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(54) **Thread braking device for weft feeder, having reduced intervention times**

Fadenbremse für eine Schussfadenliefervorrichtung mit reduzierten Eingriffszeiten

Frein de fil pour fournisseur de trame avec des temps d'intervention réduits

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(73) Proprietor: **L.G.L. Electronics S.p.A.**  
**24024 Gandino (Bergamo) (IT)**

(72) Inventors:  
• **Zenoni, Pietro**  
**24026 Leffe (Prov. of Bergamo) (IT)**

• **Pedrini, Giovanni**  
**24026 Leffe (Prov. of Bergamo) (IT)**  
• **Castelli, Rosario**  
**24024 Gandino (Prov. of Bergamo) (IT)**

(74) Representative: **Modiano, Micaela Nadia**  
**Spandonari & Modiano S.r.l.**  
**Corso Duca degli Abruzzi, 16**  
**10129 Torino (IT)**

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**EP 1 059 375 B2**

## Description

**[0001]** The present invention relates to a thread braking device for weft feeder, having reduced intervention times.

**[0002]** More particularly, the invention relates to a thread braking device for a weft feeder in shuttle-less looms, particularly gripper looms, projectile looms and air-jet looms.

**[0003]** Even more precisely, the invention relates to a thread braking device which comprises a braking means which has a continuous circular shape, typically a frustum-shaped body, which is supported frontally and coaxially to the drum of the weft feeder, in order to engage directly, or with interposed flexible elements, the thread that unwinds from the drum, and wherein the frustum-shaped braking body is subjected to the action of an electromechanical actuation means which is capable of varying the pressure with which the body is pressed against the drum of the feeder; the actuation means is supplied with a modulated excitation current.

**[0004]** Devices for positive modulated braking of the specified type are known in which the braking body is subjected to the electrodynamic action produced by the interaction of the excitation current that circulates in a coil associated with the braking body and of the magnetic field of a permanent magnet which is fixed with respect to the braking body.

**[0005]** Devices of the above-cited type are disclosed in EP-0534263 and EP-0652312 in the name of this same Applicant, and are referenced concisely hereinafter as known devices.

**[0006]** Both of these conventional devices, although providing effective modulated braking, suffer structural and functional drawbacks. From the structural point of view, they are in fact relatively complicated and bulky and require accurate manufacture of the moving coils and of the fixed permanent magnet, between which there must be a minimal air gap in order to achieve a significant electrodynamic action despite excitation currents of modest intensity.

**[0007]** On the other hand, the conductor of the moving coils must necessarily be small, and the coils must be formed by a minimal number of turns in order to avoid increasing excessively the mass, and therefore the inertia, of the frustum-shaped body that supports said coil. This is the greatest structural drawback, because in any case it limits the maximum allowable value of the excitation current; accordingly, the electrodynamic action that affects the frustum-shaped body, which depends on the ampere-turn ratio, is in any case limited to modest values, which are sufficient to produce the modulated thread braking action if the frustum-shaped body acts by direct contact on the drum of the feeder and are substantially insufficient if said body acts on the thread with interposed flexible elements, such as coils of flexible laminas or rings of bristles.

**[0008]** Moreover, Italian patent No. 1,268,111 (&EP-

A-0 707 102) the name of this same Applicant discloses a device for positive modulated thread braking for weft feeders in which the frustum-shaped body that constitutes the braking means is rigidly coupled to a support which can move along the axis of the drum of the feeder, is supported and guided by a fixed support, and in which the movable support is subjected to the action of a reversible motor which is supported by the fixed support, is supplied with the modulated excitation current (which is modulated so as to match the variation of the mechanical tension of the thread during the weaving process) and is connected to the movable support by interposing a mechanical coupling which is capable of converting the angular movements of the motor shaft into corresponding translatory motions of the movable support with respect to the fixed support.

**[0009]** This device, while constituting a substantial improvement with respect to the two previously described conventional devices, also suffers drawbacks.

**[0010]** More particularly, the use of a motor of the reversible type, preferably of the step type, which is suitable to act on the movable support in order to modulate, proportionally to the variation of the mechanical tension of the thread during the beat of the loom, so as to vary the pressure applied by the body to the drum of the braking device, does not allow to provide immediate intervention, as required by modern looms, which have a high average speed of the weft thread.

**[0011]** Moreover, the electrodynamic yield of the step motor used to drive the braking device is not satisfactory, since it is necessary to use a high driving current in order to have an adequate movement of the motor shaft.

**[0012]** The aim of the present invention is to provide a thread braking device for weft feeder which allows to have extremely short intervention times of the braking device with respect to conventional devices.

**[0013]** Within the scope of this aim, an object of the present invention is to provide a thread braking device for weft feeder in which the reduced intervention times are associated with a low driving current for actuating the motor shaft of the braking device.

**[0014]** Another object of the present invention is to provide a thread braking device for weft feeder in which the electrodynamic yield of the device is higher than in known devices for an equal driving current.

**[0015]** Another object of the present invention is to provide a thread braking device for weft feeder which allows to transmit to the braking cone of the braking device a movement which is very precise in relation to the very low thickness that the thread can have.

**[0016]** Another object of the present invention is to provide a thread braking device for weft feeder which is highly reliable, relatively easy to manufacture and at competitive costs.

**[0017]** This and other objects which will become better apparent hereinafter are achieved by a thread braking device for weft feeder according to claim 1.

