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(54) **SHOCK-ABSORBING STOPPING DEVICE FOR ROLLING SHUTTERS OR BLINDS**

STOSSABSORBIERENDE HALTEVORRICHTUNG FÜR ROLLLÄDEN ODER ROLLOS

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(73) Proprietors:
- **Postacchini, Dante**
  63023 Fermo (AP) (IT)
- **Postacchini, Roberto**
  63023 Fermo (AP) (IT)

(72) Inventors:
- **Postacchini, Dante**
  63023 Fermo (AP) (IT)
- **Postacchini, Roberto**
  63023 Fermo (AP) (IT)

(74) Representative: **Baldi, Claudio**
Ing. Claudio Baldi S.r.l.
Viale Cavallotti, 13
60035 Jesi (Ancona) (IT)

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DE-U1- 7 901 982

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Description

[0001] The present patent application for industrial invention relates to a shock-absorbing stopping device for rolling shutters or blinds, which is automatically actuated in case of accidental descent of the shutter, dissipating the kinetic energy accumulated by the rolling shutter by deformation of elastic elements.

[0002] This device falls into the category of the so-called "cushioned parachutes", the operation of which is fundamentally based on a self-blocking system that provides a short braking stroke before the shutter comes to a halt following to free descent, during which part of the kinetic energy accumulated by the winding shaft of the shutter as result of its uncontrolled descent is normally dissipated by friction.

[0003] This braking action, which precedes the definitive blocking of the shaft, and consequently of the shutter, reduces the violence of the impact on stopping, thereby preventing the whole structure from being subjected to highly dangerous mechanical stress levels.

[0004] The German patent No. DE 3140792 discloses a "cushioned parachute", which comprises a special toothed wheel, which is keyed on the winding shaft of the shutter and enclosed within an opposite pair of circular side covers, tightened one against the other by an annular series of bolts, which also cross a rotary ring that is positioned between the covers and exactly encloses said toothed wheel.

[0005] This ring is housed, with the possibility of rotating freely, in a hole made on a fixed supporting plate, which is slightly thicker than said ring, so that the border of the side covers adheres to the two opposite sides of said fixed plate and not on the sides of the ring contained in it.

[0006] Cylindrical rollers are positioned inside the spaces that separate the teeth of the aforesaid toothed wheel, and, in case of accidental descent of the shutter, they are expelled by centrifugal force from their housing and remain embedded within a space provided along the internal circumference of the aforesaid ring, which is driven into rotation by the toothed wheel by means of the cylindrical rollers embedded therein.

[0007] The ring, in its turn, drives into rotation the pair of aforesaid side covers, due to the fact that the tightening bolts of the covers cross the ring.

[0008] The rotation of the covers immediately determines a braking action against said ring, due to the fact that the border of said covers comes into contact with the sides of the fixed support plate, thereby dissipating energy through friction.

[0009] The blocking of the toothed wheel at the end of the braking stroke takes place indirectly, thereby causing the blocking of the ring by means of a stop pin fitted on the fixed support plate, but sliding inside a seat grooved along the external circumference of the ring, the blocking of which therefore follows the mechanical interference of said pin against one of the two end corners of said seat.

[0010] EP 0 671 543 discloses a cushioned locking device for rolling shutters or blind according to the preamble of claim 1.

[0011] DE 79 01 982 U discloses a safety device for rolling shutters comprising leaf springs coupled with the box housing the ring.

[0012] The aim of the present invention is to simplify the structural configuration of "cushioned parachutes" of known type, and to reduce their construction costs.

[0013] Another specific aim of the invention is to introduce new means to dissipate the kinetic energy during the braking phase, in replacement of the ordinary dissipation means by friction, which have traditionally characterised all models of "cushioned parachutes" of known type.

[0014] These and other purposes have been achieved by the stopping device of the invention, the main innovative peculiarities of which are illustrated in the characterising part of the first claim.

[0015] The stopping device for rolling shutters or blinds according to the present invention comprises a rotor that is keyed on the winding shaft of the shutter and free to rotate, during the ordinary operation of the shutter, inside a ring, said rotor and said ring being enclosed in a protection and support box.

