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

(11) **EP 1 944 262 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
11.01.2017 Bulletin 2017/02

(21) Application number: **06794053.6**

(22) Date of filing: **29.06.2006**

(51) Int Cl.:
B66B 5/04 *(2006.01)*

(86) International application number:
PCT/ES2006/000378

(87) International publication number:
WO 2007/003671 (11.01.2007 Gazette 2007/02)

(54) **SPEED LIMITER FOR LIFTING APPARATUSES**

GESCHWINDIGKEITSBEGRENZER FÜR HUBVORRICHTUNGEN

LIMITEUR DE VITESSE POUR ASCENSEURS

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(30) Priority: **04.07.2005 ES 200501527 U**

(43) Date of publication of application:
16.07.2008 Bulletin 2008/29

(73) Proprietor: **Schlosser Luezar & CVR, S.L.**
50016 Zaragoza (ES)

(72) Inventor: **SIMAL, Luis**
50009 Zaragoza (ES)

(56) References cited:
DE-A1- 2 821 547
JP-A- 2004 142 858
JP-A- 2004 142 858
US-A- 3 415 343
US-A- 5 052 523
US-A- 5 349 854
US-A1- 2001 035 315

EP 1 944 262 B1

Printed by Jouve, 75001 PARIS (FR)

Description

OBJET OF THE INVENTION

[0001] The present invention, as expressed in the wording of this descriptive report, refers to a mechanical overspeed governor that activates safety gear used in lifts. It has been conceived and built in order to obtain substantial advantages with respect to other existing systems.

BACKGROUND OF THE INVENTION

[0002] Activating the safety gear is mostly done through the usual means, conventional steering linkage and overspeed governor, having to function in both UP and DOWN movements of the lift car.

[0003] Any simplification in its way of actuating, in the number of parts the overspeed governor consists of or in its assembly, may be considered as technological progress.

[0004] The actuating devices on traditionally used safety gear are based on a governing pulley (1) on which the governing rope (2) engages and which, in its turn, rotates on another diverting or tension pulley (3) functioning as the rope tension system. In general, the overspeed governor is installed at the top part of the lift and the diverting pulley at the lower part or lift pit. The rope is linked to the steering linkage (4) connected to the lift car (5) uniting its two stretches. When the lift car (5) moves, the rope (2) moves in unison and both pulleys rotate. The governing pulley (1) includes a tripping mechanism or triggers (6) that consist in a centrifugal governor or any other known type. The car (5), the movement of which is lineal, pulls along the governing rope (2), thus making this governing pulley rotate (1), generating a centrifugal force in the triggers (6) that rotate in connection with the pulley in question. These masses or triggers (6) move radially on the pulley (1) to which opening movement a spring (19) puts up resistance to a greater or lesser extent in order to adjust the actuating or tripping speed. For the overspeed governor to actuate in two directions and avoid the influence of gravity on the opening movement of the aforementioned masses, synchronization systems consisting in levers, coupling etc. may be installed. They will synchronize the opening movement of the masses. When a certain distance is exceeded as a consequence of the rotating speed, the masses abut against a stop (8) in such a way that the pulley (1) remains blocked. The lift car (5) continues to move and therefore the rope (2) follows, but as the pulley (1) has come to a halt, a friction force is generated between the rope (2) and the pulley, which activates the steering linkage (4) of the safety gear. This must occur both in UP and DOWN directions.

[0005] The steering linkage is a mechanism that consists of a central rod (9) which rotates onto holes made either directly onto the car sling or onto bushings installed for this purpose and fixed to them and of one or various levers (10) that transmit the rotation of the rod in a certain movement of the triggering component of the safety gear. The governing rope (2) is connected to a lever (10) of the steering linkage in such a way that when the overspeed governor gets blocked, it makes the lever (10) move upwards or downwards. As a consequence, the steering linkage rod (9) rotates so as to transmit the movement to the lever (10) corresponding to the safety gear situated at the other side of the lift car.

[0006] Once the steering linkage has completed its movement, the overspeed governor rope (2) slides onto the pulleys (1,3) causing friction, wear and pressure on the rope (2) and on the steering linkage. This is difficult to control as these factors depend on the friction coefficient of the rope with the groove of the pulley and on the rope tension. Conventional overspeed governors require either a lot of assembly time or work as they are based on several components that need to be assembled onsite.

[0007] There exist other types of systems in which the configuration is more innovative because their governing pulley is situated on the lift car itself, as figures in documents U200002163, 1 P200101202, US 5052523 and EP1454867A1.

[0008] In document U200002163 the governing rope only has one fixed stretch going from the upper part to the lower part of the pit and is tightened by means of springs at both ends. The overspeed governor consists of a conventional governing pulley and a diverting pulley both mounted on the same plane and with a different rotating axis disposed on a supporting structure installed on top of the lift car structure. On top of the component that abuts against the centrifugal mass, some perforations are made with the aim of securing an auxiliary rod or lever. This auxiliary rod joins the ends of the centrifugal masses with either the steering linkage lever or with a connecting rod that functions in connection with the steering linkage rod responsible for simultaneously activating both safety gears arranged at either one side or the other of the lift car. In this arrangement it is necessary to implement new parts that connect the governor to the steering linkage, as is the case of the auxiliary rod. The use of the rope is for the activating force of the safety gear to be equally conditioned by the belt tension and the friction coefficients with the resulting difficulty in its control.

[0009] Document 200101202 does not require ropes but is based on the use of a wheel with a centrifugal system mounted onto the lift car, which rotates onto the guide rail. The centre of this wheel is connected to the steering linkage lever arranged like an articulated quadrangle in which two opposite sides are linked to the moving part of the safety gear and to the wheel respectively. When the wheel blocks, it stops rotating on the guide rail. The centre of the wheel then initiates an upward or downward movement according to the actuating direction causing the steering linkage lever to rotate thus activating the safety gear. In this arrangement it is necessary to

implement new parts that connect the overspeed governor to the steering linkage or else use a specific steering linkage for this type of overspeed governor.

[0010] Document US 5052523 is based on the use of a rope and a governing pulley that rotates on the guide rail and also includes connection means to activate the safety gear by means of a rope and a drum. This system is only valid for actuating in one direction due to the use of a rope.

