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(54) **WEFT BRAKING DEVICE FOR ACCUMULATOR YARN FEEDERS**

(57) A support (34) is adapted to be fixed to an accumulator yarn feeder (10) which is provided with a drum (12) adapted to support a yarn (Y) wound thereon which is adapted to be unwound on demand by a textile machine. A hollow braking member (20) extending around an axis coaxially engages a delivery end (12a) of the drum (12). A braking adjustment mechanism (28) comprises a first threaded element (30) which is connected to the hollow braking member (20) and can be translated axially with respect to the support (34) at the command of a second threaded element (32) which is supported rotatably by the support (34). Elastic means (38), which are functionally interposed between the two threaded elements, bias their threadings to be always mutually engaged on a same side, regardless of the direction of rotation of the second threaded element (32).

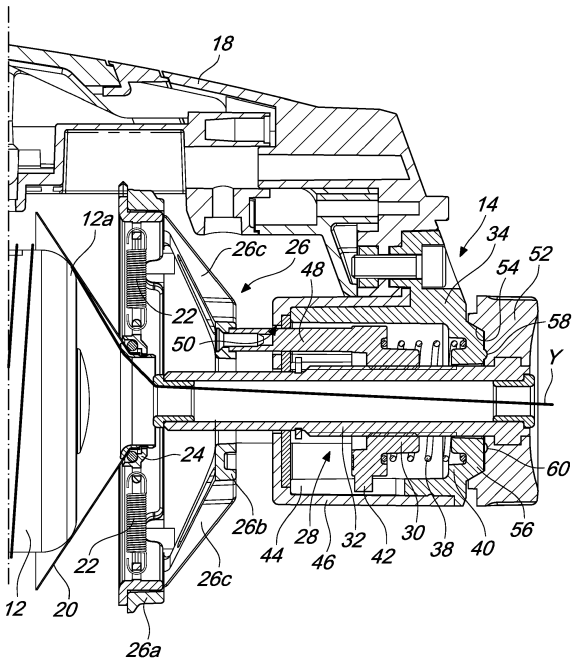

Fig. 3

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Description

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

[0002] As is known, a generic accumulator yarn feeder can comprise a drum that supports, wound thereon, a yarn that is adapted to be unwound on demand by a generic textile machine arranged downstream. Before entering the textile machine, the yarn being unwound from the drum passes through a weft braking device which controls the mechanical tension thereof.

[0003] The weft braking device can be constituted by a hollow frustum-shaped body which is pushed elastically against the delivery end of the drum by a radial system of springs. The springs have their inner ends anchored to the smaller base of the frustum-shaped body, and their outer ends anchored to an annular support. The latter can move axially on command by a screw/spindle nut mechanism which is incorporated in a fixed arm that extends parallel to the drum. The screw/spindle nut mechanism can be actuated manually by way of a knob arranged at the end of the arm, or automatically by a feedback-controlled motor.

[0004] The yarn in output from the feeder slides pressed between the drum and the hollow frustum-shaped body, in so doing receiving a braking action by friction which can be adjusted either manually, by way of the knob, or automatically by the motor.

[0005] The above described system presents some drawbacks associated with the amounts of play in the screw/spindle nut coupling, which compromise precision in the adjustment of the tension on the yarn and, as a consequence, the quality of the finished garment. In particular, when the rotation of the screw is inverted (e.g., in order to reduce the braking force after being increased in an earlier step), the first part of the rotation is aimed to recover the play of the threaded coupling and therefore does not produce any variation of tension on the yarn.

[0006] A further disadvantage of the conventional system mentioned above is that the adjustment axis, being offset with respect to the axis of translation of the annular support, causes an increase of the amounts of play, as well as oscillations of the annular support about its point of attachment.

[0007] Another known braking device, described in EP 2065495, has a system for adjusting the braking force which is arranged coaxially with respect to the drum. However, it is based on the magnetic repulsion between a first annular magnet fixed coaxially to the hollow frustum-shaped body and a second annular magnet which can be translated axially on command by a knob by way of threaded coupling. Therefore, the system described in EP 2065495 is not applicable to adjustable braking devices based on elastic forces, like the one described previously.

[0008] The aim of the present invention is to provide a weft braking device for accumulator yarn feeders that, although being based on elastic forces, overcomes the drawbacks of the conventional systems described above, and in particular that has more precise operation in relation to the amounts of play in the adjustment mechanism and to the arrangement of the adjustment system.

[0009] Within this aim, an object of the invention is to provide a weft braking device that is relatively simple from the point of view of construction in order to limit manufacturing costs.