**[0018]** Further characteristics and advantages of the

present invention will become better apparent from the following detailed description of preferred but not exclusive embodiments of the braking device according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic partially sectional view of the braking device according to the present invention; Figure 2 is a partially sectional view of a second embodiment of the braking device according to the present invention;

Figure 3 is a partially sectional view of a third embodiment of the braking device according to the invention;

Figure 4 is a schematic view of the braking device according to the invention and shown in Figure 1, associated with a weft feeder;

Figure 5 is a partially sectional schematic view of a fourth embodiment of the braking device according to the present invention; and

Figure 6 is a front view of the braking device according to the invention in its fourth embodiment.

**[0019]** With reference to the above figures, 1 designates a conventional weft feeder which comprises a fixed drum on which a hollow rotating arm, or windmilling arm, winds a plurality of turns which constitute the weft reserve. The hollow arm is rigidly coupled to a motor shaft which is likewise hollow, and the thread that arrives from a spool (not shown) runs in the cavity of the shaft of the arm. At each beat, the loom draws a certain number of turns from the reserve, and the thread that unwinds from the drum of the weft feeder 1 is subjected to a modulated braking means which allows to control the mechanical tension of the thread, keeping it substantially constant as the travel acceleration that the loom applies to said thread in performing each individual beat varies.

**[0020]** The braking means is composed of a braking body 2, typically a frustum-shaped body which has a continuous circular shape (in a first embodiment of the invention), is made of high-strength synthetic material, and is supported by a movable support 3, which is arranged in front of the drum of the feeder 1 and coaxially thereto and with which the body 2 is pushed into contact in order to engage the thread that unwinds from the feeder 1.

**[0021]** The frustum-shaped body 2 is rigidly coupled to the movable support 3 by interposing springs 4 which provide an elastic suspension which is capable of damping the braking action but most of all of ensuring the perfect centering of the frustum-shaped body 2 with the drum of the weft feeder 1.

**[0022]** In the figures, the weft thread is designated by the reference letter T.

**[0023]** In the embodiment shown in Figure 1, the movable support 3 is connected to a support 5 which is directly connected to the shaft 6 of a motor.

**[0024]** An important feature of the invention consists in that the motor is a linear motor M, whose shaft 6 is

made of nonmagnetic material and constitutes the rotor of the linear motor. The shaft 6 is coupled to a supporting element 7 on which two magnetic rings (for example made of neodymium) are fitted; such rings are magnetized radially and in opposite directions.

**[0025]** The two magnetic rings are designated by the reference numerals 10 and 11 and are fitted on a ring 9 of magnetic material (for example iron), which is in turn fitted on a spool 8 (made of plastics) rigidly coupled to the shaft 6.

**[0026]** The stator of the linear motor is constituted by an outer enclosure 20, through which the shaft 6 passes coaxially, and by at least two pole shoes 12 and 13 which wrap around two coils 14 and 15.

**[0027]** Preferably, the linear motor has an additional pole shoe (third pole 16) which greatly improves the efficiency of the motor.

**[0028]** The modulation of the braking action of the braking device according to the invention is performed by acting on a movement of the braking device, i.e., of the shaft 6 and therefore of the braking body 2. In practice, the flux generated by the magnets 10 and 11 concatenates with the coils 14 and 15, and by making currents flow through said coils one obtains a movement of the shaft 6 in one direction or the other according to the direction of the current.

**[0029]** The braking device according to the invention can further be provided with means for measuring the movement of the motor, i.e., the movement of the shaft 6 that directly actuates the braking device. The means for sensing the movement of the motor are conveniently constituted by a sensor device 24 which faces a magnet 25 which is rigidly coupled to the end of the shaft 6 of the motor that lies opposite the end that is connected to the braking body 2.

**[0030]** The sensor device 24 is sensitive to the magnetic field and measures the distance between it and the magnet 25.

**[0031]** Such distance is directly proportional to the movement that the shaft 6 of the motor performs in order to move the braking body 2 into contact with the drum of the weft feeder 1.

**[0032]** In this manner it is possible to know in real time the exact position of the shaft 6 and therefore the braking force applied to the braking device (braking body 2).

**[0033]** The actuation of the linear motor can be controlled by a signal which arrives from the loom, or more specifically from a sensor, which directly measures the actual tension of the weft thread T, and by means of a microprocessor regulates the braking action of the braking device according to the parameters outside the loom or according to the tension of the weft thread T.

**[0034]** In practice, the command issued by the microprocessor consists of a current signal which excites the coils 14 and 15. The use of a linear motor allows to have high transmission efficiency for the motion applied by the shaft 6 to the braking body 2, since the connection between the two elements is substantially direct.

**[0035]** Moreover, for equal excitation currents of the coils 14 and 15, and with coil excitation sources used in a conventional braking device, the electrodynamic yield, i.e., the force that can be generated by the motor, is much higher in the case of a linear motor and therefore the ratio of dissipated power to performance is highly in favor of the linear motor.

**[0036]** Figure 2 is a view of a second embodiment of the braking device according to the invention, in which the linear motor is used as shown in Figure 1, with the variation that the braking body, designated by the reference numeral 32 in this case, is formed by a ring which has, on its internal circumference, a ring of bristles 33 which are meant to apply pressure, pushing the weft thread T against the drum of the weft feeder 1.

**[0037]** Figure 3 illustrates a third embodiment of the braking device according to the invention, in which the linear motor, designated by the reference letter M in this figure and in the preceding figures for the sake of simplicity, is applied in order to actuate a braking body 42 which is constituted by a multiple-lamina brake.

**[0038]** Figure 4 is instead a general view of the weft feeder with which the linear motor is associated in order to provide a braking device according to the present invention.

**[0039]** Figure 5 is a view of another embodiment of the braking device according to the invention, in which a plurality of linear motors, particularly three linear motors, are used as shown in detail in Figure 6. The three linear motors, each designated by the reference letter M, are arranged so that the braking cone is perfectly centered on the drum of the weft feeder 1 in order to achieve constant braking of the weft thread T once a certain braking force has been preset.