[0011] The overspeed governor described in document US 5052523 is based on the use of a rope and includes as an option a friction sliding clutch which, by means of a brake, limits the pressure to transmit. This clutch carries out certain normal pressure and, through friction, limits the force to transmit, this force sliding and thus functioning like a brake. Although this type of clutch eliminates wear of the rope, its efficiency resides in the normal pressure produced between both sides of two discs. It does not have an adjusting system that makes adjustment easy nor does it allow the maintenance of the force when facing small dimensional variations due to wear of the friction components. Another aspect is the volume the clutch occupies which makes its installation in reduced spaces and in the lift car difficult as it is an accessory of the overspeed governor and is not on the same plane as the governing pulley.

[0012] The overspeed governor described in document DE 29922874 U1 uses a rope and also includes a brake sliding clutch in a similar way as the one previously described but it does not include an adjustment system making possible easy adjustment of the force to transmit and which, in turn, allows maintaining the force when facing slight dimensional variations due to wear of the friction components.

[0013] The overspeed governor in document EP1454867A1 describes an overspeed governor in the lift car that requires levers for the connection to the safety gear. As a traction system it uses different possibilities of rigid systems and a version with a toothed zip presenting it as an inconvenient only possible in one coupling point, not allowing to choose the position of the overspeed governor with respect to the component arranged in the lift shaft. The system that makes it possible for the toothed pulley to rotate after blocking is not able to adjust by means of springs. Also US 5 349 854 discloses an over speed governor for elevators.

[0014] The main disadvantages of the overspeed governors described above are the connection between the governor rope (2) and the steering linkage (4,9,10) which require the manufacturing of car sling parts made to measure, the size of the overspeed governors with clutch as well as the assembly time necessary to install the pulleys and the ropes, adjusting the rope tension between a maximum and a minimum, etc.

[0015] Another important problem is the possible loss of efficiency of the components that guarantee a minimum yield strain: reduction of the tension of the rope or wheel that rotates onto the guide rail, reduction of the friction coefficients between the rope and the pulley or between the wheel and the guide rail (greased guide rail). The present systems that use a clutch are not conceived to obtain easy adjustment of the maximum force to transmit. They cannot put up with dimensional variations (temperature, humidity, wear, etc.) either, without significantly affecting the value of the maximum force to transmit. These aspects may seriously affect the correct functioning of the overspeed governor as it could cause a failure in activating the safety gear. Not having an adjustment system may cause uncontrolled transmission force.

[0016] Another drawback of the overspeed governors that use a rope lies in the use of an encoder or sensor as a means of knowing the positioning of the lift car due to the fact that with rope systems there always exist small amounts of sliding that lead to obtaining erroneous information as well as causing rope wear. There exist position control systems based on a toothed timing belt but they are separate from the overspeed governor, not included in the governor.

[0017] The disadvantages of the systems based on a rigid zip are its high cost and assembly as well as the fact that it is impossible to obtain more than one coupled tooth which results in less security if the tooth breaks and basically that it is impossible to position the governor and the vertical side of the zip in different points as they need to be tangent.

DESCRIPTION OF THE INVENTION

[0018] The invented device has a new design, which makes it possible to solve the following problems depending on whether its arrangement is in the lift shaft or in the lift car and on the type of assembly and components used:

- Eliminating the connection between overspeed governor and steering linkage at the same time as facilitating pre-assembly -at the factory- onto the lift car, even together with the safety gear thus constituting the one package.

- Not depending on the strain transmitted to the safety gear with the tension of the component arranged in the shaft, being either a rope or a guide rail, having the possibility of using a toothed timing belt as the component arranged in the lift shaft along with a system that limits the force transmitted to the steering linkage.

- Eliminating the sliding between the lift car movement and the overspeed governor component.

[0019] The current invention makes it possible to use a mechanical overspeed governor using a toothed timing belt (11) incorporating an adjustable limiting system (15,16,22) that enables the pulley, on which the timing belt engages, to rotate once the blocking has occurred,

limiting the blocking force transmitted to the steering linkage-safety gear system during the actuating process. If its location is in the lift car, the axis of the governing pulley (1) can be used and therefore the overspeed governor on the axis of the steering linkage rod (9), enabling to integrate it into the safety gear so that the assembly of both components becomes easier. All this is extremely simple to achieve and it is easy to manufacture the one package consisting of both components.

[0020] The overspeed governor is based on two aspects:

1. - On the one hand, the traditional governing pulley (1) that uses a rope (2) is replaced by a toothed pulley (16) onto which a toothed belt couples (11), and the governor is fitted out with an adjustment system that limits the blocking force and therefore the force transmitted to the steering linkage (4), enabling the toothed pulley (16) to rotate even after the blocking has occurred.

2. - The overspeed governor is arranged in such a way that it may be assembled and sustained onto the steering linkage rod itself (9) on making the rotation axis of the governing pulley coincide with the steering linkage rod (9) so that it can be included into the safety gear thus facilitating the assembly of both components into a single component.

[0021] The overspeed governor, object of the invention, consists of a toothed pulley (16) on which a toothed timing belt (11), mounted onto a pulley, engages. It rotates on a hollow tube (14) or fixed axis. A centrifugal or inertial governing system is installed on the pulley (6) like the ones already know technically (of this type of governors as well as of the ones in other sectors). When a certain rotation speed of the governing pulley (1) is exceeded, the governing system (6) abuts against a stop (8), these stops being concentric with the governing pulley and joining the steering linkage in such a way that the rotation of the stop (8) causes the steering linkage (4) to move by means of the rotation of the steering linkage rod (9). In order to obtain, once the safety gear and the steering linkage (4) are activated and have reached their rotation or extreme position, there exists an adjustable limiting system, which allows the toothed pulley (16) to continue to rotate after the safety gear performance and transmitting limited pressure. The system which limits the transmitted force to the steering linkage may be set out between the stop (8) of the governing system and the actuating of the steering linkage or on another part, such as for example between the outer toothed pulley (16) and its inner part. On using a toothed belt, tension is not necessary to ensure the safety gear performance. It is enough to make sure the belt (11) is perfectly fastened at both ends, both on the top and on the bottom part. For the described invention to function properly the system is fitted out with one or several diverting pulleys (17). These pulleys are positioned on a plate (18) connected to a hollow tube (14) or axis on which the pulley rotates or another part of the car sling or lift shaft, depending on the arrangement needed, being on the same plane as the governing pulley. These pulleys act as guides and as belt guards making it possible to install the overspeed governor independently of the toothed timing belt on both sides of the overspeed governor.