[0010] This aim and this and other objects, which will become clearer from the description that follows, are achieved by the weft braking device having the characteristics of the appended claim 1, while the appended dependent claims define other characteristics of the invention.

[0011] The invention will be now 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 perspective view of an accumulator yarn feeder on which a weft braking device according to the invention is installed;

Figure 2 is a perspective view showing the weft braking device of Figure 1 in detail;

Figure 3 is an axial cross-sectional view of the weft braking device of Figure 2;

Figure 4 is a perspective view of a weft braking device according to an alternative embodiment of the invention;

Figure 5 is an axial cross-sectional view of the weft braking device of Figure 4.

[0012] With initial reference to Figures 1-3, an accumulator yarn feeder 10 comprises a drum 12 which is adapted to support, wound thereon, a yarn Y (shown only in Figure 3). The yarn is unwound from the drum 12 on demand by a generic textile machine arranged downstream (not shown), after having passed through a weft braking device 14 which will be described in more detail hereinafter.

[0013] As the drum 12 is depleted, a flywheel 16 entrained in rotation by a motor M winds on new loops, taking the yarn from a distaff arranged upstream (not shown).

[0014] The weft braking device 14 is supported at the free end of an arm 18 that protrudes from the motor body parallel to the drum 12.

[0015] With particular reference to Figures 2 and 3, the weft braking device 14 comprises a hollow braking member 20, typically a thin-walled frustum-shaped body, e.g. made of plastic material, which is pushed elastically with its inner surface against the delivery end 12a (Figure 3) of the drum 12. The hollow braking member 20 is supported coaxially to the drum 12 by means of a radial system of traction springs 22. The traction springs 22 have their inner ends anchored to a ring 24 which is fixed to the smaller base of the hollow frustum-shaped body 20,

and their outer ends anchored to a frame 26 with a circular profile.

[0016] The frame 26 is provided with an outer ring 26a, to which the outer ends of the traction springs 26 are connected, and with an inner ring 26b which is connected to the outer ring 26a by way of a triplet of radial arms 26c.

[0017] The frame 26 is functionally connected to a braking adjustment mechanism 28.

[0018] The braking adjustment mechanism 28 is of the type with screw/spindle nut and comprises a first threaded element 30, which in the embodiment described herein is a spindle nut 30, which is connected to the hollow braking member 20 and can be translated axially at the command of a second threaded element, which in the embodiment described herein is a screw 32.

[0019] The braking adjustment mechanism 28 is mounted on a support 34 which is screwed to the arm 18 and, according to the invention, is provided with elastic means which are functionally interposed between the spindle nut 30 and the support 34 in order to bias the threading of the spindle nut 30 to always engage the threading of the screw 32 on a same side, regardless of the direction of rotation of the screw 32.

[0020] Advantageously, the braking adjustment mechanism 28 is supported coaxially to the drum 12, and the screw 32 is hollow so as to be passed through by the yarn Y that is unwound from the drum 12 (Figure 3).

[0021] In this embodiment, the elastic means are arranged so as to act in contrast with the radial system of springs 22, i.e., so as to "press" the spindle nut 32 in the direction of the drum 12, and therefore they have a greater rigidity in an axial direction than that of the radial system of springs 22.

[0022] In more detail, the elastic means comprise a compression spring 38 which is functionally interposed between the spindle nut 30 and a wall 40 of the support 34 which is perpendicular to the axis of the screw 32 and passed through slideably by the latter.

[0023] The spindle nut 30 is provided with radial pins 42 which slideably engage respective longitudinal grooves 44 which are provided on the support 34 (Figure 3), so as to translate axially without rotation when the screw 32 is rotated.

[0024] The support 34 is covered by a transparent shell 46 which makes it possible to see the position of the radial protrusions 42, which shows the level of braking.

[0025] The spindle nut 30 is connected to the frame 26 by way of a triplet of longitudinal columns 48 which protrude monolithically from the spindle nut 30, pass through respective holes 50 provided on the transparent shell 46, and are screwed axially to the inner ring 26b of the frame 26.

[0026] The screw 32 can be actuated manually by way of a knob 52 which is connected thereto.

[0027] The knob 52 is fixed to the screw 32 on the opposite side of the wall 40 with respect to the spring 38, and is kept pressed by the latter against the wall 40.

[0028] Centering means are interposed between the end wall 40 and the knob 52. The centering means comprise a frustum-shaped seat 54, which in the embodiment described herein is provided on the inner axial side of the knob 52, and a frustum-shaped protrusion 56, which in the embodiment described herein is provided on the outer face of the wall 40 and engages the frustum-shaped seat 54.