**[0040]** This allows to transmit the movement to the braking cone with very high precision and therefore to adapt the braking device also to very low thicknesses of the weft thread T.

**[0041]** By means of the three linear motors M it is possible to preset initially a certain force on the motor axis so as to make the braking cone mate exactly with the drum of the weft feeder 1. After performing this operation, the microprocessor (not shown) reads on the feedback sensor the resulting movement and sets the zero point of each motor M, determining for the three points the zero plane for which the braking cone is centered exactly on the rounded end portion of the weft feeder 1.

**[0042]** The linear motors M are then actuated by a signal which originates from the weaving loom or from a tension meter arranged on said weft T, in order to maintain the programmed tension value.

**[0043]** It is further important to use linear motors having a low inertia and with a moving coil or magnet, because the times and responses must be on the order of a few hundred microseconds, up to a few milliseconds.

**[0044]** The movable braking part must be very light.

**[0045]** Figure 5 illustrates the connection between the linear motor M and the movable support 3 which is con-

nected to the braking body 2.

**[0046]** This connection is provided by means of a ball joint 40. The three linear motors M are all engaged in the same ball joint 40 and allow to form a plane on which the base of the braking cone (braking body 2) is arranged, so as to achieve exact self-centering of the braking cone 2 with respect to the drum of the weft feeder 1.

**[0047]** As shown in Figures 2 and 3, instead of the braking cone 2 it is possible to have a brake of the bristle type or a multi-lamina brake.

**[0048]** The use of a linear motor as described, according to the present invention, therefore allows to have high movement speeds and therefore very short intervention times of the braking body on the weft thread T.

**[0049]** Average weft speeds of up to 1800 m/min are in fact reached in modern shuttle-less looms. With a reserve drum having a diameter of 140 mm, for example, one obtains approximately 4000 rpm. Since the instantaneous speed can be as much as 50% higher than the average speed, main motor speeds of 6000 rpm may also occur. This means that the weft thread T travels along one turn in approximately 10 msec, and since a loom with a height of 1800 mm requires at least 4 turns of thread to form a beat, the brake must modulate the braking action at least twice per beat and therefore intervene in a few milliseconds if one wishes it to intervene in real time. It is thus evident that intervention speed is an essential fact.

**[0050]** In practice it has been observed that the weft thread braking device fully achieves the intended aim and objects, since it allows to intervene with extremely short times on the braking of the weft thread, thus meeting the requirements of extremely fast intervention of modern looms.

**[0051]** The device thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with other technically equivalent elements.

**[0052]** For example, the shaft 6 of the motor M can be moved to the end of its stroke so as to allow the brake to open completely if it is necessary to replace it or if it is necessary to insert the thread through said braking means.

**[0053]** In practice, the materials used, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

**[0054]** 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 thread braking device for weft feeder, comprising a braking means (2, 3) which is supported frontally and coaxially with respect to a drum of a weft feeder (1) in order to directly or indirectly engage the thread (T) that unwinds from said drum, **characterized in that** said braking means is actuated by at least one linear motor (M) which allows the mutual approach or spacing of said braking means (2, 3) with respect to said drum in order to modulate the braking of said weft thread (T), **in that** the rotor of said linear motor (M) is constituted by a shaft (6) which is connected to said braking means (2, 3), the movement of said shaft (6) allowing to modulate the braking action of said braking means (2, 3) on the weft thread (T), **and in that** said linear motor (M) comprises an outer enclosure (20) suitable to accommodate said shaft (6) which is supported by a supporting element (7) which is arranged coaxially to said shaft (6), a ring (9) of magnetic material being fitted on said supporting element (7), two magnetic rings (10, 11) being fitted on said ring (9) of magnetic material, said magnetic rings (10, 11) being magnetized radially and in opposite directions.
2. The device according to claim 1, **characterized in that** said linear motor (M) comprises at least two poles (12, 13).
3. The device according to claim 1, **characterized in that** said linear motor (M) comprises three poles (12, 13, 16).
4. The device according to claims 2 or 3, **characterized in that** the outer enclosure (20) of said motor (M) constitutes the stator of the motor, two coils (14, 15) being accommodated between said outer enclosure (20) and said poles (12, 13, 16) of the linear motor (M).
5. The device according to one or more of the preceding claims, **characterized in that** said shaft (6) has, at the end that lies opposite the end for connection to said braking means (2, 3), a magnet (25) which faces at least one sensor (24) for detecting the movement of said shaft (6) of the linear motor (M).
6. The actuation device according to claims 4 or 5, **characterized in that** said coils (14, 15) are current-driven according to the braking force to be obtained on said weft thread (T).
7. The actuation device according to claim 5, **characterized in that** the current for driving said coils (14, 15) is supplied by a microprocessor which is con-

nected to a sensor for detecting the tension of the weft thread (T), said microprocessor being further connected to said sensor (24) for detecting the movement of said shaft (6) of the linear motor (M) in order to produce the intended movement of said shaft (6) according to the intended braking force, which is determined by comparing the braking force applied by said shaft (6) with the tension of said weft thread.

8. The device according to claim 1, **characterized in that** said braking means (2, 3) is a frustum-shaped body which is connected, by virtue of flexible means, to a movable support (5) which is in turn connected to a support which is keyed on said shaft (6) of said at least one linear motor (M).
9. The device according to claim 1, **characterized in that** said braking means (2, 3) comprises a brake with bristles which is connected to said shaft (6) of said at least one linear motor (M).
10. The device according to claim 1, **characterized in that** the braking means (2.3) comprises a multi-lamina brake which is connected to the shaft (6) of said at least one linear motor (M).
11. The device according to claim 1, **characterized in that** it comprises three linear motors (M) which are connected to said braking means (2, 3) by a supporting element, said three linear motors being suitable to allow the centering of said braking means (2.3) with respect to the drum of said weft feeder (1).

