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(54) Weft feeder for textile machines with a weft-braking device

(57) The yarn (F) is unwound from a yarn-storing drum (12) and is fed to a textile machine. A weft-braking device (18) is integral with a slide (22) movable along a direction parallel to the axis of the drum (12), and is provided with a hollow braking member (32) having a circular profile, which is coaxially biased, with its inner surface, against the delivery edge of the drum (12) by actuator means (20, 21) to brake the unwinding yarn. A yarn tension sensor (38) generates a measured tension signal (Tm) indicative of the tension of the yarn delivered from the drum. A control unit (CU) is programmed to compare the measured tension signal (Tm) with a reference tension signal (Tr) and to drive the actuator means (20, 21) in such a way as to minimize the difference between the measured tension and the reference tension. The control unit (CU) is programmed to generate a poor braking signal (Sib, Sib') when the reference tension (Tr) is higher then the maximum tension avaliable with said actuator means at a stroke-end position, and an excessive braking signal (Seb, Seb') when the reference tension (Tr) is lower then the minimum tension avaliable with said actuator means at a stroke-end position. Means for correcting the position (VD, M) of said slide (22, 23) are enabled by the poor braking signal (Sib, Sib') and the excessive braking signal (Seb, Seb').

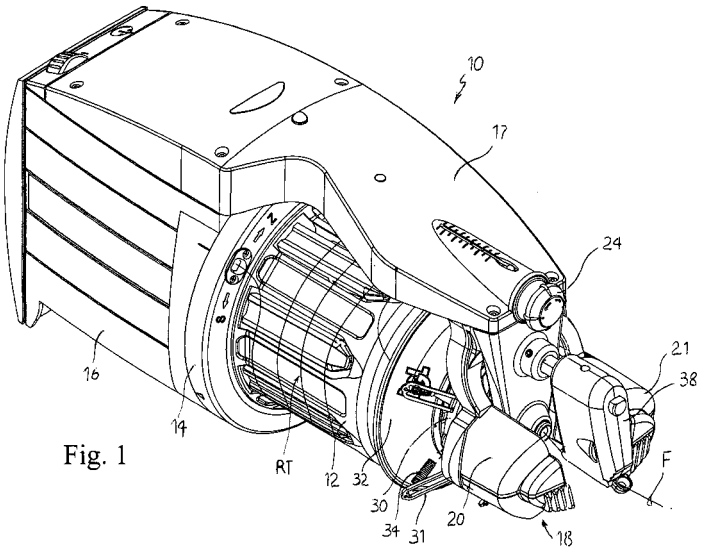

Fig. 1

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Description

[0001] The present invention relates to a weft feeder for textile machines, which is provided with a device for braking the yarn delivered from the feeder.

[0002] As known, weft feeders for textile machines comprise a stationary drum on which a motorized swivel arm winds a plurality of yarn loops forming a weft reserve. Upon request from the loom, the loops are unwound from the drum, then pass through a weft braking device which controls the tension of the yarn in order to maintain it substantially constant, and finally are fed to the loom.

[0003] In the weft feeders of the above-cited type, which are well known to the person skilled in the art, the weft-braking device typically comprises a frustoconical hollow member which is coaxially supported with its larger base facing the drum, and is biased with its inner surface against the delivery edge of the drum from which the loops are unwound. Therefore, the unwinding yarn runs between the drum and the frustoconical member, which applies a braking action upon the yarn. The braking unit is fixed to a slide that is arranged to slide in a longitudinal direction and is manually positionable at a fixed position in order to set the static pre-load with which the frustoconical member is biased against the drum.

[0004] It is already known from EP-B-1059375 of Applicant to modulate the pressure applied by the cone to the drum, i.e., the braking action applied to the unwinding yarn, by operatively connecting the frustoconical braking member to a pair of linear actuators arranged with their axes parallel to the axis of the cone. The current across the actuators is modulated as a function of the fluctations of the yarn tension, which tension is detected by sensors.

[0005] The above-mentioned actuators should have a very short response time and a small size. As known, actuators with these features are avaliable on the market, but they only can make strokes of a few millimeters, generally 5-6 mm. However, it would be desirable to have longer strokes avaliable, up to 30-40 mm, because, as well known to the person skilled in the art, particularly with high count yarns, the braking action required while feeding the yarn is often much higher than the maximum force appliable by the actuators at the end of their stokes.