[0029] Furthermore, the knob 52 can advantageously move by steps between different preset braking positions, which are determined by the snap engagement of protrusions 58, which in this embodiment are spherical and are provided on the outer face of the wall 40, with corresponding seats 60 of the knob 52, which in this embodiment are provided on the face that delimits the inner axial side of the knob 52.

[0030] During operation, the yarn Y being unwound from the feeder slides between the delivery end 12a of the drum 12 and the hollow frustum-shaped body 20, receiving from these a braking action owing to friction; then it passes through the screw 32; and finally it is transferred to the textile machine arranged downstream.

[0031] The braking force can be adjusted by the knob 52.

[0032] By virtue of the compression spring 38, the threading of the spindle nut 30 always engages the threading of the screw 32 on the same side, regardless of the direction of rotation of the screw 32, so as to eliminate the play when the rotation of the knob 52 is inverted, e.g., in order to reduce the braking force after being increased in an earlier step.

[0033] Therefore, according to the set aims, the adjustment of the braking force is considerably more exact with respect to current solutions.

[0034] Furthermore, according to the set aims, the solution according to the invention is simple in terms of construction by virtue of the fact that the compression spring 38 performs multiple functions, in addition to the basic function described above. In particular, it ensures the centering between the knob 52 and the support 34 by way of the frustum-shaped coupling 54, 56, it determines the rotation by steps of the knob 52, and it enables the rapid disengagement of the brake for cleaning/maintenance operations and/or substitution of the braking body.

[0035] Furthermore the coaxial arrangement of the adjustment mechanism 28 with respect to the drum 12 makes it possible to further reduce the amounts of play and the oscillations of the frame 26, with further benefits in terms of precision of adjustment.

[0036] Figures 4 and 5 show an alternative embodiment of the invention, which differs from the previous one in that the adjustment mechanism 128, instead of being actuated manually by a knob, is actuated by a motor 160 through a geared transmission. This transmission is composed of a pinion 162 which is keyed on the driving shaft 164 of the motor 160, and engages a gear 166 which is keyed on the screw 132 of the adjustment mechanism 128.

[0037] Preferably, the motor 160 is a stepper motor,

and is feedback-controlled on the basis of to the signal received from a load cell (not shown) in order to stabilize the yarn tension at a preset value.

[0038] 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 protection of the claims.

[0039] For example, although in the embodiments described the spring acts in contrast with the radial system of springs that support the hollow frustum-shaped body, so as to also perform the accessory functions described above, it could also be arranged so as to act in the same direction as the radial system of springs, so as to bias the threading of the spindle nut to engage the threading of the screw on the opposite side from the embodiments described.

[0040] Furthermore, the frustum-shaped braking body in the embodiments described can be substituted by a different hollow braking member that extends around an axis, e.g., an annular brush and the like.

[0041] The radial system of springs 22 can also be substituted by other elastically yielding supporting means, e.g., elastic cables and the like.

[0042] Furthermore, although in the embodiments described the threaded element that is rotated is the screw and the threaded element that performs a translational motion is the spindle nut, such configuration could be inverted, with the screw being connected to the hollow braking element and made to translate without rotation with respect to the support, and the spindle nut being held axially and made to rotate in order to adjust the braking force.

[0043] The disclosures in Italian Patent Application No. 102018000007866 from which this application claims priority are incorporated herein by reference.

[0044] 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 accumulator yarn feeders that are provided with a drum (12) adapted to support a yarn (Y) wound thereon which is adapted to be unwound on demand by a textile machine, which comprises a support (34) adapted to be fixed to the yarn feeder (10), a hollow braking member (20) extending around an axis and adapted to coaxially engage a delivery end (12a) of said drum (12), and a braking adjustment mechanism (28) which comprises a first threaded element (30) connected to said hollow braking member (20) and capable of translating axially with respect to the support (34) at the command of a second threaded element (32) which is supported rotatably by the support (34), **characterized in that** it comprises elastic means (38) which are functionally interposed between said first threaded element (30) and said support (34) in order to bias the threading of said first threaded element (30) to engage the threading of said second threaded element (32) always on a same side regardless of the direction of rotation of said second threaded element (32).

2. The weft braking device according to claim 1, **characterized in that** said first threaded element (30) and said second threaded element (32) are supported coaxially to the drum (12).