[0016] Means of known type are positioned between said rotor and ring to engage the two components, when said rotor achieves excessive angular speed during the descent of the shutter, which can be attributed to failure, such as for example the free uncontrolled descent of the shutter.

[0017] In other words, it can be stated that said ring is normally stopped and maintains its idle position until the descending travel of the shutter does not exceed a predefined speed value, beyond which said ring starts rotating due to the effect of the driving action exerted by said rotor by means of said engagement means.

[0018] The primary characteristic of said ring is the presence of at least one facet engaged against a corresponding element adapted to be elastically deformed when said facet abandons its idle position, condition that only occurs when the ring is driven into rotation by the rotor.

[0019] According to a preferred embodiment of the invention, the ring is provided with a pair of facets engaged against two elements, in order to have a symmetric distribution of the stress loads that intervene in case of cushioned braking of the descending travel of the shutter.

[0020] This means that the kinetic energy accumulated by the shutter during its uncontrolled descent is automatically and immediately dissipated to elastically deform said elements, thereby progressively decelerating the travel of the shutter, which is subjected to final stop when a suitable catch provided on the external perimeter of said ring is stopped against a tooth obtained inside the frame of the box.

[0021] In order to additionally cushion the last part of the braking travel of the shutter, the catch is given a profile

that interferes with the border of its sliding and guiding seat, in such a way that, for a final section, sliding occurs with rubbing between contact surfaces, additionally dissipating energy by friction.

[0022] For purposes of clarity, the description of the stopping device of the invention continues with reference to the attached drawings, which are reproduced for illustrative and not limitative purposes, wherein:

- Fig. 1 shows a plan view of the device according to the invention, without side cover, so as to show the structural configuration of the box that houses the rotor and ring, the latter being shown in idle position, which corresponds to the absence of deformation of said deformable elements;
- Fig. 2 is basically identical to Fig. 1, except in that it shows said ring driven into rotation by the rotor, with consequent deformation of said elastically deformable elements;
  Fig. 2A is an enlarged detail of Fig. 2;
- Fig. 3 is basically identical to Fig. 2, except in that it shows said ring at the end of its rotation, which corresponds to the maximum deformation of said elastically deformable elements and to the stop of the uncontrolled descent of the shutter; in this figure, a portion of the cover of the box is shown on bottom left;
  Fig. 3A is an enlarged detail of Fig. 3;
- Fig. 4 is basically identical to Fig. 3, except in that it refers to an alternative constructive embodiment of the device of the invention;
  Fig. 4A is an enlarged detail of Fig. 4;
- Fig. 5 shows a cross-sectional view of the device of the invention according to a horizontal plane and provided with cover;
  Fig. 5A is an enlarged detail of Fig. 5;
- Fig. 6 shows an axonometric view of the device according to the invention, without top cover and provided with a ring made with a hard metal insert;
- Fig. 6A is an axonometric view of said ring according to a special constructive embodiment;
- Fig. 7 shows an enlarged detail of one of the support bearings of the rotor (1);
- Fig. 8 is a cross-sectional view of the gasket mounted on the support bearings of the rotor (1).

[0023] Referring to figs. 1 to 3, the device (A) of the invention comprises a rotor (1) adapted to be keyed on the winding shaft of the shutter and free to rotate, during the ordinary operation of the shutter, inside a ring (2), said rotor (1) and said ring (2) being enclosed inside a protection and support box (3) provided with cover (3a) fitted to the box (3) with screws.

[0024] Said rotor (1) can be imagined as a sort of toothed wheel, the teeth of which are separated by U-shaped spaces (1 a) that exactly house the cylindrical rollers (4).

[0025] Each space (1 a) is provided with a curved notch (1 b) on the back side, if considered with reference to the clockwise rotation direction of the rotor (1), which corresponds to the descent of the shutter, as shown in the attached figures.

[0026] This notch (1b) is shaped as a quarter of circumference with same diameter as the cylindrical rollers (4), thereby receiving them in cradle-like configuration during the transitory phase in which said rollers (4) are expelled from the space (1 a) where they are normally housed.

[0027] It must be noted that expulsion is caused by a fixed cam (20) that interferes with each roller (4) when it crosses the Top Dead Centre (TDC) of its circular travel.