## Patentansprüche

1. Fadenbremsvorrichtung für eine Schußfadenliefer-  
vorrichtung, mit einem Bremsmittel (2, 3), das vor  
und koaxial zu einer Trommel einer Schußfadenlie-  
fervorrichtung (1) gehalten ist, um mit dem Faden  
(T) direkt oder indirekt in Eingriff zu kommen, wel-  
cher sich von der Trommel abwickelt, **dadurch ge-  
kennzeichnet, dass**  
das Bremsmittel durch mindestens einen Linearmot-  
tor (M) betätigt wird, welcher das wechselweise An-  
näheren des Bremsmittels (2, 3) zu und Entfernen  
desselben von der Trommel ermöglicht, um das Ab-  
bremsen des Schußfadens (T) zu regulieren, **dass**  
der Rotor des Linearmotors (M) durch eine mit dem  
Bremsmittel (2, 3) verbundene Achse (6) gebildet  
ist, wobei die Bewegung der Achse (6) die Regulie-  
rung der Bremswirkung des Bremsmittels (2, 3) am  
Faden (T) ermöglicht, **und dass**  
der Linearmotor (M) eine äußere Verkleidung (20),  
die zur Aufnahme der Achse (6) geeignet ist und  
durch ein koaxial zur Achse angeordnetes Stützele-  
ment (7) abgestützt ist, einen an dem Stützelement

- (7) befestigten Ring (9) aus einem magnetischen Material, sowie zwei auf dem Ring aus einem magnetischen Material befestigte Magnetringe (10, 11) aufweist, wobei die Magnetringe (10, 11) radial und in entgegengesetzten Richtungen magnetisiert sind.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Linearmotor (M) mindestens zwei Pole (12, 13) umfasst.
  3. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Linearmotor (M) drei Pole (12, 13, 16) umfasst.
  4. Vorrichtung nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** die äußere Verkleidung (20) des Motors (M) einen Stator für den Motor bildet, wobei zwei Spulen (14, 15) zwischen der äußeren Verkleidung (20) und den Polen (12, 13, 16) des Linearmotors (M) angeordnet sind.
  5. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Achse an dem Ende, das zu dem Ende entgegengesetzt ist, an dem das Bremsmittel (2, 3) zu befestigen ist, einen Magneten (25) hat, welcher mindestens einem Sensor (24) zum Erfassen der Bewegung der Achse des Linearmotors (M) zugewandt ist.
  6. Betätigungsverrichtung nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** die Spulen (14, 15) entsprechend der auf den Schußfaden (T) aufzubringenden Bremskraft mit Strom versorgt werden.
  7. Betätigungsverrichtung nach Anspruch 5, **dadurch gekennzeichnet, dass** der Strom zum Versorgen der Spulen (14, 15) durch einen Mikroprozessor zugeführt wird, welcher mit einem Sensor zum Erfassen der Spannung des Schußfadens (T) verbunden ist, wobei der Mikroprozessor ferner mit einem Sensor (24) zum Erfassen der Bewegung der Achse (6) des Linearmotors (M) verbunden ist, um die gewollte Bewegung der Achse (6) entsprechend der gewollten Bremskraft zu bewirken, welche durch Vergleich der auf die Achse (6) aufgebrachten Bremskraft mit der Spannung am Schußfaden bestimmt ist.
  8. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Bremsmittel (2, 3) ein kegelförmiger Körper ist, welcher durch die Wirkung elastischer Mittel mit einem beweglichen Träger (5) verbunden ist, der wiederum mit einer Träger verbunden ist, welcher an der Achse (6) des mindestens einen Linearmotors (M) verkeilt ist.
  9. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Bremsmittel (2, 3) eine Bremse

mit Bürsten umfasst, welche mit der Achse (6) des mindestens einen Linearmotors (M) verbunden ist.