[0006] Therefore, it is a main object of the present invention to improve the above-described weft-braking device in order to widen the range of braking forces applied by the device, while maintaining a high accuracy and uniformity of the braking action.

[0007] It is another object of the invention to automatize the operation of the device operating within said widened range of braking forces.

[0008] The above object and other advantages, which will better appear below, are achieved by the weft feeder with weft-braking device having the features recited in claim 1, while the dependent claims state other advantageous, though seconday, features of the invention.

[0009] The invention will be now described in more detail with reference to a few preferred, non-exclusive embodiments, shown by way of non limiting example in the attached drawings, wherein:

Fig. 1 is a perspective view of a weft feeder provided with a weft-braking device according to the invention;

Fig. 2 is a broken-away view in side elevation of the weft feeder of Fig. 1;

Fig. 3 is a block diagram showing the control system of the weft feeder of Fig. 1;

Fig. 4 is a view similar to Fig. 2, showing an alternative embodiment of the weft feeder according to the invention;

Fig. 5 is a block diagram showing the control system of the weft feeder of Fig. 4;

[0010] With initial reference to Figs. 1, 2, a weft feeder 10 for textile machines comprises a stationary drum 12 on which a motorized swivel arm 14 driven by a motor 16 winds a plurality of loops of yarn F forming a weft reserve or stock RT. Upon request from the loom (not shown), yarn F is unwound from drum 12 and is fed to the loom. A stationary arm 17 lying parallel to the axis of drum 12 supports a weft-braking device 18 at its free end, having the aim of controlling the tension of the unwinding yarn in order to maintain it substantially constant.

[0011] weft-braking device 18 comprises a pair of linear electric actuators 20, 21 which are driven by a control unit CU (Fig. 3) via respective driving blocks R1, R2 and are supported by a slide 22, with their operating rods such as 21a (Fig. 2) lying parallel to the axis of drum 12 at diametrically opposed positions. The slide is slidable along stationary drum 17 under control of a worm-screw mechanism 23 operatable by a knob 24. Linear actuators 20, 21 each incorporate a respective position sensor S1, S2 (Fig. 3) connected to send a position signal to control unit CU. An annular support 30 coaxial to the drum is attached to the free ends of the operating rods, and is provided with radial anchor projections 31. A frustoconical hollow member 32 is coaxially supported with its larger base 32a facing the drum, and is biased with its inner surface against the delivery edge of drum 12, by a spider assembly of springs 34 each having one end anchored to a respective projection 31 of annular support 30, and the opposite end anchored to a ring 36 attached to the smaller base 32b of the frustoconical member. The frustoconical member can be made, e.g., of a metal sheet or synthetic or laminated fabric impregnated with a polimeric resin.

[0012] A yarn tension sensor 38 of a conventional type is supported downstream of weft-braking device 18 in order to measure the tension of the yarn delivered from the feeder. Sensor 38 is connected to send a measured tension signal Tm to control unit CU, which is programmed to compare the measured tension signal Tm

with a reference tension signal Tr and to drive linear actuators 20, 21 in such a way as to minimize the difference between them. Reference tension Tr is preset depending on various parameters, such as the angular position of the machine, whereby different reference tensions may correspond to different angular positions.

[0013] Yarn F is unwound from drum 12 and runs between the delivery edge of the drum and frustoconical member 32, which applies the desired braking action upon the yarn. By operating knob 24, the preload is adjusted with which the frustoconical member is biased against the drum at rest.

[0014] When the comparison between the measured tension Tm and the reference tension Tr results in the required yarn tension being higher than the maximum tension avaliable with the linear actuators at their outermost positions, control unit CU is programmed to generate a poor braking signal Sib which enables a visual device VD (which is only diagrammatically shown in Fig. 3), such as a display or a pilot light, which provides the user with the information that knob 24 should be rotated such as to increase the preload with which frustoconical member 32 is biased against drum 12, whereby the weft braking device will operate with a higher average level of braking forces.

[0015] On the contrary, when the comparison between the measured tension Tm and the reference tension Tr results in the required yarn tension being lower than the minimum tension avaliable with the linear actuator at their innermost positions, control unit CU is programmed to generate an excessive braking signal Seb which enables visual device VD such as to provide the user with the information that knob 24 should be rotated such as to reduce the preload of the springs, whereby the weft braking device will operate with a lower average level of braking forces.