3. The weft braking device according to claim 1 or 2, **characterized in that** said elastic means (38) are arranged so as to act against elastically yielding supporting means (22) which are functionally interposed between said hollow braking member (20) and said first threaded element (30), and have a greater rigidity in an axial direction than that of said elastically yielding supporting means (22).

4. The weft braking device according to one of claims 1-3, **characterized in that** said first threaded element is a spindle nut (30) which is guided to slide axially without rotation with respect to said support (34), and said second threaded element is a screw (32).

5. The weft braking device according to claim 4, **characterized in that** said screw (32) can be actuated manually by way of a knob (52) which is connected thereto.

6. The weft braking device according to claim 5, **characterized in that** said elastic means (38) are arranged so as to axially push said knob (52) against a wall (40) of said support, centering means (54, 56) being interposed between said wall (40) and said knob (52).

7. The weft braking device according to claim 6, **characterized in that** said centering means comprise a frustum-shaped seat (54) which is provided on either said knob (52) or said wall (40) and is engaged coaxially by a frustum-shaped protrusion (56) provided on the other one of either said knob (52) or said wall (40).

8. The weft braking device according to one of claims 5-7, **characterized in that** said knob (52) can move by steps between different preset braking positions determined by the snap engagement of protrusions (58) provided on either said knob (52) or said support (34), with corresponding seats (60) provided on the

other one of either said knob (52) or said support (34).

9. The weft braking device according to one of claims 1-4, **characterized in that** said second threaded element (32) is driven by a motor (160) which is feedback-controlled on the basis of a signal received from a load cell, in order to stabilize the tension of the yarn at a preset value.

10. The weft braking device according to one of claims 1-9, **characterized in that** said support (34) is protected by a transparent shell (46).