[0022] To facilitate its assembly and eliminate parts between the overspeed governor and safety gear-steering linkage, a tube or axis (14) is used as a rotation axis (14), on the outer part of which a governing pulley (1) is installed and on its inner part it engages or joins the steering linkage rod (9). The rest of the components such as the stop (8) and the system that limits the force between the pulley and the governing pulley (16,15, 22) also use this tube as their rotation axis.

[0023] The combination of the two previous aspects, along with the technically already known systems, makes it possible to obtain a great variety of configurations among which the following need to be mentioned:

- Governing pulley (1) with an adjustable system that limits the force (15,22,28,29,30,31) to the steering linkage rod (9) with a 1 stretch-toothed timing belt (11) attached without tension at the top and bottom part.

- Governing pulley (1) with an adjustable system that limits the force (15,28,29,30,31) at one end of the lift shaft, a tensioning pulley at the other end and a double stretch-toothed timing belt (11) linked to the steering linkage.

[0024] Due to the coupling system with belt and the fact that the toothed wheel functions connected to the lift car, there is no sliding between the latter and the timing belt which makes it possible to ensure, by placing an encoder or sensor on the governing pulley, and to know the exact position of the lift car without needing a specific system to carry out this function.

[0025] To complement the description that follows ad so as to obtain a better understanding of the characteristics of the invention, a set of drawings is attached to this descriptive report. The drawings will help understand better the innovations and advantages of the device being the object of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Figure 1. - Shows a schematic arrangement of a conventional overspeed governor.

Figure 2. - Shows a preferred arrangement of the overspeed governor, object of the invention, with a toothed timing belt (11), radial limiting system and

rotation on the steering linkage rod (9).

Figure 3. - Shows a preferred arrangement of the overspeed governor, object of the invention, with a rope and rotation on the steering linkage rod (9).

Figure 4. - Shows a preferred arrangement of the overspeed governor, object of the invention, with a toothed timing belt (11) at one end of the lift shaft, double stretch, diverting pulley at the other end (3) and a radial limiting system.

Figure 5. - Shows a cross section of a preferred overspeed governor arrangement with a radial limiting system (15,22) between the pulley (16) and the governing pulley and with rotation on the steering linkage rod (9).

Figure 6. - Shows a cross section of a preferred overspeed governor arrangement with an axial adjustable limiting system (28,29,30,31) between the pulley (16) and the governing pulley and with rotation on the steering linkage rod (9).

DESCRIPTION OF A PREFERRED ARRANGEMENT

[0027] From the drawings mentioned earlier, it may be observed that the overspeed governor, object of the invention, has a hollow tube (14) connected to a plate (18) in which a hole has been made for the tube to pass through. On the outside of this tube (14), a governing pulley is installed (1) on top of which a toothed pulley (16) is mounted so that a belt (11) placed in the lift shaft couples onto this pulley. The rotation of the pulley is produced by means of one or several bearings positioned on the outside of the tube. On one side of the pulley a centrifugal system (6), which moves some masses as a consequence of the rotation of the pulley, is installed. In order to adjust the movement of those masses in accordance with the rotation speed, a spring (19) is installed that puts up resistance to this radial movement, which is overcome as a consequence of the centrifugal force.

[0028] The compensation between the weight of the masses is done through coupling both masses - as if they were two toothed wheels- at the other side of their rotation axis.

[0029] Connecting the pulley to the governing pulley is done by means of an adjustable limiting system between the pulley (16) and the governing pulley (15) which enables the pulley, on which the belt engages, to rotate once it has been blocked, transmitting continuous and limited pressure to the steering linkage-safety gear system during the actuating process. One option for this system is to have at least one groove or slit (25) in radial direction on the pulley where the timing belt or first part (16) of the adjustable system which limits the force (15) engages and at least one radial drill on the governing pulley or second part (15) of the concentric adjustable system which limits the force with the pulley or first part of the adjustable force-limiting system by placing round-shaped projections (22) and compression springs (26) on this pulley. They oppose the movement of the projections towards the centre as a consequence of the rotation of the first part (16) of the adjustable force-limiting system (15) on the second one (15) as the projections are inserted into the grooves (25) of the pulley. Another option for the pulley rotation system after blocking consists of the following:

- A projection on the inside of the pulley (31) and placed in its central part so that the projection can be part of the pulley or of another intermediary component generating a T-shaped profile.

- A depression in the governing pulley or second part (15) of the concentric adjustable force-limiting system on the projection of the pulley in such a manner that the second part leans axially and adjusts radially on the pulley or first part of the system, and a washer (30) that leans onto the other side of the projection and adjusts radially on the pulley and on the second part of the adjustable force-limiting system that constitutes the governing pulley.

- One or more sets of screws (29) that link the second part of the adjustable force-limiting system (15) with the washer (30), compressing the flat springs (28) in such a way that they pressurize the projection of the pulley (31) with an adjustable force value depending on the compression. The neck length of the screws (29) regulates the tightening torque of the springs (28) as the neck of the springs abuts against the washer (30), limiting in this way the compression. The head of the screws (29) and the flat springs (28) are inside depressions of the governing pulley in such a way that they do not stick out axially.

- The limiting system is regulated by changing the rigidity of the flat springs (28) and tightening torque which, in turn, are adjusted through the neck length of the screws (29) or through shim discs.

[0030] On the same tube (14) a disc (21) is installed. It has been emptied on the inside in an interior diameter. On its perimetric part there are three radial slanted holes placed on top of the centrifugal masses (6) so that in their radial movement they end up sticking out of the groove of the disc (21), abutting in the part where there is no groove (8) causing the disc (21) to rotate in connection with the pulley. In its central part, the disc is connected to the steering linkage rod (9) by means of a pin (23) or other system depending on the shape of the steering linkage rod so that its rotation moves the rod (9), causing direct activation without any intermediary safety gear components. Once the rod (9) reaches its final position, the governing pulley (1) and the disc stop rotating while

the pulley continues to rotate as a consequence of the actuation of the adjustable system that limits the force (15,28,29,30,31), which is unable to produce more pressure.