[0016] An alternative embodiment of the invention is shown in Figs. 4, 5, wherein worm-screw mechanism 123 is driven by an electric motor M controlled by control unit CU via a respective driving block R, so that the operation of the weft-braking device is completely automatized.

[0017] When the comparison between the measured tension Tm and the reference tension Tr results in the required yarn tension being higher than the maximum tension avaliable with the linear actuators at their outermost positions, control unit CU is programmed to generate a poor braking signal Sib' which enables motor M to move the slide supporting the weft-braking device such as to increase the preload with which frustoconical member 32 is biased against drum 12, whereby the weft braking device will operate with a higher average level of braking forces.

[0018] On the contrary, when the comparison between the measured tension Tm and the reference tension Tr results in the required yarn tension being lower than the minimum tension avaliable with the linear actuator at their innermost positions, control unit CU is programmed to generate an excessive braking signal Seb' which enables motor M such as to reduce the preload, whereby the weft braking device will operate with a lower average level of braking forces.

[0019] Therefore, in the second embodiment, the position-correcting means, which in the first embodiment were passive and consisted of a visual device adapted to inform the user that the slide had to be manually moved in order to change the pre-load applied by the braking member upon the drum, are now active and operate in an automatized way to change the preload in view of the poor braking signal or of the excessive braking signal.

[0020] A few preferred embodiments of the invention have been described herein, but of course many changes may be made by a person skilled in the art within the scope of the inventive concept. For instance, the frustoconical braking member may be replaced by a different hollow braking member having a circular profile, e.g., a member consisting of bristles or of a plurality of blades, and the spider assembly of springs 34 could be unnecessary if the material of the braking member is sufficiently elastic. Furthermore, the worm-screw mechanism which drives the slide could be provided of both a knob and a motor, and the pilot light or display could be provided even in presence of the motor.

Claims

1. A weft feeder for textile machines, comprising a yam-storing drum (12) from which a yarn (F) is unwound to feed a textile machine, and a weft-braking device (18), which is attached to a slide (22) movable along a direction parallel to the axis of the drum (12) and is provided with:

   - a hollow braking member (32) having a circular profile, which is coaxially biased, with its inner surface, against the delivery edge of the drum (12) by actuator means (20, 21) to brake the unwinding yarn,
   - a yarn tension sensor (38) generating a measured tension signal (Tm) indicative of the tension of the yarn delivered from the drum,
   - a control unit (CU) programmed to compare the measured tension signal (Tm) with a reference tension signal (Tr), and to drive said actuator means (20, 21) such as to minimize the difference between said measured tension and said reference tension,

   characterized in that said control unit (CU) is programmed to generate a poor braking signal (Sib, Sib') when the reference tension (Tr) is higher then the maximum tension avaliable with said actuator means at a stroke-end position, and an excessive braking signal (Seb, Seb') when the reference tension (Tr) is lower then the minimum tension avaliable with said actuator means at a stroke-end position,

and **in that** it comprises means for correcting the position (VD, M) of said slide (22, 23), which are enabled by said poor braking signal (Sib, Sib') and excessive braking signal (Seb, Seb').

2. The weft feeder of claim 1, **characterized in that** said means for correcting the position comprise a visual device (VD) adapted to inform a user that said slide (22, 23) should be moved to change the preload with which said braking member (32) is biased against the drum (12), when said poor braking signal (Sib, Sib') and excessive braking signal (Seb, Seb') are enabled.

3. The weft feeder of any of claims 1 or 2, **characterized in that** said means for correcting the position comprise a motor (M) that is operatively connected to said slide (22) and is controlled by the control unit (CU) such that the pre-load applied by the braking member (32) to the drum (12) is increased when said poor braking signal (Sib, Sib') is generated, while said preload is reduced when said excessive braking signal (Seb, Seb') is generated.

4. The device of any of claims 1 to 3, **characterized in that** said slide (22) is driven by a worm-screw mechanism (23) operatable by a knob (24).

5. The device of any of claims 1 to 3, **characterized in that** said slide (22) is driven by a worm-screw mechanism (23) operatable by said motor (M).