[0028] As mentioned above, the rotor (1) is exactly housed with possibility of rotating inside the ring (2), which is provided on the internal border with a loop (2a) extending for an arch of circumference situated astride the Top Dead Centre (TDC) of the circular travel covered by each of said rollers (4) as long as the rotor (1) rotates jointly with the winding shaft of the shutter.

[0029] The loop (2a) has a gradually increasing depth, which is nevertheless constant for half of its length, and equal to the radius of the cylindrical rollers (4).

[0030] Each roller (4) slides inside the loop (2a) that receives it as soon as the cam (20) expels it from its housing (1 a); however, due to the fact that the maximum depth of the loop (2a) is equal to the radius of each roller (4), half of the roller is contained in said loop (2a) and the other half is contained in the notch (1 b).

[0031] More precisely, the loop (2a) is softly joined at one end with the internal border of the ring (2), whereas it finishes at the other end with a rounded step (2b) situated downstream said Top Dead Centre according to the direction of rotation of the rotor (1) during the descent of the shutter.

[0032] From a different perspective, it can be stated that said rounded step (2b) is situated at the end of the section of the loop (2a) with constant depth equal to the radius of the rollers (4).

[0033] As mentioned above, the interference of each rollers (5) with the cam (20), both during the descent and ascent of the shutter, determines the temporary partial expulsion from the space (1a) of each roller (4), which passes over the cam (20) and falls again in its space (1 a).

[0034] If, nevertheless, the clockwise rotation speed of the rotor (1) becomes too high (such as in case of accidental uncontrolled descent of the shutter), the roller (4) - which is temporarily expelled from its space (1 a) and housed astride said loop (2a) and notch (1b) - is not given sufficient time to fall and return inside its space (1 a), thereby being embedded between said notch (1 b) and step (2b), as shown in Fig. 2A.

[0035] The ring (2) is housed in the box (3) in such a way to rotate freely around an axis passing through the centre of the rotor (1).

[0036] The ring (2) is provided with a diametrically opposite pair of facets (5) engaged against corresponding elastically deformable elements (6).

[0037] According to the preferred embodiment illustrat-

ed in the attached figures, said elastically deformable elements consist in two leaf springs (6), the ends of which are attached inside suitable niches (3c) of the box (3).

[0038] The interference between said springs (6) and the facets (5) of the ring (2) ensures the stable stop of the ring in its ordinary idle position (see Fig.1), which does not correspond to the elastic deformation of the springs (6) that are simply placed side by side in connection with the facets (5).

[0039] The idle position of the ring (2) is maintained as long as no roller (4) is embedded between said notch (1 b) and step (2b), as shown in Fig. 1.

[0040] Should the shutter collapse accidentally, the embedding condition shown in Fig. 2A intervenes, driving into rotation the ring (2) by the rotor (1), as shown in Figs. 2 and 3.

[0041] The kinetic energy accumulated by the shutter during its uncontrolled descent is immediately and automatically dissipated by the device of the invention (A) to elastically deform the leaf springs (6), as shown in Figs. 2 and 3, thereby progressively decelerating the descent of the shutter, which is definitely stopped when a suitable catch (8) provided on the external border of the ring (2) stops against a tooth (9) obtained on the cover (3a) of the box (3).

[0042] By driving the cover (3a) in anti-clockwise rotation, the tooth (9) brings the ring (2) back to idle position, without direct intervention on the ring; evidently, before driving the cover (3a) in rotation, the screws (100) used to fit it to the box (3) must be removed.

[0043] In other words, to "re-fit" the stopping device of the invention (A), it will be sufficient to remove the fixing screws (100) of the cover (3a) of the box (4) and rotate the cover (3a) in anticlockwise direction, in such a way that the internal tooth (9) drives the ring (2) into rotation until it cancels the elastic deformation suffered by the leaf springs (6) during the preceding braking phase of the collapsing travel of the shutter.

[0044] Referring to figs. 4 and 4A, according to an advantageous alternative embodiment of the device of the invention - in order to additionally cushion the last part of the braking travel of the shutter - the catch (8) is given a suitable profile to interfere with the border (10) of its sliding and guiding seat (11), in such a way that, for a final part, sliding occurs with rubbing between contact surfaces, additionally dissipating energy by friction.