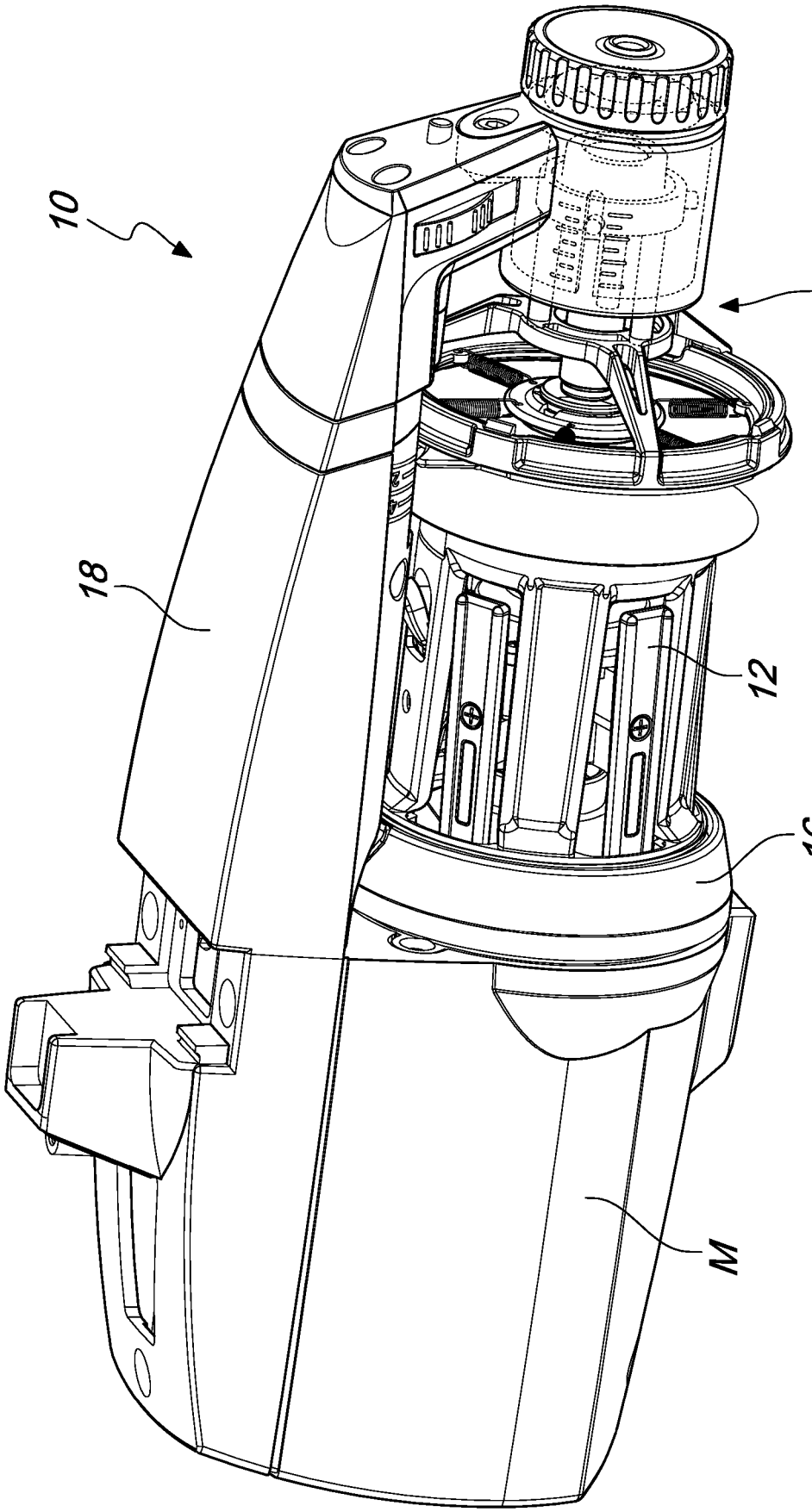

Fig. 1

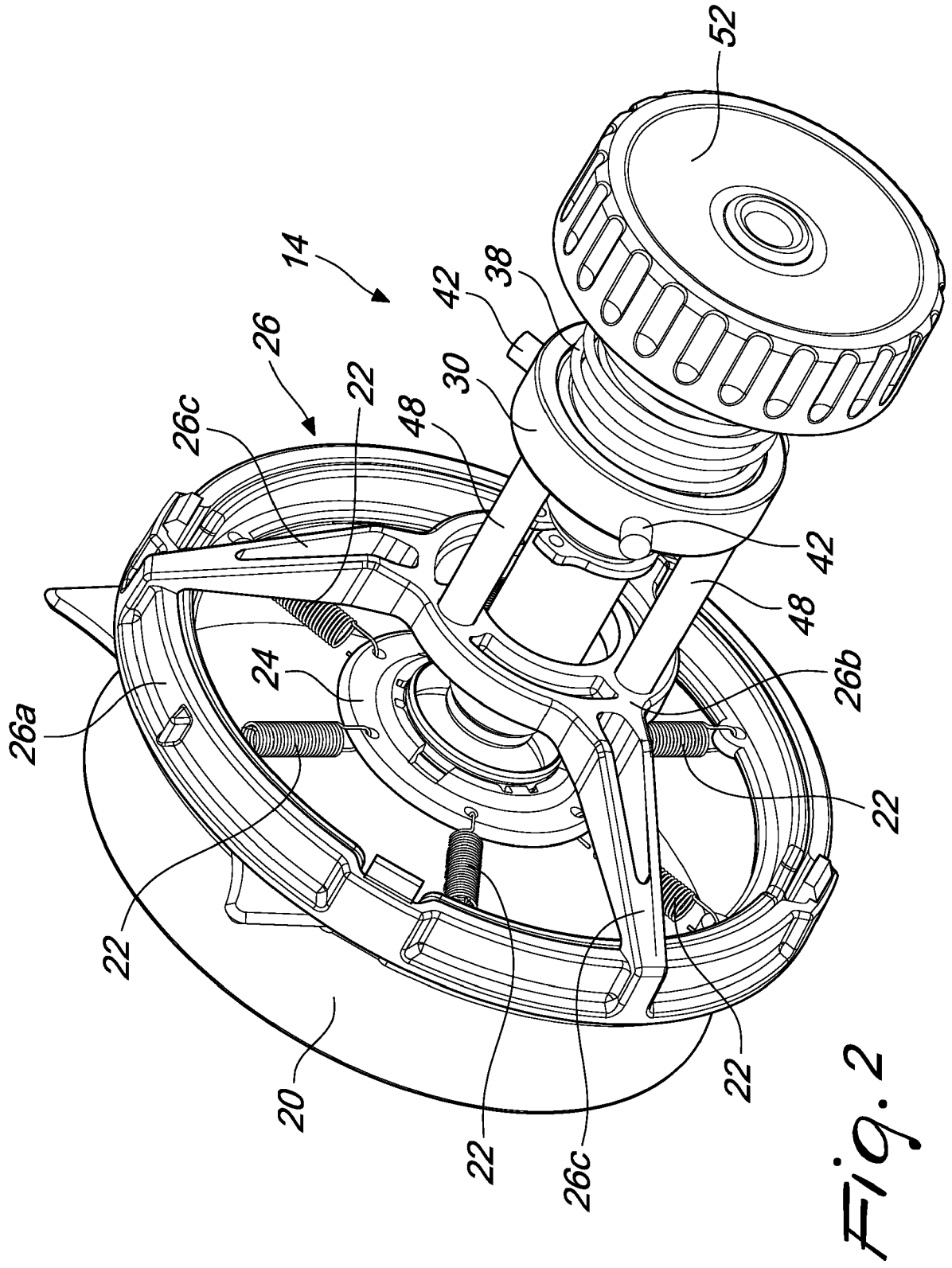

Fig. 2