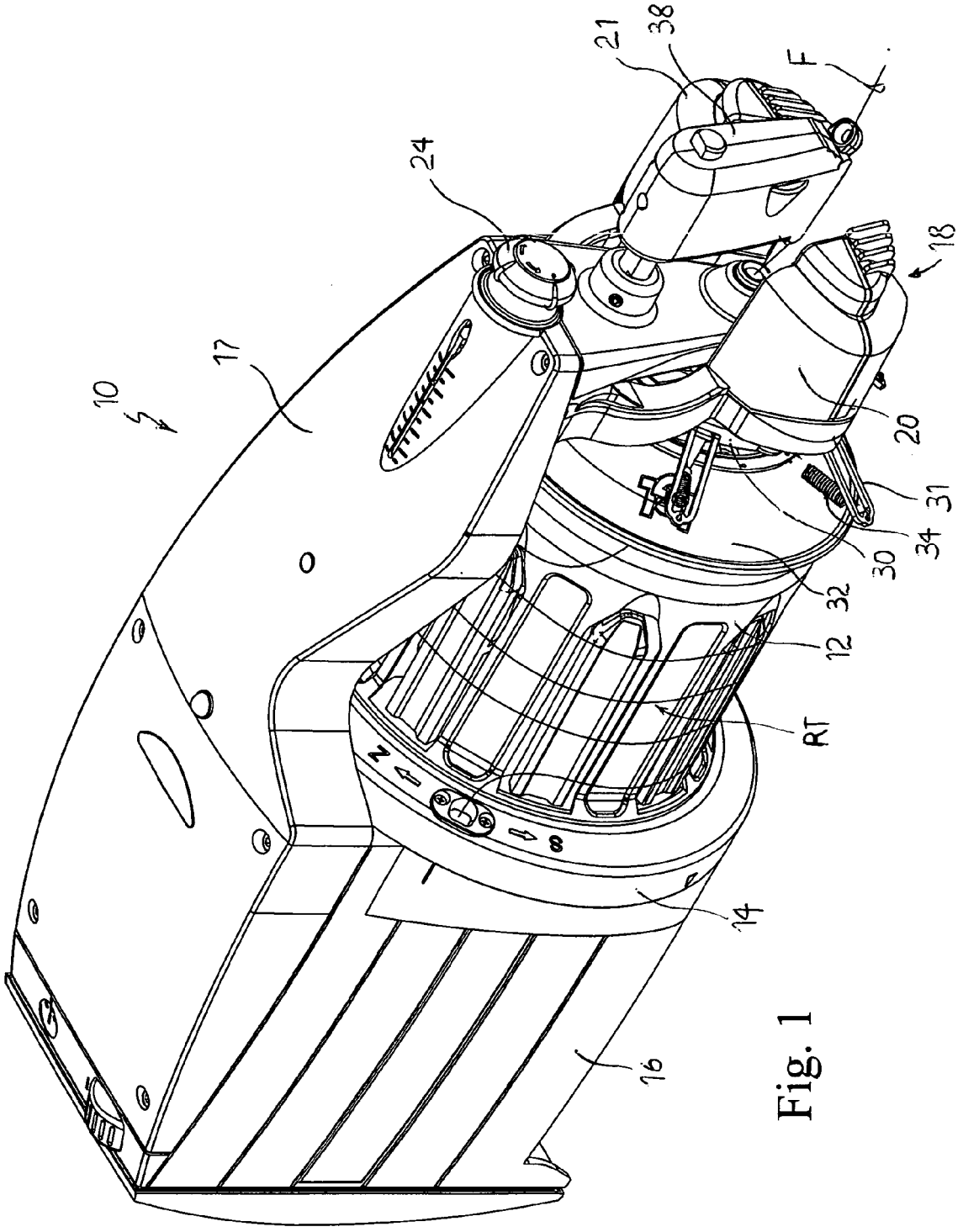

Fig. 1

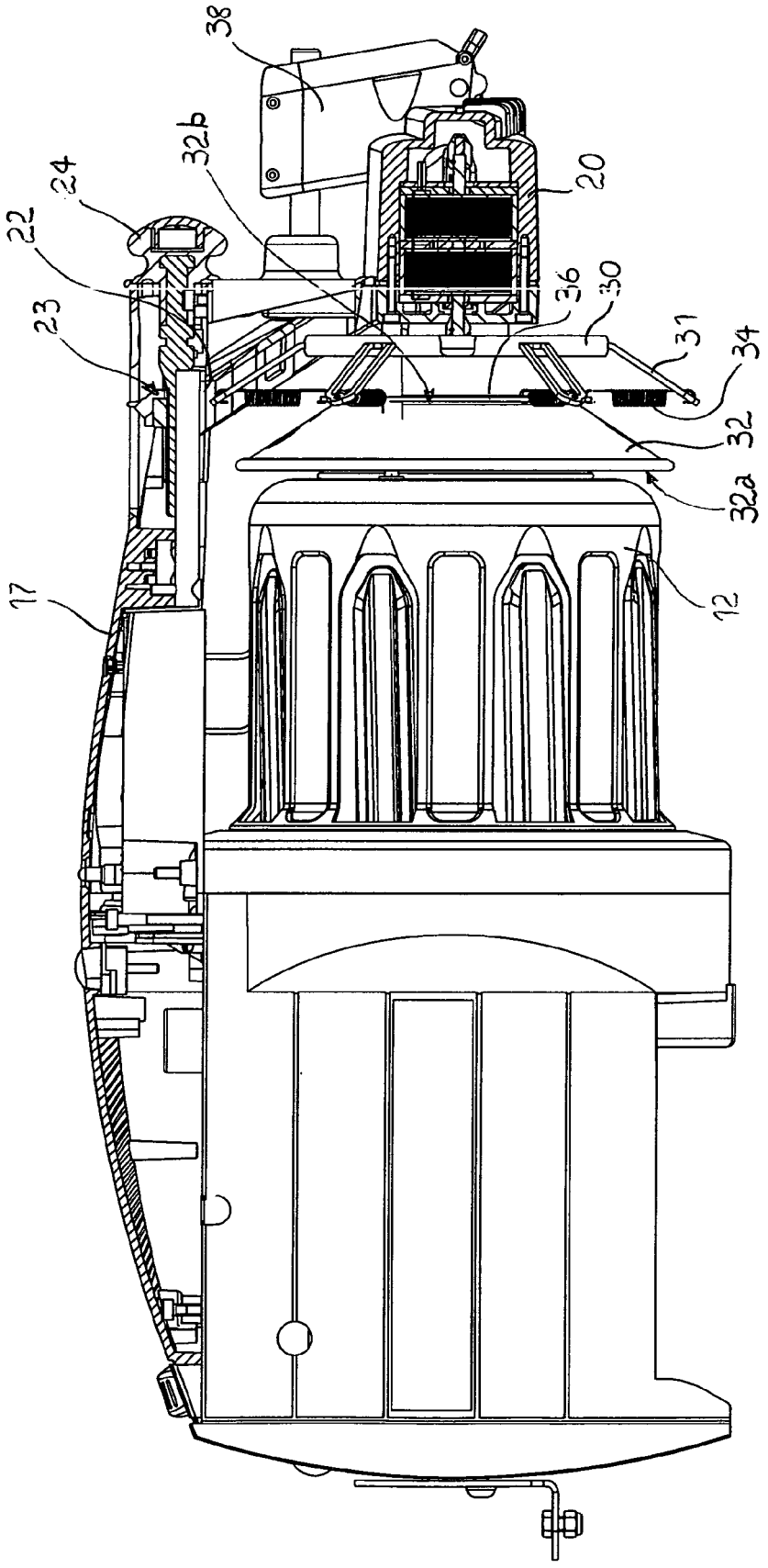