[0045] Referring to figs. 5 and 5A, it must be noted that a gasket (G) is provided between cover (3a) and box (3) to ensure perfect watertightness of the device.

[0046] According to a preferred embodiment of the ring (2), as shown in figs. 6 and 6A, the ring is provided with a hard metal insert (200) with the step (2b), in which a roller (4) is embedded during the uncontrolled descent of the shutter.

[0047] Referring to figs. 7 and 8 it must be noted that on the support bearings (N) of the rotor (1) a gasket (G2) is mounted and housed inside a corresponding seat obtained in the box (3), having an edge (G3) that adheres and rubs against the internal ring (N1) of the bearing (N).

[0048] The gasket (G2) prevents water and any other impurity from penetrating inside the bearings (N) and reach the spaces (1 a) through said bearings (N), thereby impairing the correct operation of the stopping device.

Claims

1. A shock-absorbing stopping device (A) for rolling shutters or blinds, comprising:

- a box (3) closed with a cover (3a),
- a rotor (1) adapted to be coupled to the winding shaft of the shutter, said rotor (1) being enclosed in the box (3) and free to rotate around a horizontal axis, and consisting in a sort of toothed wheel, the teeth of which are separated by spaces (1a),
- a plurality of cylindrical rollers (4) housed in corresponding said spaces (1a) of the rotor (1),
- a ring (2) in which said rotor (1) is arranged, adapted to be driven into rotation by the rotor (1), the internal border of said ring (2) being provided with a loop (2a) extending for an arch of circumference situated astride a Top Dead Centre (TDC) of the circular travel covered by each roller (4) as long as the rotor (1) rotates jointly with the winding shaft of the shutter, and
- a fixed cam (20) that interferes with said rollers (4) to bring them out of the spaces (1 a) of the rotor and into the loop (2a) of the ring (2),

said device (A) being **characterised in that**

the ring (2) is provided with at least one facet (5) obtained on the external border, which is engaged on an element (6) coupled with said box (3),

said element (6) being adapted to be elastically deformed by interference with the borders of said facet (5) when the ring (2) is driven into rotation by the rotor (1),

the ring (2) is provided with a catch (8) on the external border and adapted to stop against a tooth (9),

the box (3) is provided with a sliding and guiding seat (11) of said catch (8) and said catch (8) is given a suitable section (8a) to interfere with an edge (10) of said seat (11) of the box, in such a way that, for a final part, sliding occurs with rubbing between contact surfaces, additionally dissipating energy by friction.

2. The device of the above claim, **characterised in that** the ring (2) is provided with a diametrically opposite pair of facets (5) engaged against two corresponding elements (6).

3. The device of claim 1 or 2, **characterised in that**

the tooth (9) is obtained on the cover (3a) of the box (3).

4. The device of one or more of the above claims, **characterised in that** the loop (2a) of the ring (2) is provided at one end with a rounded step (2b) and the ring (2) is provided with a hard metal insert (200) in the step (2b).

5. The device of one or more of the above claims, **characterised in that** the element (6) consists in a leaf spring (6), the ends (6a) of which are attached inside suitable niches (3c) of the box (3).

6. The device of one or more of the above claims, **characterised in that** each space (1 a) of the rotor is provided with a curved notch (1 b) on its back side - if considered with reference to the direction of rotation of the rotor (1), which corresponds to the descent of the shutter - and said notch (1 b) is shaped as a quarter of circumference having the same diameter as the cylindrical rollers (4), thereby receiving them in cradle-like configuration during the transitory phase in which said rollers (4) are expelled from the space (1 a), it being also provided that said loop (2a) of the ring is provided at one end with a rounded step (2b) situated at the end of a section of the loop with constant depth equal to the radius of the rollers (4).