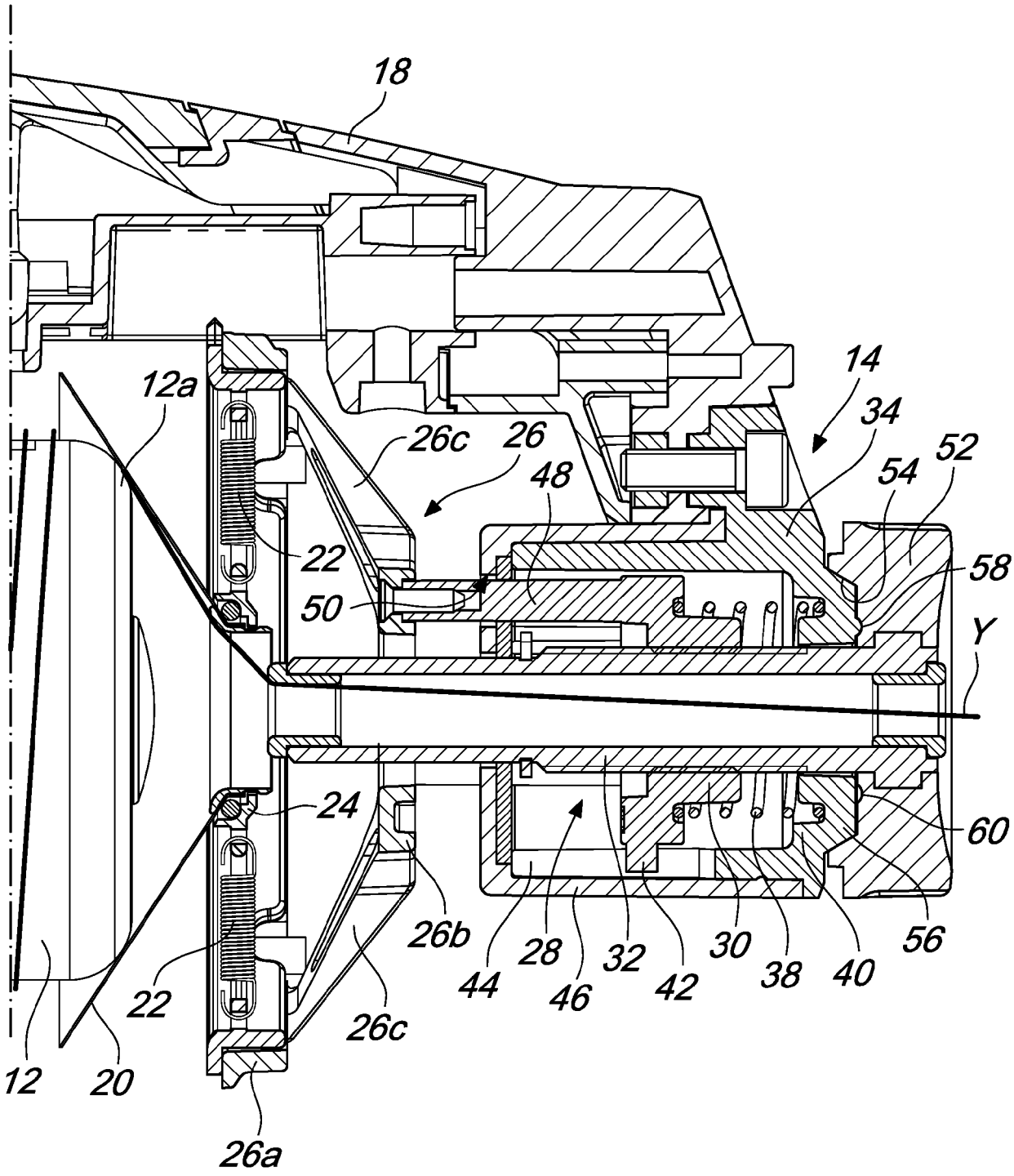
18
12a
14
34
26c
26
48
52
54
22
58
50
Y
24
60
26b
44
28
46
32
42
30
38
40
56
22
26c
12
20
26a

