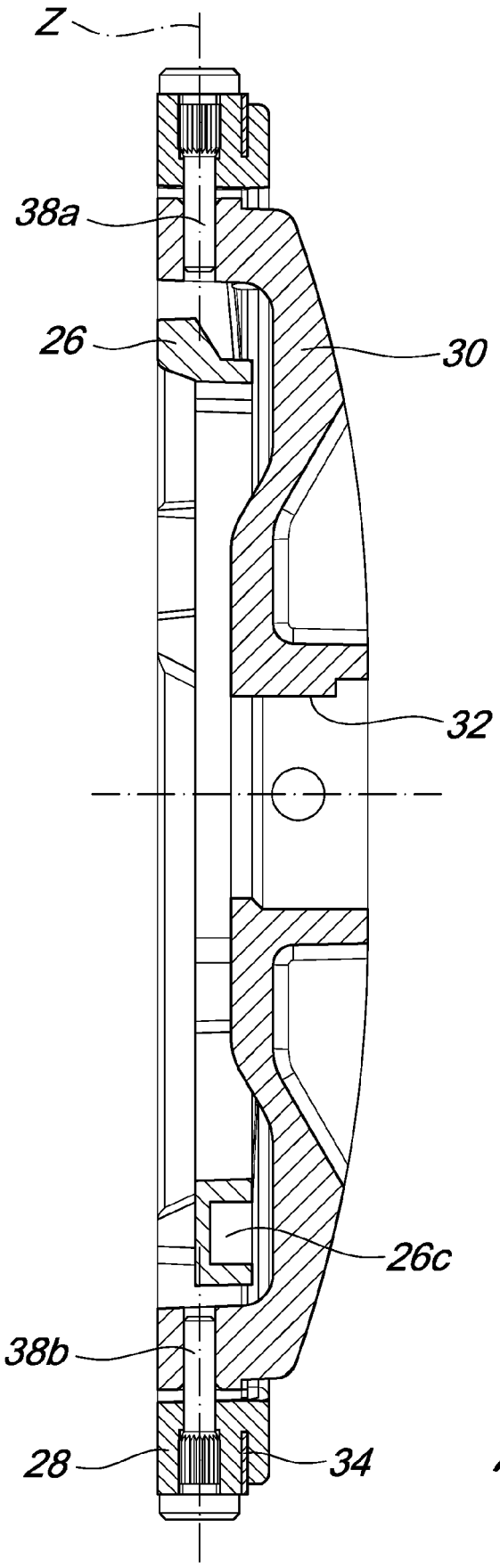

Fig. 4

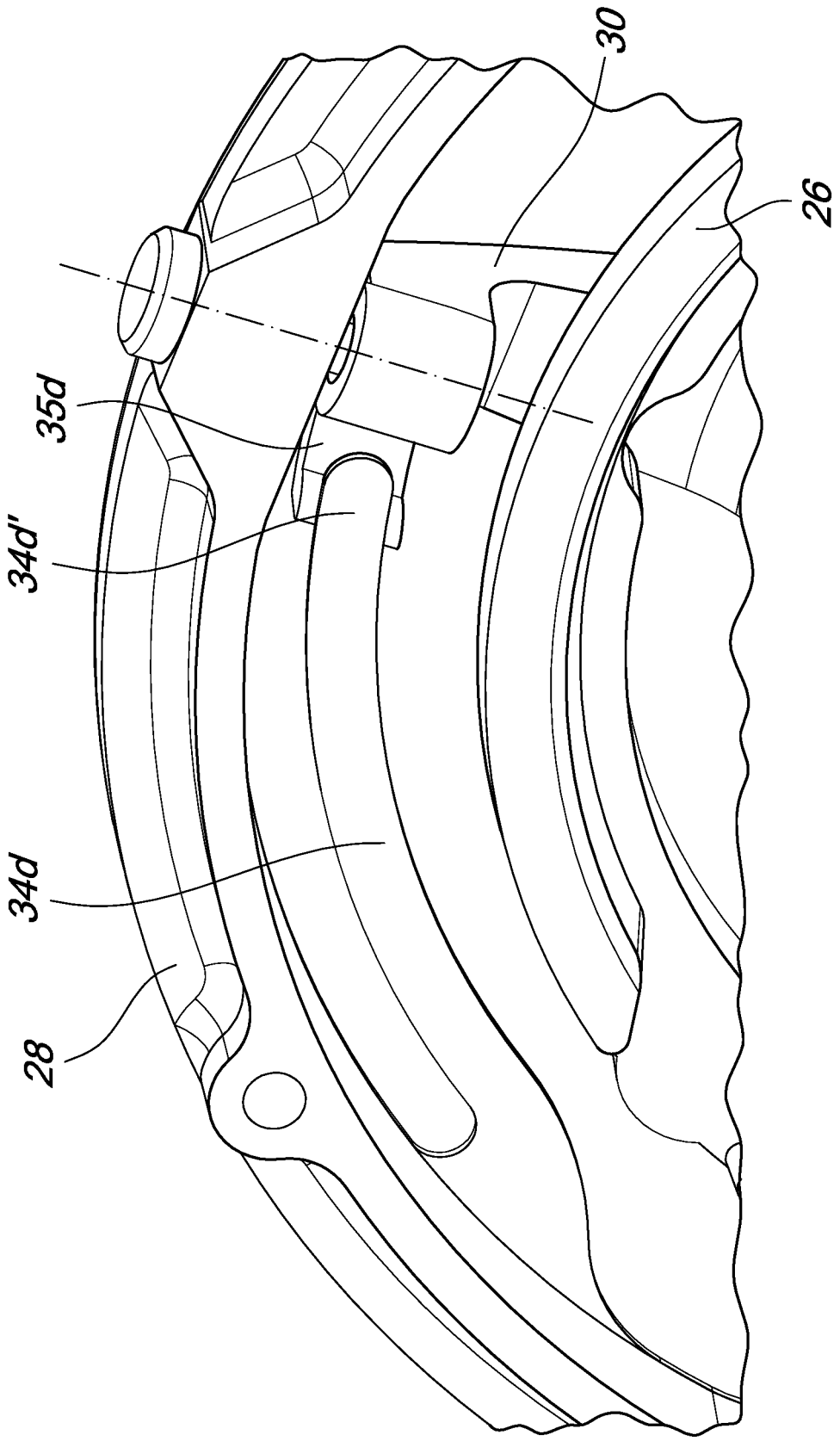

Fig. 5

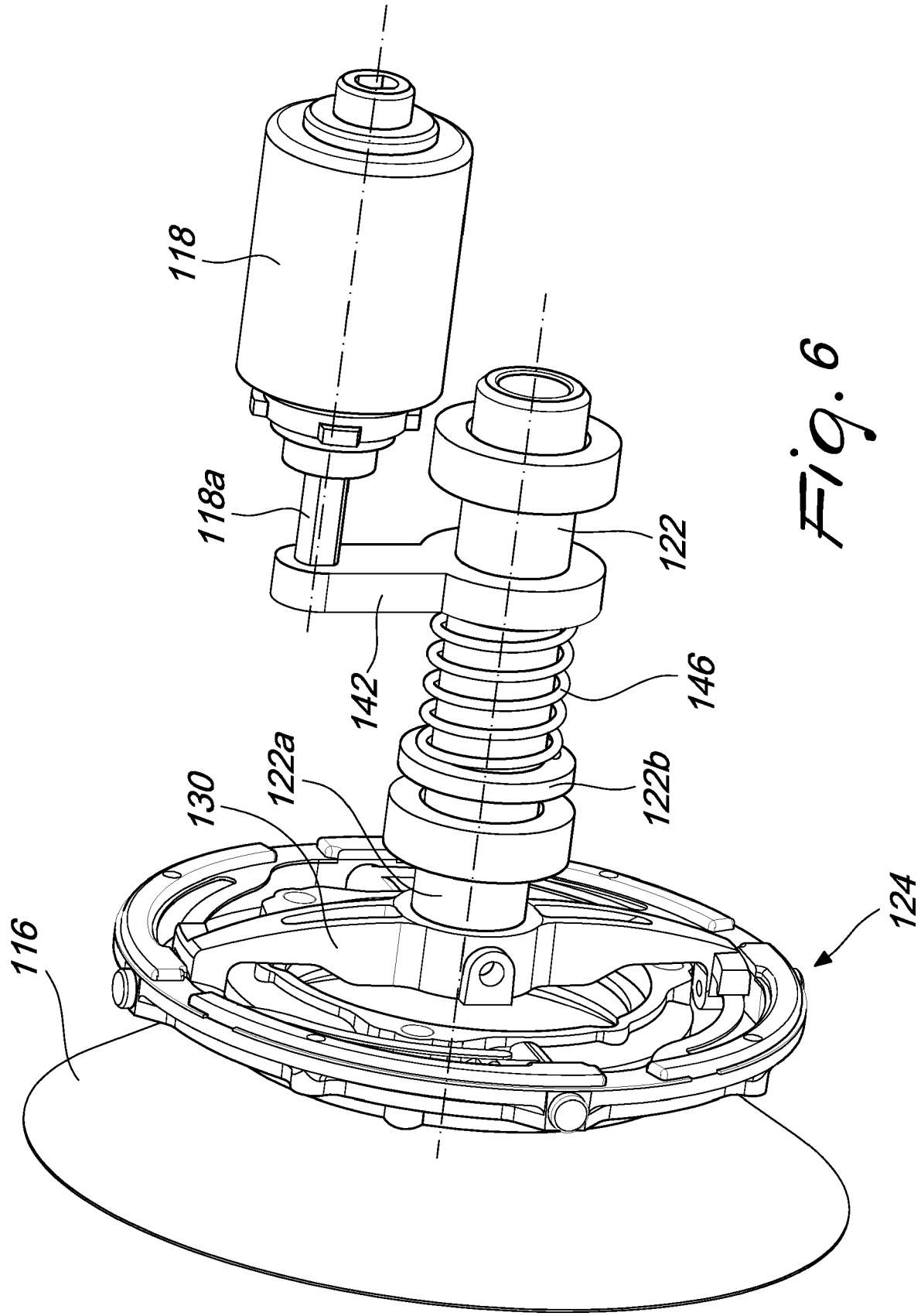

Fig. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 16 1943

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 0 942 892 B1 (IRO AB [SE]) 20 March 2002 (2002-03-20)	1,2,8,13	INV. D03D47/36
Y	* figures 2,3 *	9	
A		3-7	

X	EP 1 717 181 A1 (LGL ELECTRONICS SPA [IT]) 2 November 2006 (2006-11-02)	1,10-13	
Y	* paragraphs [0010] - [0016]; figures 1-3 *	9	

X	US 5 546 994 A (SARFATI ALBERTO G [IT]) 20 August 1996 (1996-08-20) * figures 1,3,4 *	1,13	

TECHNICAL FIELDS SEARCHED (IPC)

D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 August 2018	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 16 1943

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-08-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0942892 B1	20-03-2002	CN 1238737 A	15-12-1999
		DE 19649220 A1	28-05-1998
		EP 0942892 A1	22-09-1999
		KR 20000057267 A	15-09-2000
		US 6164580 A	26-12-2000
		WO 9823520 A1	04-06-1998
EP 1717181 A1	02-11-2006	CN 1854366 A	01-11-2006
		DE 602006000210 T2	28-08-2008
		EP 1717181 A1	02-11-2006
US 5546994 A	20-08-1996	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0942892 A **[0010]**
- EP 49897 A **[0012]**
- EP 703869 A **[0012]**
- IT 102017000043202 **[0051]**