Patentansprüche

1. Stoßdämpfende Arretiervorrichtung (A) für Rollläden oder Jalousien, umfassend:

   - ein mit einem Deckel (3a) geschlossenes Gehäuse (3),
   - einen Rotor (1), der dazu geeignet ist, fest mit einer Wickelwelle des Rollladens verbunden zu werden, wobei der Rotor (1) in dem Gehäuse (3) untergebracht ist, sich frei um eine horizontale Achse drehen kann und aus einer Art Zahnrad besteht, dessen Zähne durch Lücken (1 a) getrennt sind,
   - eine Vielzahl von Zylinderrollen (4), die in den Lücken (1 a) des Rotors (1) untergebracht sind,
   - einen Ring (2), in dem der Rotor (1) angeordnet und der dazu geeignet ist, vom Rotor (1) in Drehung versetzt zu werden, wobei am Innenrand des Rings (2) eine Schleife (2a) herausgearbeitet ist, die sich über einen Umfangbogen rittlings auf einem oberen Totpunkt (PMS) des Rundverlaufs einer jeden Rolle (4) erstreckt, bis der Rotor (1) sich zusammen mit der Wickelwelle des Rollladens dreht, und
   - eine feste Nocke (20), die mit den Rollen (4) zusammenwirkt, um sie aus den Lücken (1 a) des Rotors heraus in die Schleife (2a) des Rings (2) zu bringen,

   wobei die Vorrichtung (A) **dadurch gekennzeichnet ist, dass**
   der Ring (2) mindestens eine auf seinem Außenrand herausgearbeitete Flachstelle (5) aufweist, die an einem mit dem Gehäuse (3) fest verbundenen Anschlagelement (6) anstößt,
   das Anschlagelement (6) dazu geeignet ist, sich durch das Einwirken der Ränder der Flachstelle (5) elastisch zu verformen, wenn der Ring (2) durch die Mitnahme durch den Rotor (1) in Drehung versetzt wird,
   der Ring (2) auf seinem Außenrand mit einer Arretierklinke (8) versehen und in der Lage ist, an einem Zahn (9) auf Anschlag zu gehen,
   das Gehäuse (3) mit einem Gleit- und Führungssitz (11) für die Arretierklinke (8) versehen ist und die Arretierklinke (8) ein Profil (8a) aufweist, das mit einer Kante (10) des Sitzes (11) des Gehäuses in der Weise zusammenwirkt, dass das Gleiten im Endabschnitt mit einem Reiben zwischen den Kontaktflächen erfolgt, wodurch Energie zusätzlich durch Reibung dissipiert wird.

2. Vorrichtung nach dem vorstehenden Anspruch, **dadurch gekennzeichnet, dass** der Ring (2) ein Paar diametral gegenüberliegende Flachstellen (5) aufweist, die jeweils an zwei Anschlagelemente (6) anstoßen.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Zahn (9) auf dem Deckel (3a) des Gehäuses (3) herausgearbeitet ist.

4. Vorrichtung nach einem oder mehreren der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Schleife (2a) des Rings (2) an einem ihrer Enden eine abgerundete Stufe (2b) aufweist und der Ring (2) an der Stufe (2b) mit einem Hartmetalleinsatz (200) versehen ist.

5. Vorrichtung nach einem oder mehreren der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** das Anschlagelement (6) aus einer Blattfeder (6) besteht, deren Enden (6a) in hierfür vorgesehenen Nischen (3c) des Gehäuses (3) eingehängt sind.

6. Vorrichtung nach einem oder mehreren der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** jede Lücke (1 a) des Rotors eine gebogene Kerbe (1 b) auf ihrer Rückseite aufweist - bezogen auf die Drehrichtung des Rotors (1), die dem Absenken des Rollladens entspricht - sowie dadurch, dass die Kerbe (1 b) das Profil eines Viertelumfangs mit demselben Durchmesser wie die Zylinderrollen (4) besitzt, welche auf diese Weise in der Übergangsphase in einer wiegeähnlichen Ausgestaltung aufgenommen werden, in der die Rollen (4) aus den

Lücken (1 a) ausgestoßen sind, wobei ferner vorgesehen ist, dass die Schleife (2a) des Rings an einem ihrer Enden eine abgerundete Stufe (2b) aufweist, die sich am Ende eines Schlaufenabschnitts mit einer gleichbleibenden, dem Radius der Rollen (4) entsprechenden Tiefe befindet.