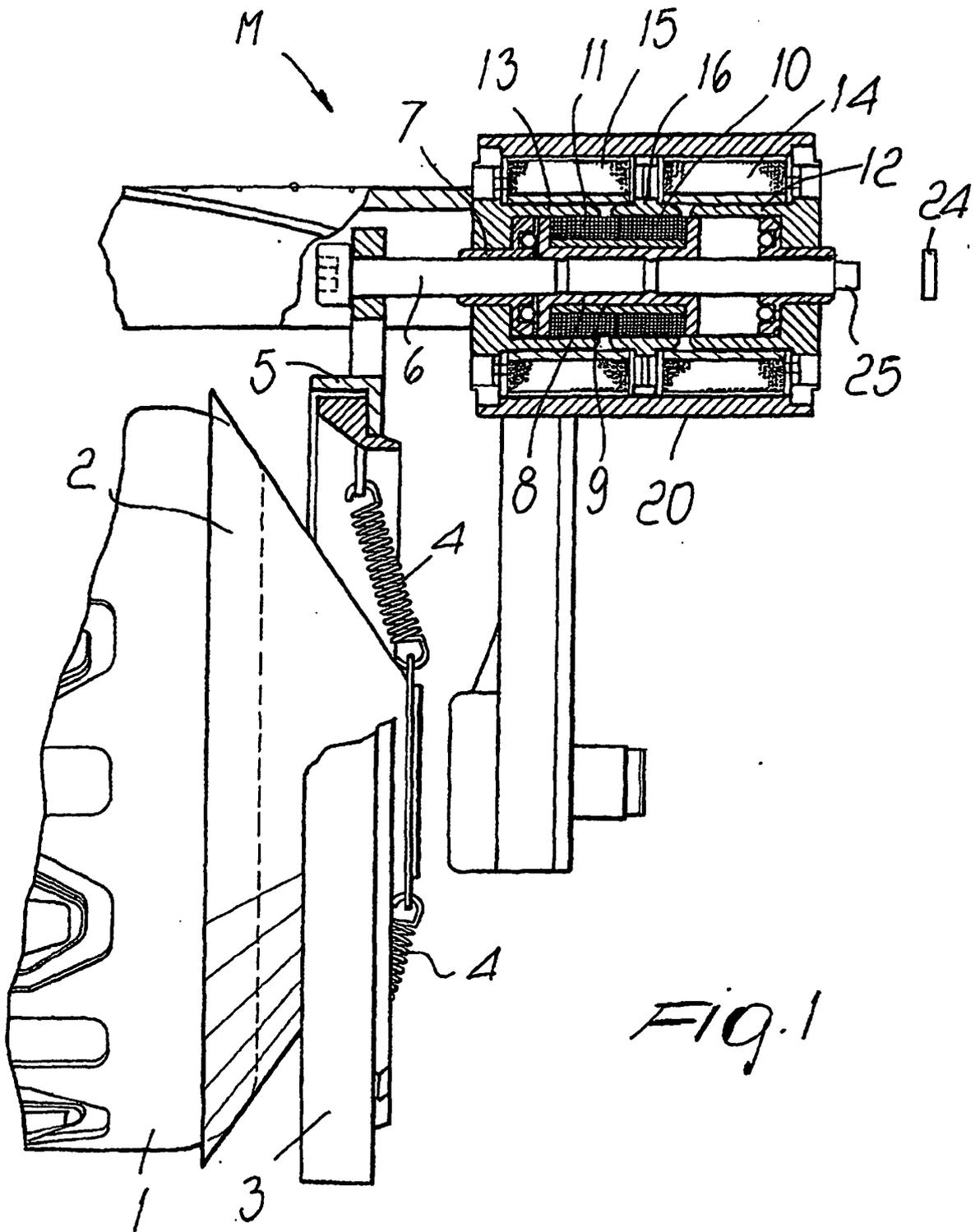
10. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Bremsmittel (2, 3) eine mehrlagige Bremse ist, welche mit der Achse (6) des mindestens einen Linearmotors (M) verbunden ist.
11. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** sie mindestens drei Linearmotoren (M) umfasst, welche mit dem Bremsmittel (2, 3) durch ein Stützelement verbunden sind, wobei die drei Linearmotoren dazu geeignet sind, das Bremsmittel (2, 3) bezüglich der Trommel der Schußfadensliefer Vorrichtung (1) zu zentrieren.

### Revendications

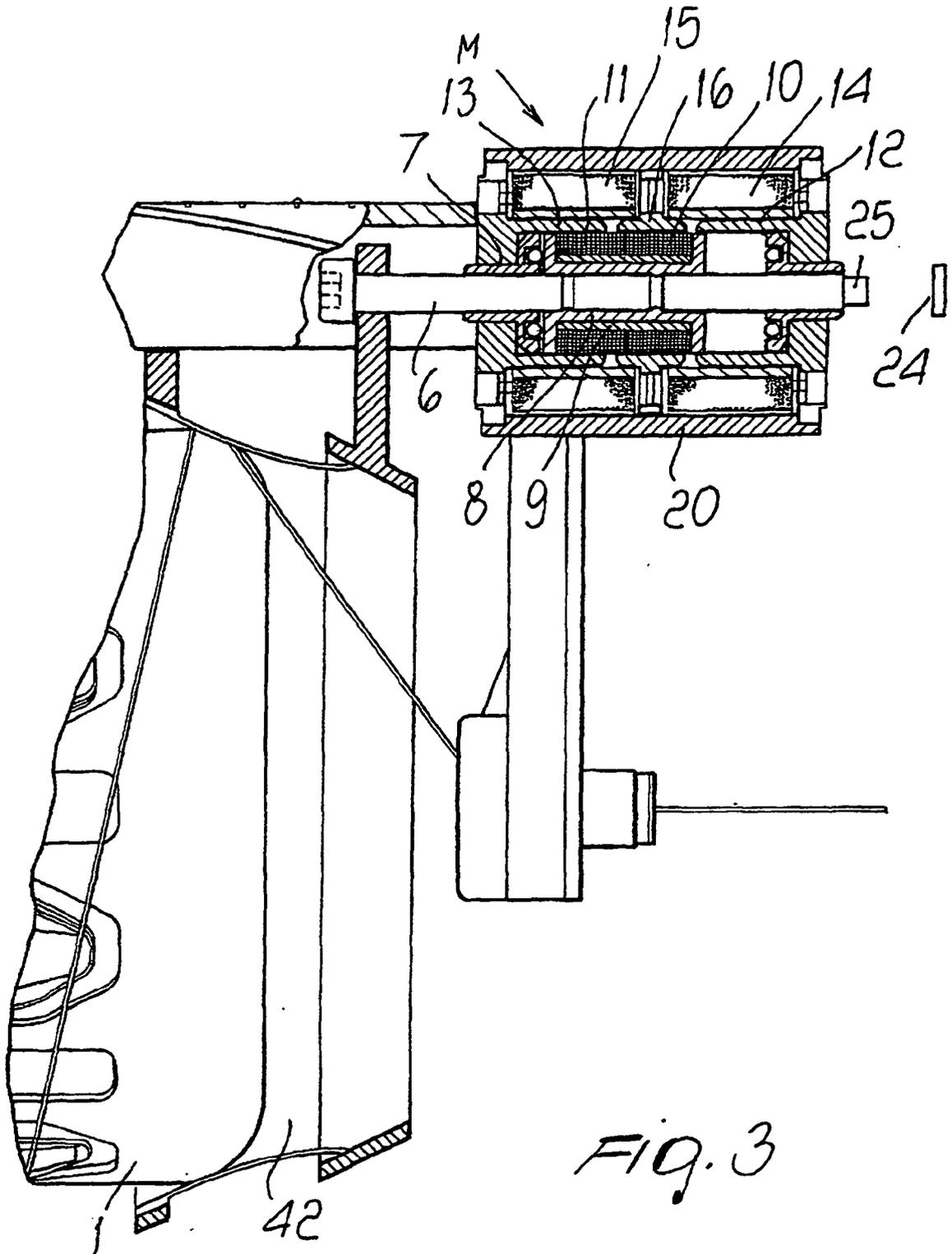
1. Un dispositif de freinage de fil pour un dispositif d'amenée de fil de trame, comprenant des moyens de freinage (2, 3) qui sont supportés de façon frontale et coaxiale par rapport à un tambour d'un dispositif d'amenée de fil de trame (1) de façon à engager directement ou indirectement le fil (T) qui se déroule dudit tambour, **caractérisé en ce que** lesdits moyens de freinage sont actionnés par au moins un moteur linéaire (M) qui permet l'approche ou l'espacement mutuel desdits moyens de freinage (2, 3) par rapport audit tambour de façon à moduler le freinage dudit fil de trame (T), **en ce que** le rotor dudit moteur linéaire (M) est constitué par un arbre (6) qui est relié auxdits moyens de freinage (2, 3), le mouvement dudit arbre permettant de moduler l'action de freinage desdits moyens de freinage (2, 3) sur le fil de trame (T), et **en ce que** ledit moteur linéaire (M) comprend une enceinte externe (20) appropriée pour recevoir ledit arbre (6) qui est supporté par un élément de support (7) agencé coaxialement audit arbre, une bague (9) constituée d'un matériau magnétique étant adaptée sur ledit élément de support (7), deux bagues magnétiques (10, 11) étant adaptées sur ladite bague (9) constitués d'un matériau magnétique, lesdites bagues magnétiques (10, 11) étant magnétisées radialement et dans
2. Le dispositif selon la revendication 1, **caractérisé en ce que** ledit moteur linéaire (M) comprend au moins deux pôles (12, 13).
3. Le dispositif selon la revendication 1, **caractérisé en ce que** ledit moteur linéaire (M) comprend trois pôles (12, 13, 16).
4. Le dispositif selon la revendication 2 ou la revendication 3, **caractérisé en ce que** l'enceinte externe (20) dudit moteur (M) constitue le stator du moteur,