[0031] In order to prevent axial movements between the components and the overspeed governor packages, fittings or parts (24) are installed that axially join the governing pulley to the blocking disc so that the overspeed governor constitutes a solid block that is mounted on the steering linkage rod (9).

[0032] In order to make it easier to fasten the governor to the car sling, on one end of the tube on which the pulley (1) is mounted, a plate (18) may be installed. This plate (18) can be the lid of the safety gear. Thus combining both products -the safety gear and the overspeed governor- into a preassembled package. On top of the plate (18) two diverting pulleys (17) are installed vertically (17) to obtain a greater amount of coupled teeth and guide the timing belt in relation to the rest of the components arranged in the lift shaft.

[0033] The materials used in the manufacturing of the braking components, their shapes and dimensions and all possible further details have nothing to do with the object of the invention, as long as they do not affect its essentials.

[0034] The toothed timing belt is fixed to the lift shaft or guide rail at the top and bottom part by means of a tensioning system based on a spring. It is installed in such a way that it can activate electric switches in order to detect possible breakage of the timing belt and thus bringing the lift to stop.

Claims

1. Overspeed governor for an elevator with a toothed timing belt (11), comprising a clutch (12,15) that limits the blocking force, a toothed pulley (13) engaged by the toothed timing belt (11), the pulley rotates on a hollow tube (14), a centrifugal or inertial governing system which is installed on the pulley (6,7), such that when a certain rotation speed of the governing pulley (1,13) is exceeded, the governing system (6,7) abuts against a stop (8), which stop is concentric with the governing pulley and joins the steering linkage in such a way that the rotation of the stop (8) causes the steering linkage (4) to move by means of the rotation of the steering linkage rod (9), once the safety gear and the steering linkage (4) are activated the clutch (12,15) allows the toothed pulley to continue to rotate, the clutch (12,15) is set out between the outer toothed wheel (16) of the governing pulley and its inner part, wherein to ensure that tension of the toothed belt is not necessary for the safety gear performance the system is fitted out with one or several diverting pulleys (17), these pulleys are positioned on a plate (18) connected to a hollow tube (14) or axis on which the pulley rotates, wherein the overspeed governor is further defined by the fact that it consists in using a hollow tube (14) as a rotating axis on the outer part of which the governing pulley (1) is installed and on the inner part of which the steering linkage rod (9) engages, the rest of the components such as the stop (8) and/or the clutch (12,15) also use this hollow tube as rotating axis, further defined in that due to the coupling system with belt and the fact that the toothed wheel functions connected to the lift car, there is no sliding between the latter and the timing belt which makes it possible using an encoder or sensor on the governing pulley, to know the exact position of the lift car.

Patentansprüche

1. nspruch 1: Übergeschwindigkeitsregler für einen Aufzug mit Steuerungs-Zahnriemen (11), folgendes umfassend: eine Kupplung (12,15), die die blockierenden Kräfte begrenzt, eine gezahnte Riemenscheibe (13), in die der Zahnriemen (11) eingreift, die Riemenscheibe dreht auf einer hohlen Röhre (14), ein Zetrifugal- oder Trägheitsgesteuertes Steuerungssystem, das auf der Scheibe (6, 7) angebracht ist, sodass wenn eine bestimmte Drehgeschwindigkeit der Steuerungsscheibe (1, 13) überschritten wird, stößt das Steuerungssystem (6,7) an einen Halt (8), dieser Halt ist konzentrisch bezüglich der Steuerungsscheibe und verbindet die Regler-Koppelung so, dass die Drehung des Halts (8) die Regler-Koppelung (4) dazu bringt, sich durch die Drehung der Regler- Koppelungsstange (9) zu bewegen, sobald die Sicherheitsvorrichtung und Steuerungskoppelung (4) aktiviert sind, ermöglicht die Kupplung (12,15) der Zahnriemenscheibe sich weiter zu drehen, die Kupplung (12,15) ist zwischen dem äußeren gezahnten Rad (16) der Steuerungsscheibe und der Innenseite angebracht, wobei um sicherzustellen, dass die Spannung des Zahnriemens nicht notweindig für die Wirkung der Sicherheitsvorrichtung ist, ist das System mit einer oder mehreren Umlenk-Scheiben (17) ausgestattet, diese Scheiben sind auf einer Platte (18) angebracht, die mit einer hohlen Röhre (14) oder Achse verbunden ist, auf der sich die Scheibe dreht, wobei der Übergeschwindigkeitsregler ist weiter durch die Tatsache definiert ist, dass sie aus einer hohlen Röhre (14) besteht, als eine rotierende Achse auf der äußeren Seite, wobei die Steuerungsscheibe (1) angebracht wird und auf der inneren Seite, an der die Steuerungskoppelungsstange (9) eingreift, der Rest der Komponenten, wie zumm Beispiel der Halt (8) und/oder die Kupplung (12,15), ebenso wird die hohle Röhre als Rotationsachse benutzt, weiterhin dabei durch das Kupplungssystem mit Riemen definiert ist, und der Tatsache, dass die Zahnradfunktionen an den Fahrkorb angeschlossen sind, es besteht kein Gleiten

zwischen dem letzteren und dem Steuerungs-Riemen, wodurch ermöglicht wird, durch das Verwenden eines Wertgebers oder Sensors auf der Antriebsscheibe, die genue Position des Fahrkorbs zu kennen.