Revendications

1. Dispositif d'arrêt amorti (A) pour rideaux ou volets roulants comprenant :

   - une boîte (3) fermée par un couvercle (3a),
   - un rotor (1) apte à être couplé à un arbre d'enroulement du volet, ledit rotor (1) étant logé dans ladite boîte (3), libre de tourner autour d'un axe horizontal et consistant d'une roue dentée dont les dents sont séparées par des écartements (1 a),
   - une pluralité de rouleaux cylindriques (4) logés dans lesdits écartements (1 a) du rotor (1),
   - une bague (2) dans laquelle ledit rotor (1) est disposé ; bague apte à être entraînée en rotation par le rotor (1) et sur le bord interne de laquelle (2) est réalisée une anse (2a) qui se déploie pour un arc de circonférence situé à cheval d'un Point Mort Supérieur (PMS) du trajet circulaire parcouru par chacun des dits rouleaux (4) tant que le rotor (1) tourne solidairement avec l'arbre d'enroulement du volet, et
   - une came fixe (20) qui interfère avec lesdits rouleaux (4) pour les amener hors des dits écartements (1 a) du rotor et dans ladite anse (2a) de la bague (2),

   ledit dispositif (A) étant **caractérisé en ce que** ladite bague (2) présente au moins une facette (5), réalisée sur son bord interne, qui va en butée sur une cale (6) solidaire à ladite boîte (3),
   ladite cale (6) étant apte à se déformer de manière élastique suite à l'interférence avec les bords de ladite facette (5), lorsque ladite bague (2) entre en rotation, entraînée par ledit rotor (1),
   ladite bague (2) présente un ergot d'arrêt (8) prévu sur son bord externe et en mesure d'aller en butée contre une dent (9)
   ladite boîte (3) est munie d'un siège (11) de coulissement et de guide du dit ergot d'arrêt (8) et ledit ergot d'arrêt (8) présente un profil (8a) qui interfère avec un rebord (10) du dit siège (11) de la boîte, de manière à ce que le coulissement s'effectue - pour un segment final - par glissement entre les surfaces en contact, avec ultérieure dissipation d'énergie par frottement.

2. Dispositif selon la revendication précédente, **caractérisé en ce que** ladite bague (2) présente une paire diamétralement opposée de facettes (5), en butée contre deux cales respectives (6).

3. Dispositif selon la revendication 1 ou 2, **caractérisé en ce que** ladite dent (9) est réalisée sur le couvercle (3a) de la boîte (3).

4. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite anse (2a) de la bague (2) présente, à une de ses extrémités, un gradin arrondi (2b), et ladite bague (2) incorpore un insert en métal dur (200), en correspondance du dit gradin (2b).

5. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite cale (6) consiste en un ressort (6) du type à arbalète, dont les extrémités (6a) résultent accrochées dans des niches (3c) adéquates prévues à cet effet de la boîte (3).

6. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** chaque écartement (1 a) du rotor présente une entaille (1 b) ayant profil arqué positionnée en correspondance de son côté postérieur - si pris en compte en référence à la direction de rotation du rotor (1), qui correspond à la phase de descente du volet - et **en ce que** ladite entaille (1 b) a le profil d'un quart d'une circonférence ayant un diamètre égal à celui des rouleaux cylindriques (4) qui peuvent s'y loger, comme dans un berceau, pendant la phase transitoire où lesdits rouleaux (4) résultent expulsés de l'écartement (1a), étant également prévu que ladite anse (2a) de la bague présente, à l'une de ses extrémités, un gradin (2b) arrondi, positionné à la fin d'un segment qui présente une profondeur constante et égale au rayon des rouleaux (4).