Fig. 2

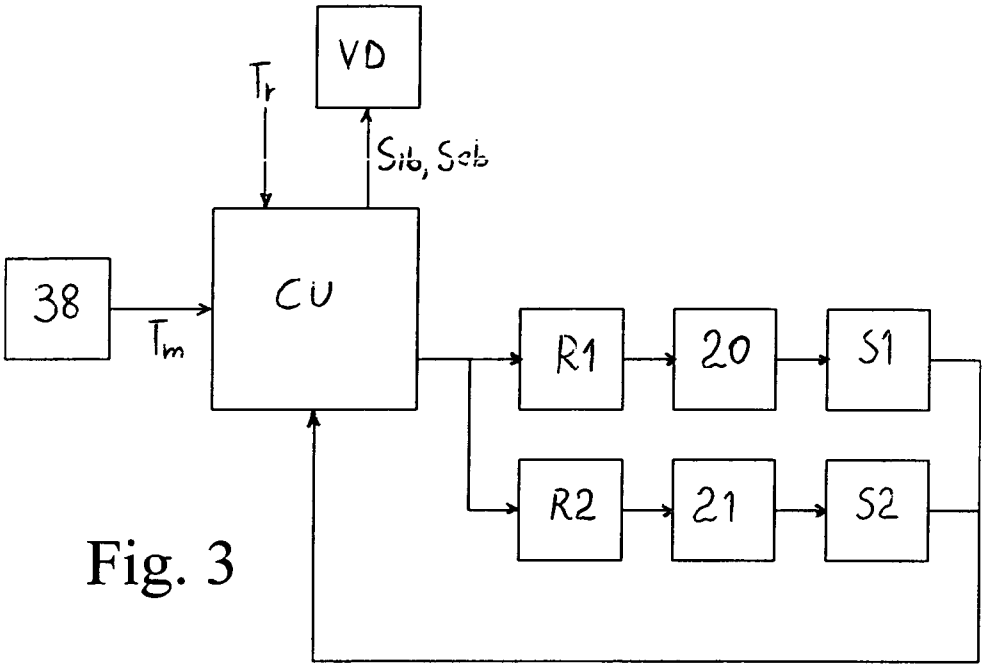
VD
Tr
Sib, Seb
38
Tm
CU
R1
20
S1
R2
21
S2