Revendications

1. ffirmation 1: Limiteur de vitesse pour un ascenseur avec courroie crantée (11), contenant un embrayage (12,15) qui limite la force de blocage, une poulie crantée (13) commandée par la courroie crantée (11). La poulie tourne sur un tube creux (14), un système d'actuation centrifuge ou inertiel qui est installé sur la poulie (6,7), de façon à ce que quand une certaine vitesse dé rotation de la poulie du limiteur (1,13) est dépassée, le système d'actuation (6,7) s'appuie sur une butée (8). Cette butée est concentrique avec la poulie du limiteur et unit la barre de transmission de telle façon que la rotation de la butée (8) force la barre de transmission (4) à bouger, par le biais de la rotation de la bielle de la barre de transmission (9). Une fois le parachute et la barre de transmission (4) activés, l'embrayage (12,15) permet à la poulie crantée de continuer à tourner. L'embrayage (12,15) se situe entre la roue crantée extérieure (16) de la poulie du limiteur et sa partie intérieure. Afin de s'assurer que la tension de la courroie crantée n'est pas nécessaire pour la performance du parachute, le système est équipé avec une ou plusieurs poulies de renvoi (17). Ces poulies sont placées sur une plaque (18) connectée à un tube creux (14) ou un axe sur lequel tourne la poulie, de telle façon que le limiteur de vitesse se définit aussi par le fait qu'il consiste à utiliser un tube creux (14) comme axe de rotation à l'extérieur duquel est installée la poulie du limiteur (1) et à l'intérieur duquel est prise la bielle de la barre de transmission (9). Le reste des composants, tels que la butée (8) et/ou l'embrayage (12,15) se servent aussi de ce tube creux en tant qu'axe de rotation, **caractérisé par le fait qu'**à cause du système de couplage avec la courroie et **le fait que** la roue crantée fonctionne connectée à la cabine, il n'y a pas de glissement entre ce dernier et la courroie crantée qui offre la possibilité d'utiliser un encodeur ou senseur sur la poulie du limiteur, afin de connaître la position exacte de la cabine.