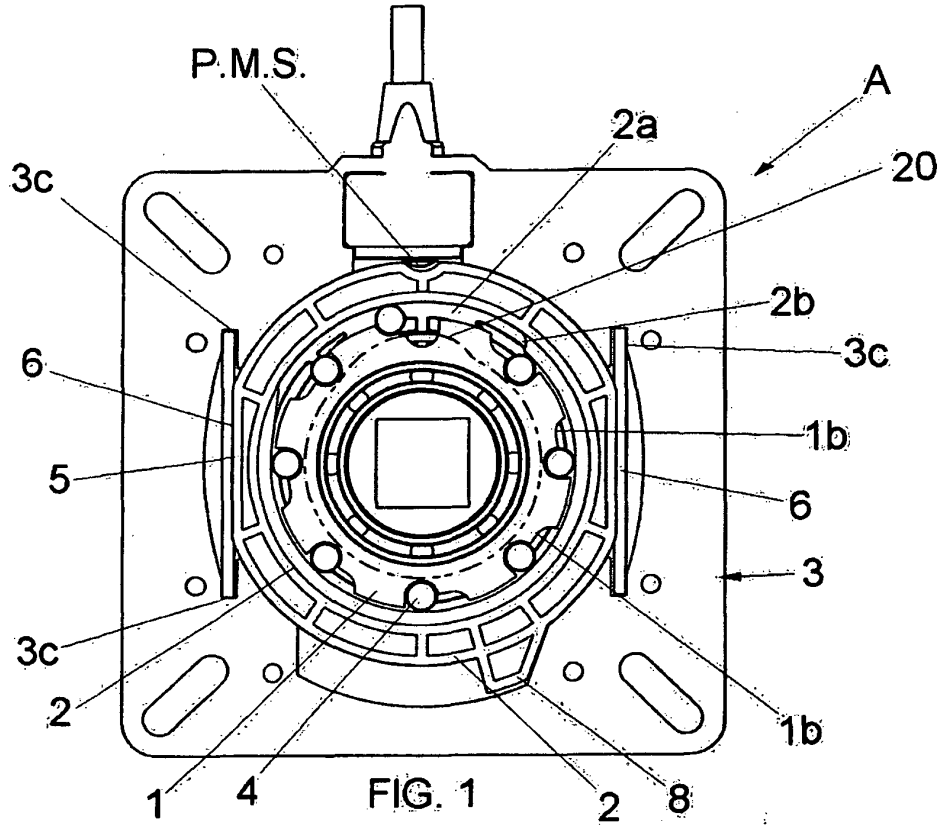


FIG. 1

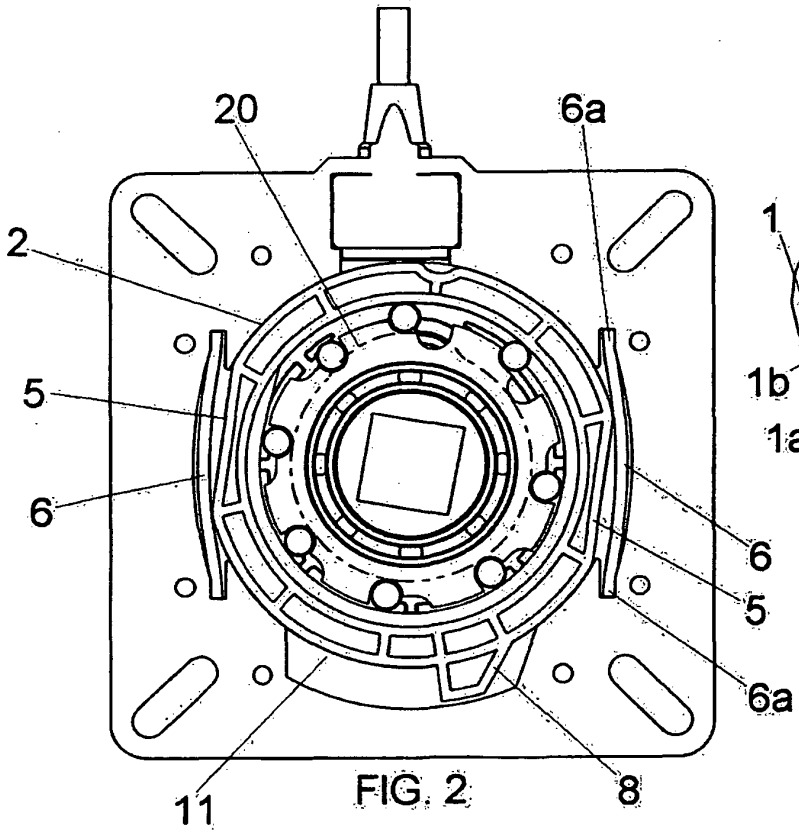


FIG. 2

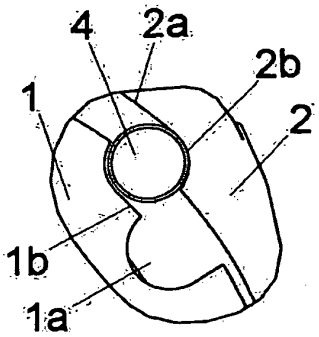