Fig. 3

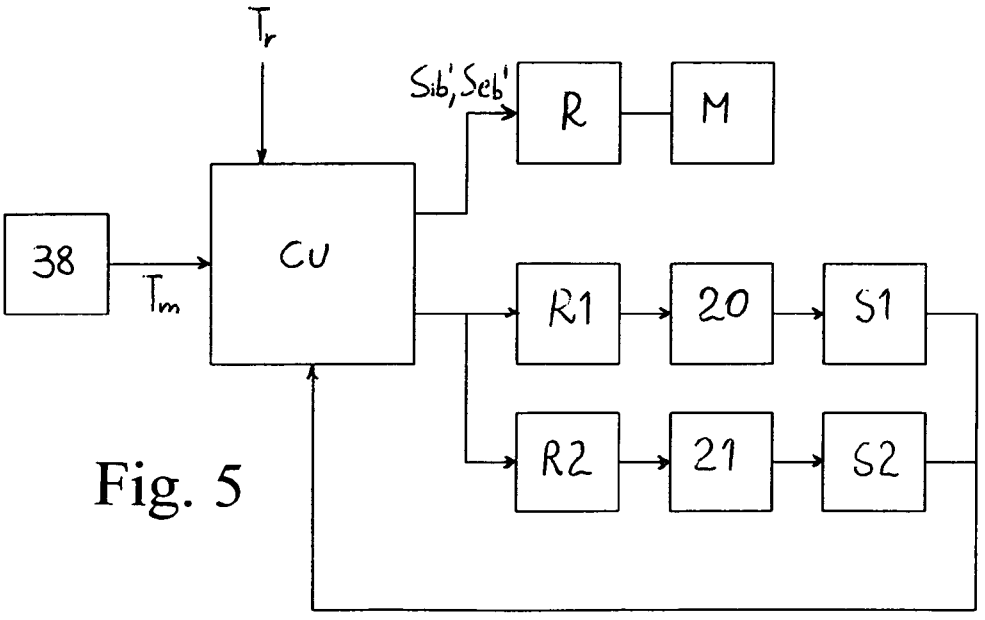
Tr
Sib', Seb'
R
M
38
Tm
CU
R1
20
S1
R2
21
S2