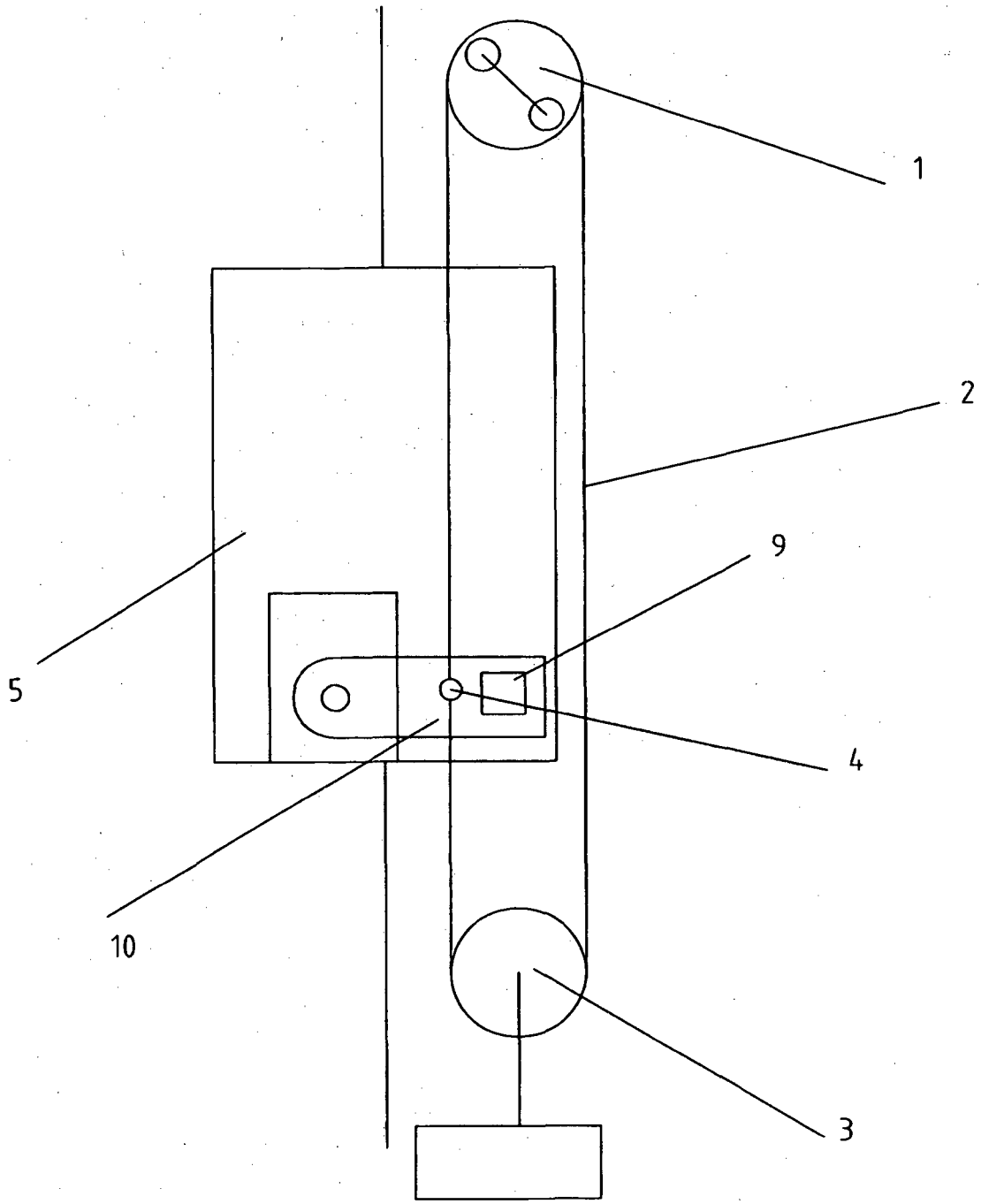

Figura 1

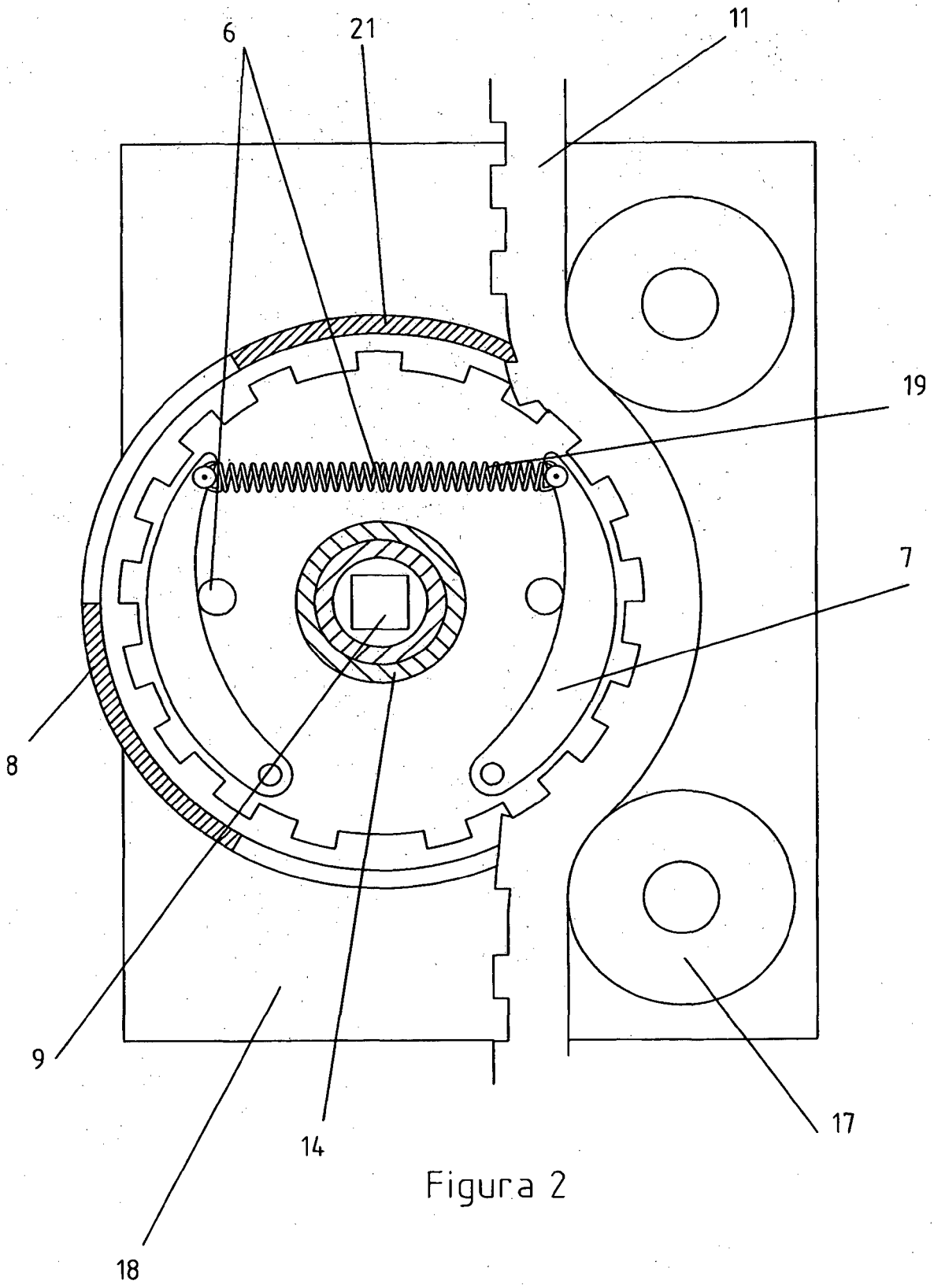

Figura 2

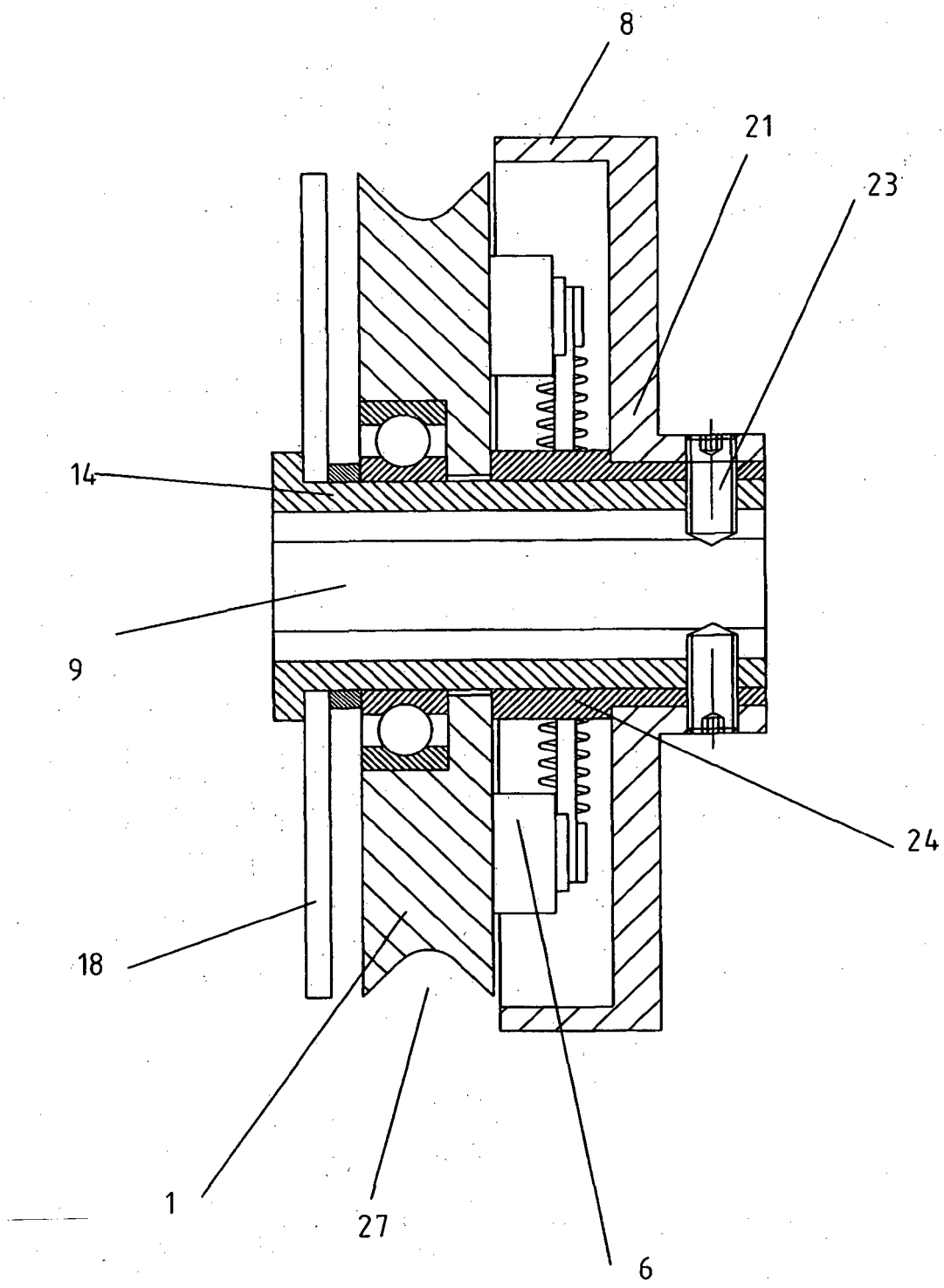

Figura 3

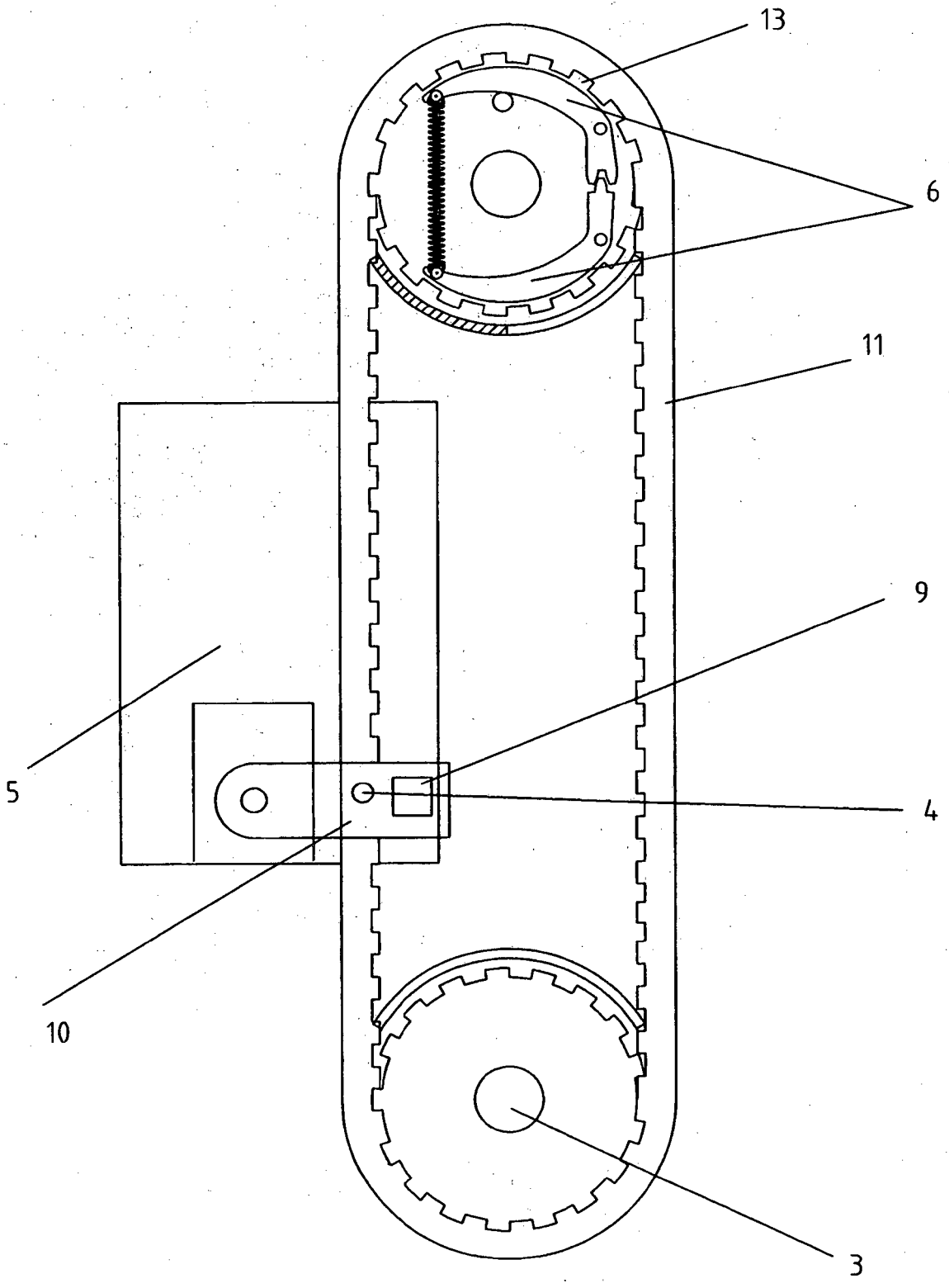