Fig. 3

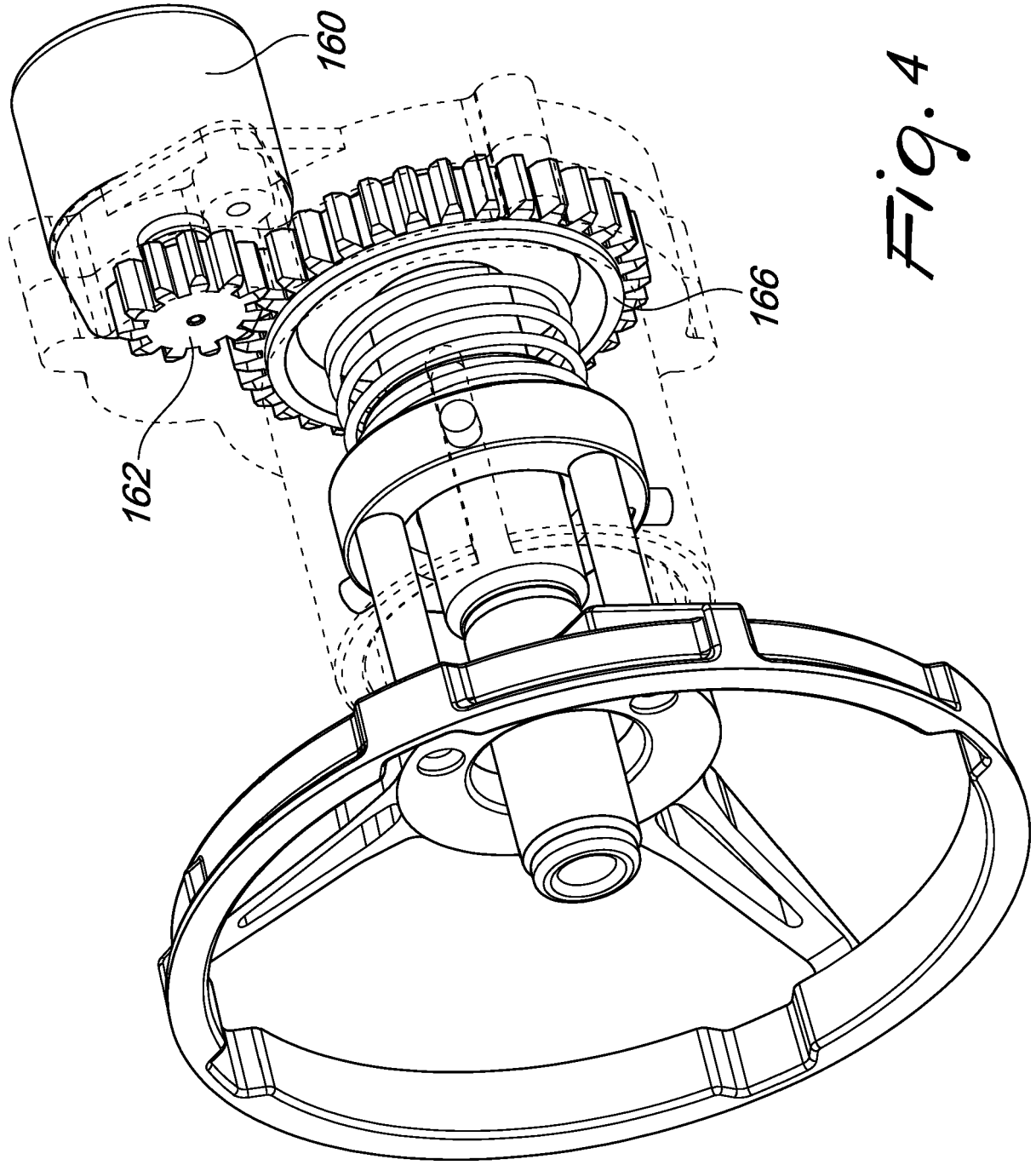

Fig. 4

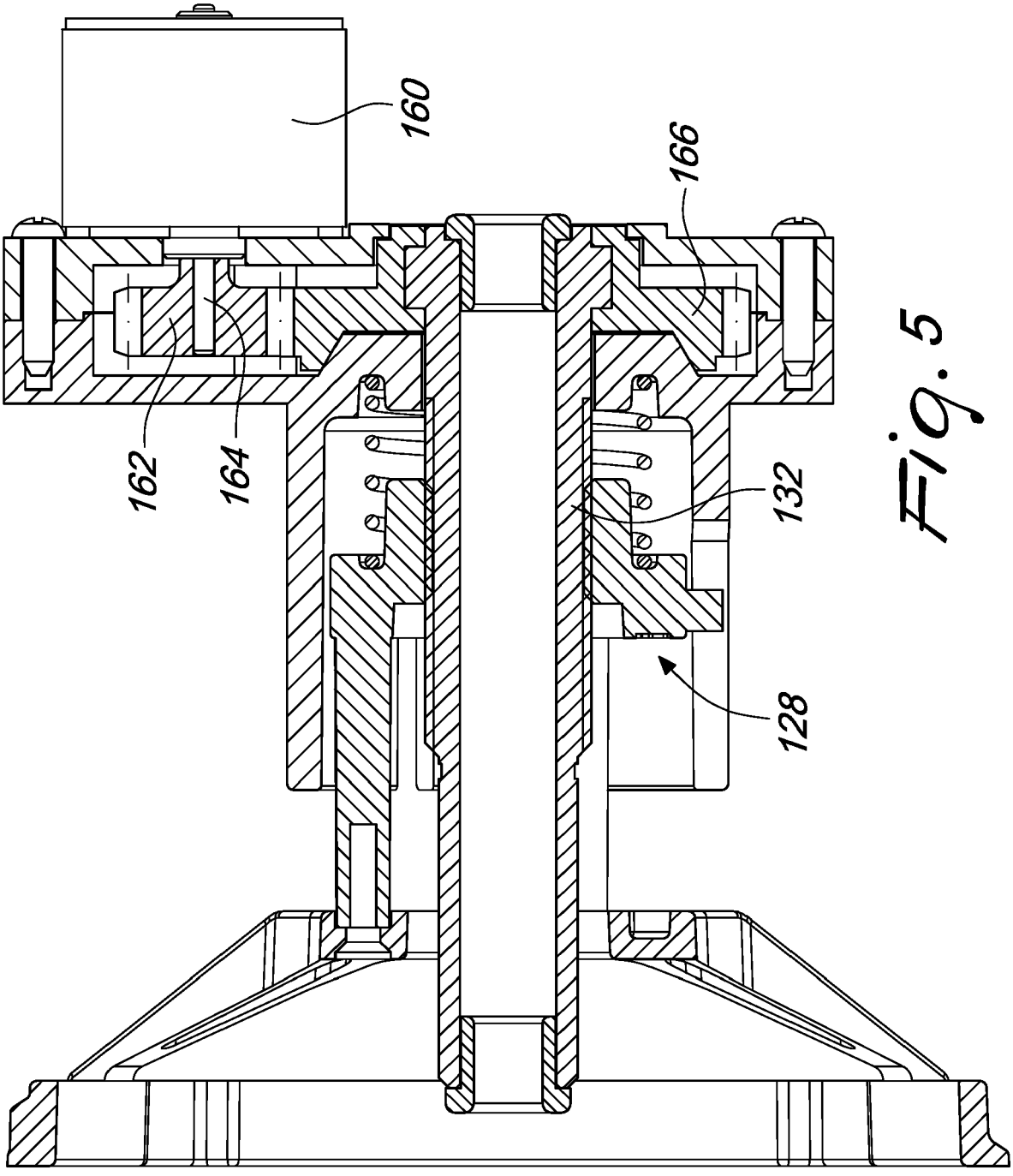

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 6485

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	EP 2 065 496 A1 (MEMMINGER IRO GMBH [DE]) 3 June 2009 (2009-06-03) * abstract * * pages 8, line; claims 1,3-9,14,15,18 * * figures 1-5 * * column 1 - column 10 *	1-10	INV. D03D47/36
A	EP 2 878 721 A1 (MEMMINGER IRO GMBH [DE]) 3 June 2015 (2015-06-03) * abstract * * claims 1,5 * * figures 1,2,3a * * paragraphs [0001], [0012] - [0016], [0018], [0020] - [0022], [0024], [0029], [0032], [0037], [0038], [0043], [0044], [0052], [0055] - paragraphs [0057], [0060], [0061], [0067], [0071] - [0074], [0083], [0086], [0089] *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

D03D
D04B
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 December 2019	Heinzelmann, Eric

CATEGORY OF CITED DOCUMENTS

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18-12-2019

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REFERENCES CITED IN THE DESCRIPTION

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- IT 102018000007866 **[0043]**