Fig. 5

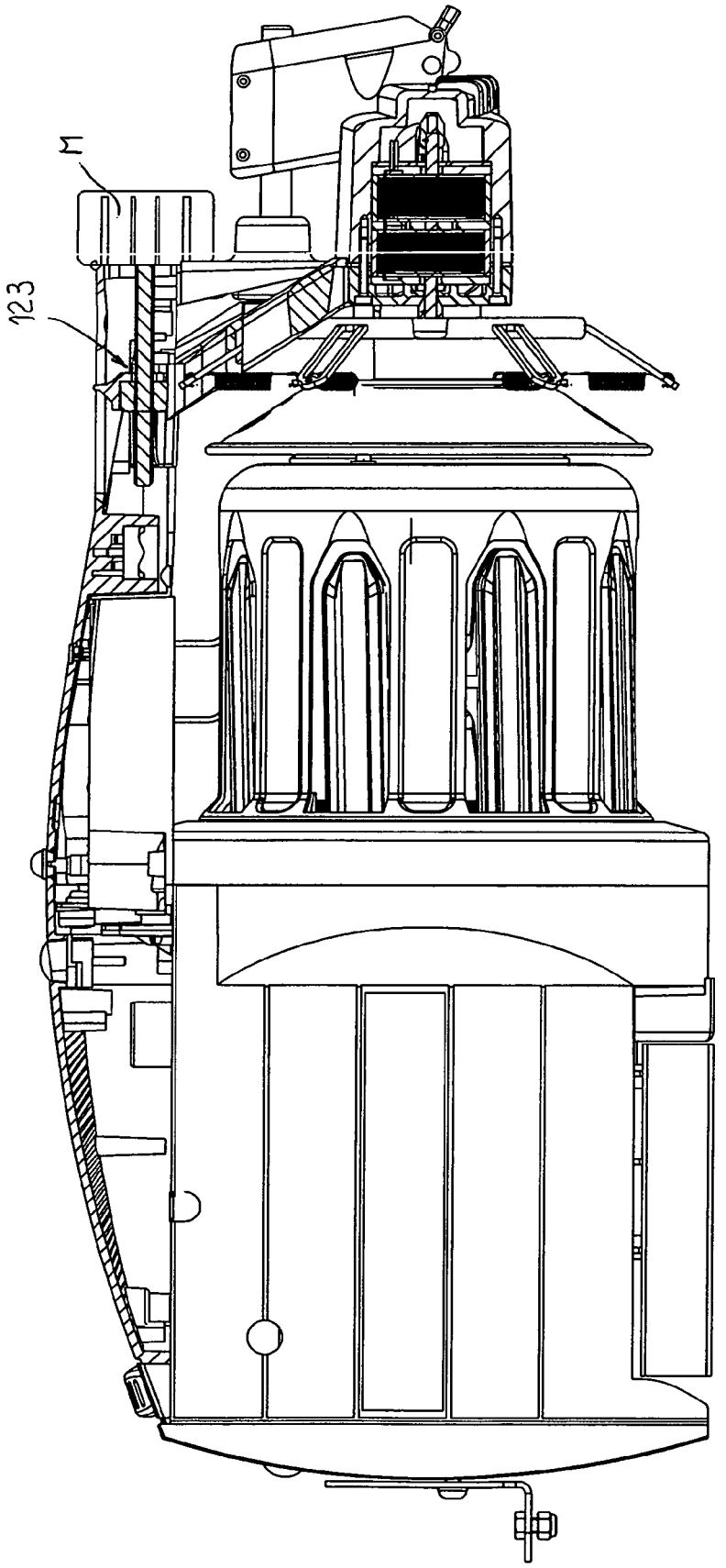

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5433

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	EP 1 059 375 B (LGL ELECTRONICS SPA [IT]) 17 September 2003 (2003-09-17) * paragraphs [0019] - [0035]; figures 1,5 *	1-5	INV. D03D47/36
A	EP 0 707 102 A (LGL ELECTRONICS SPA [IT]) 17 April 1996 (1996-04-17) * column 3, line 34 - column 4, line 18; figure 1 *	1-5	

TECHNICAL FIELDS SEARCHED (IPC)

D03D
D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 December 2007	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

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14-12-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1059375 B	17-09-2003	DE 60005244 D1	23-10-2003
		DE 60005244 T2	01-07-2004
		EP 1059375 A1	13-12-2000
		IT TO990459 A1	01-12-2000
EP 0707102 A	17-04-1996	DE 69514069 D1	27-01-2000
		DE 69514069 T2	20-04-2000
		IT TO940805 A1	10-04-1996
		JP 8113851 A	07-05-1996
		US 5553641 A	10-09-1996

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

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Patent documents cited in the description

- EP 1059375 B **[0004]**