Figura 4

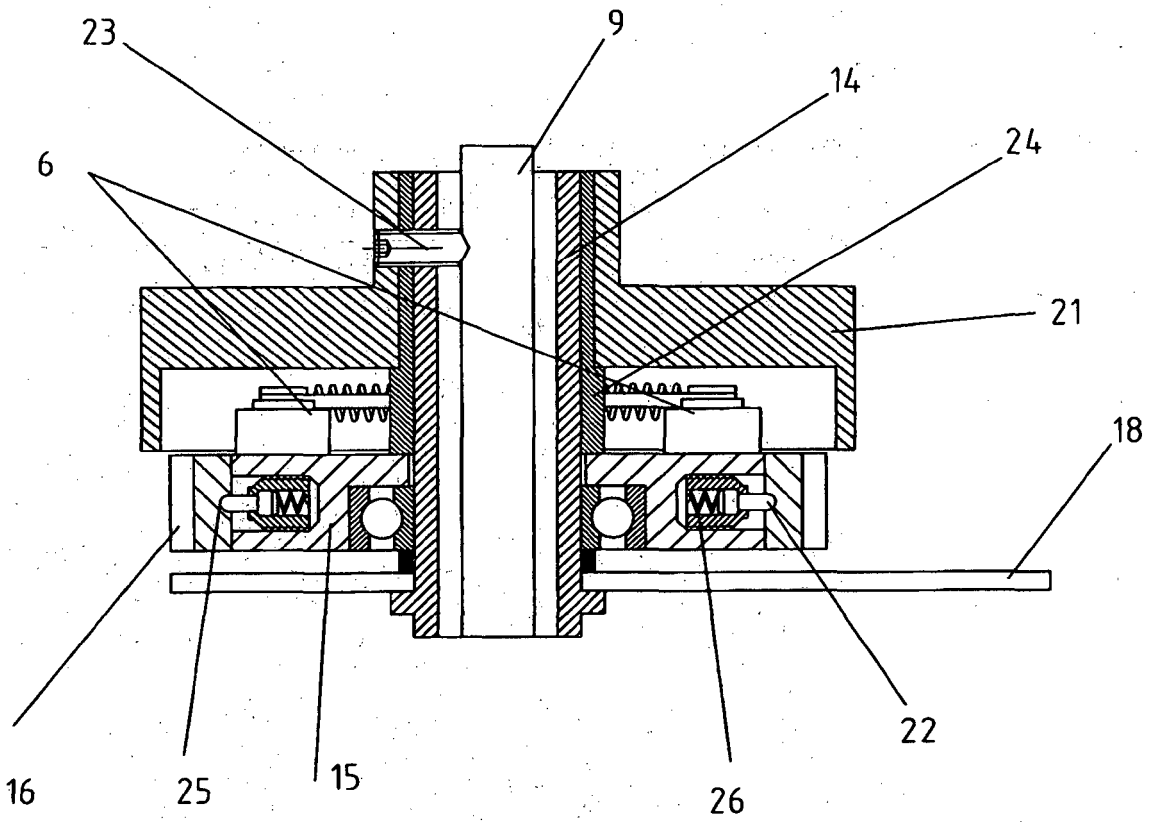

Figura 5

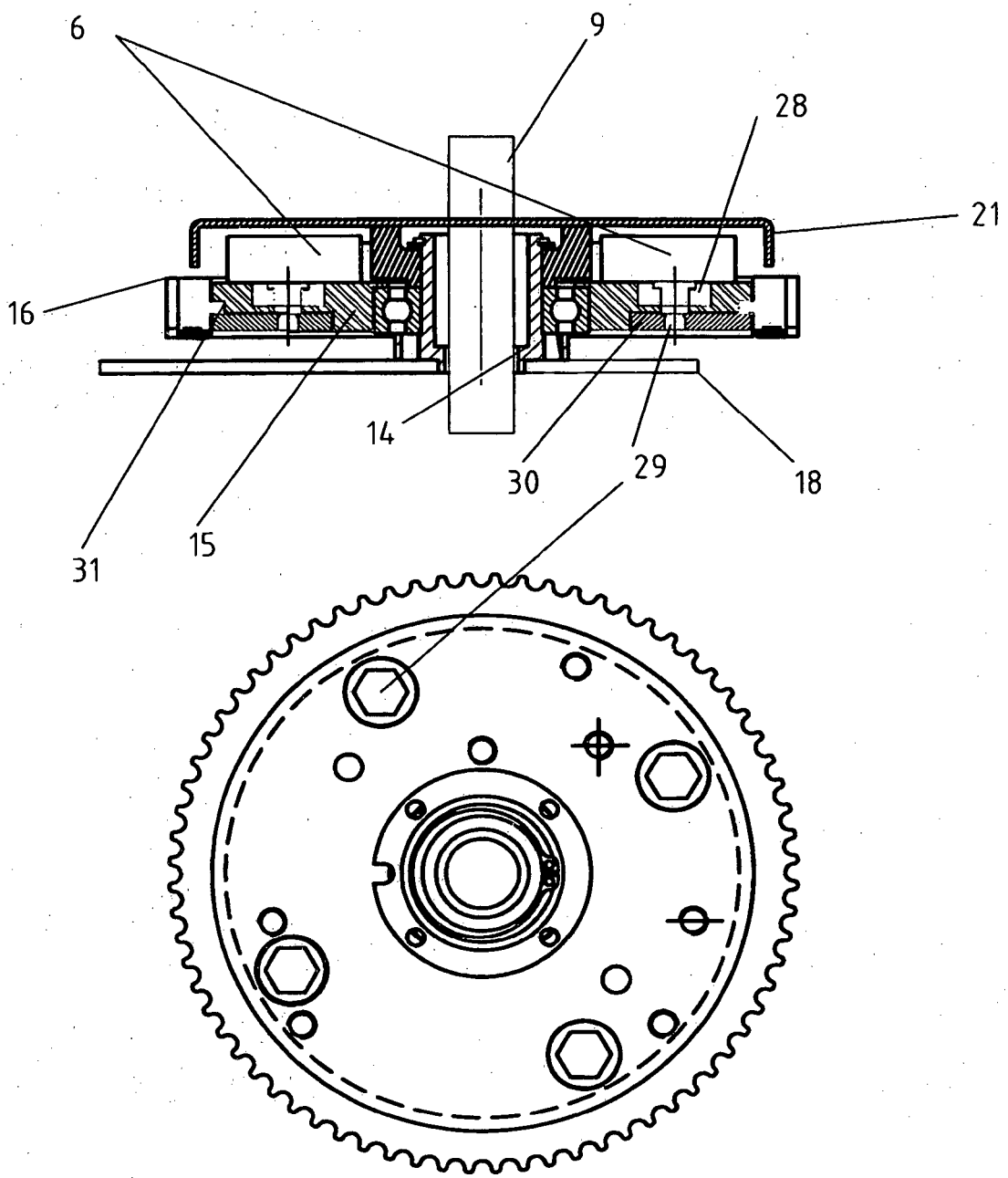

Figura 6

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

- US 200002163 U **[0007]**
- US 200101202 P **[0007]**
- US 5052523 A **[0007] [0010] [0011]**
- EP 1454867 A1 **[0007] [0013]**
- WO 200002163 U **[0008]**
- WO 200101202 A **[0009]**
- DE 29922874 U1 **[0012]**
- US 5349854 A **[0013]**