deux bobines (14, 15) étant reçues entre ladite enceinte externe (20) et lesdits pôles (12, 13, 16) du moteur linéaire (M).

5. Le dispositif selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit arbre (6) présente, à l'extrémité opposée à l'extrémité destinée à la liaison auxdits moyens de freinage (2, 3), un aimant (25) qui fait face à au moins un capteur (24) destiné à détecter le mouvement dudit arbre (6) du moteur linéaire (M). 5  
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6. Le dispositif d'actionnement selon la revendication 4 ou la revendication 5, **caractérisé en ce que** lesdites bobines (14, 15) sont entraînées par un courant, en fonction de la force de freinage devant être obtenue sur ledit fil de trame (T). 15
7. Le dispositif d'actionnement selon la revendication 5, **caractérisé en ce que** le courant destiné à entraîner lesdites bobines (14, 15) est fourni par un microprocesseur relié à un capteur destiné à détecter la tension du fil de trame (T), ledit microprocesseur étant en outre relié audit capteur (24) destiné à détecter le mouvement dudit arbre (6) du moteur linéaire (M) afin de produire le mouvement souhaité dudit arbre (6) en fonction de la force de freinage souhaitée, qui est déterminée en comparant la force de freinage appliquée par ledit arbre (6) avec la tension dudit fil de trame. 20  
25  
30
8. Le dispositif selon la revendication 1, **caractérisé en ce que** lesdits moyens de freinage (2, 3) constituent un corps tronconique qui est relié, grâce à des moyens souples, à un support mobile (5) qui, à son tour, est claveté sur ledit arbre (6) dudit au moins un moteur linéaire (M). 35
9. Le dispositif selon la revendication 1, **caractérisé en ce que** lesdits moyens de freinage (2, 3) comprennent un frein à balai qui est relié audit arbre (6) dudit au moins un moteur linéaire (M). 40
10. Le dispositif selon la revendication 1, **caractérisé en ce que** lesdits moyens de freinage (2, 3) comprennent un frein à lamelles multiples relié à l'arbre (6) dudit au moins un moteur linéaire (M). 45
11. Le dispositif selon la revendication 1, **caractérisé en ce qu'il** comprend trois moteurs linéaires (M) qui sont reliés auxdits moyens de freinage (2, 3) par un élément de support, lesdits trois moteurs linéaires étant prévus pour permettre le centrage desdits moyens de freinage (2, 3) par rapport au tambour dudit dispositif d'amenée de fil de trame (1). 50  
55







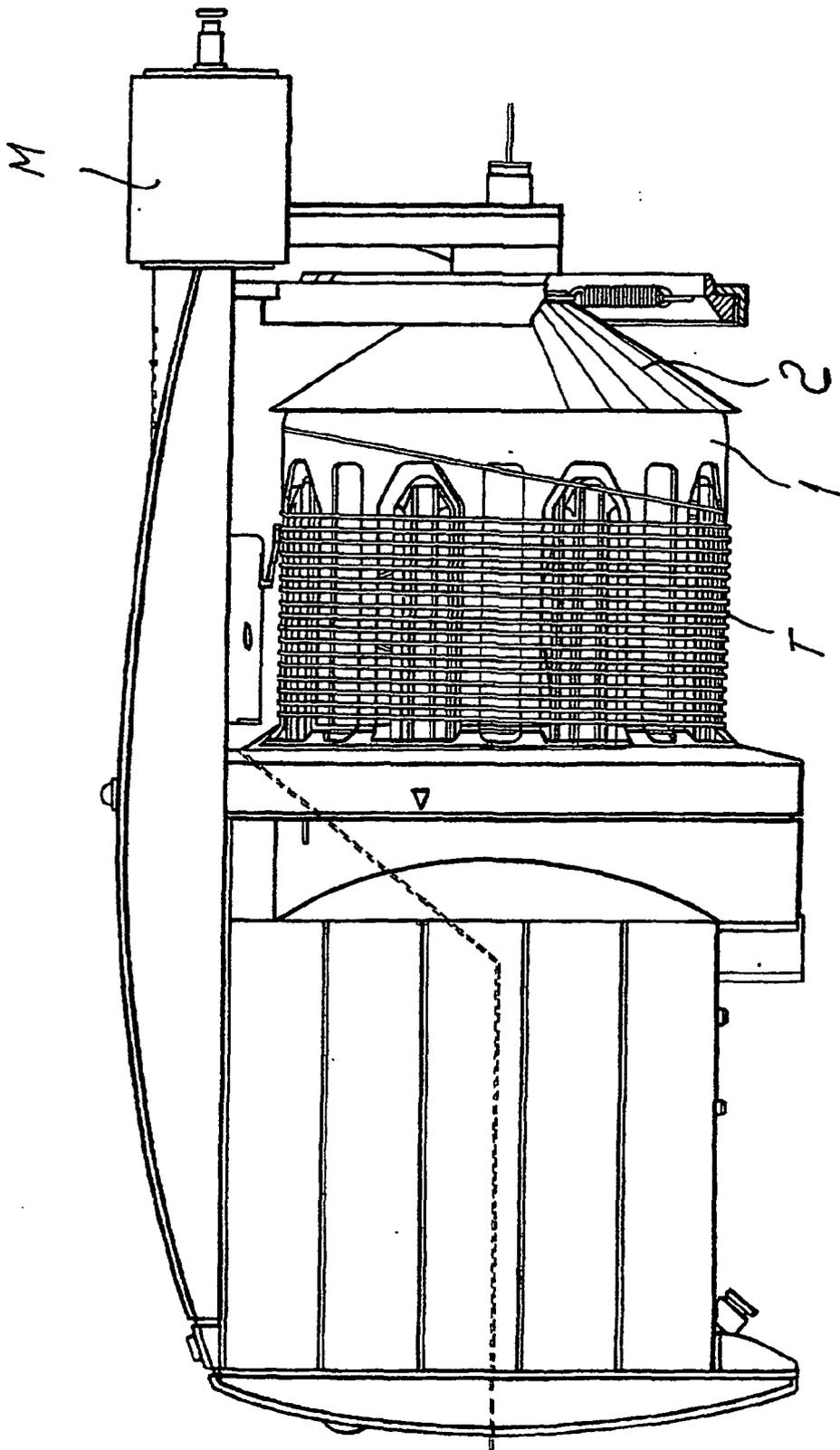


FIG. 4

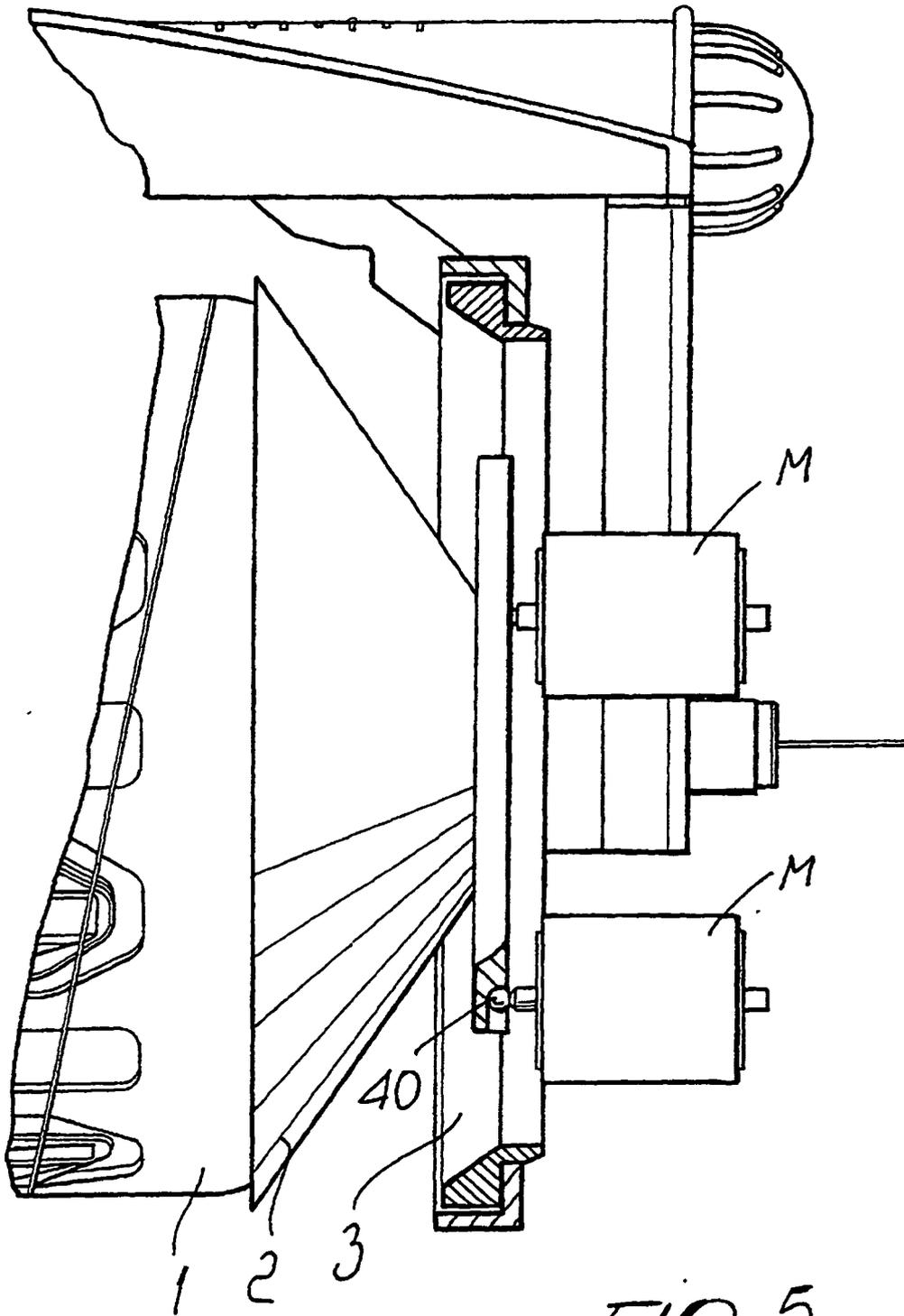


FIG. 5

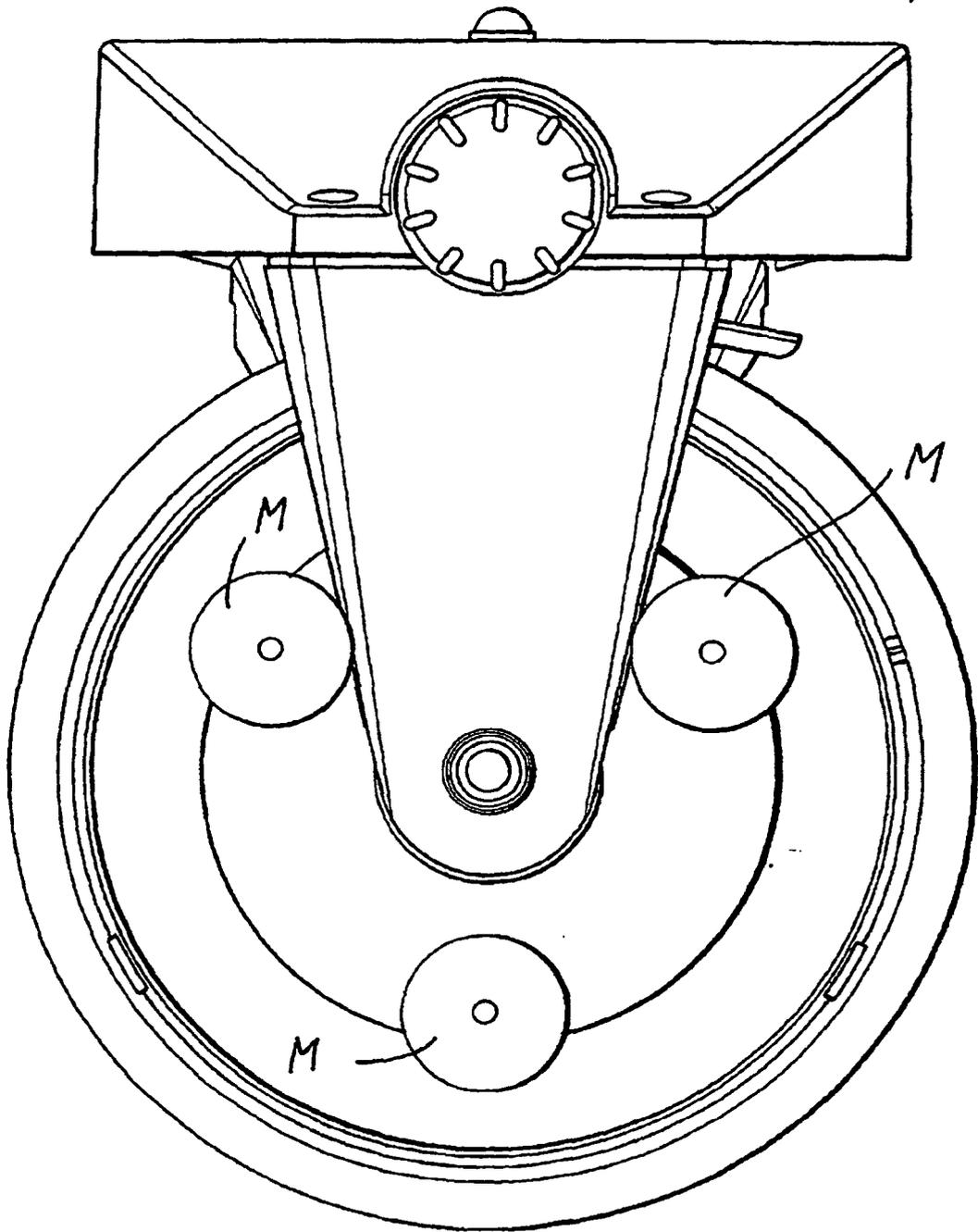


FIG. 6

**REFERENCES CITED IN THE DESCRIPTION**

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