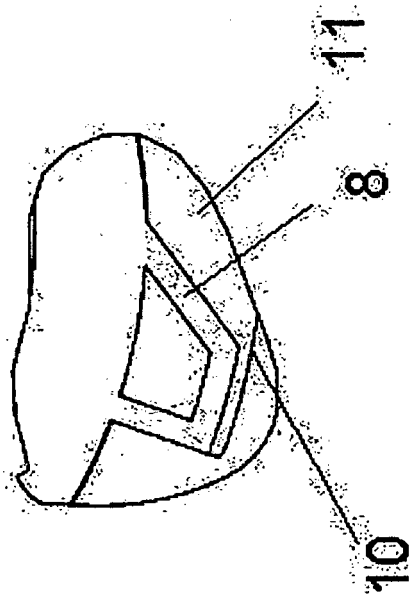


FIG. 2A

FIG. 3A



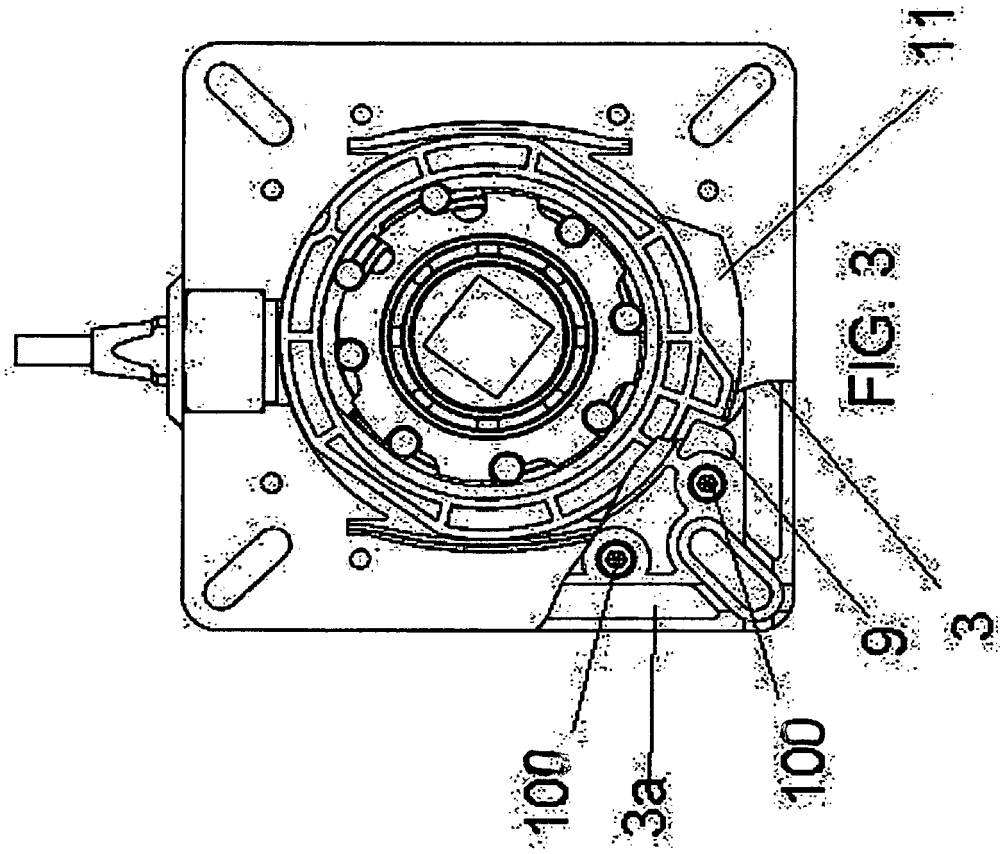


FIG. 3

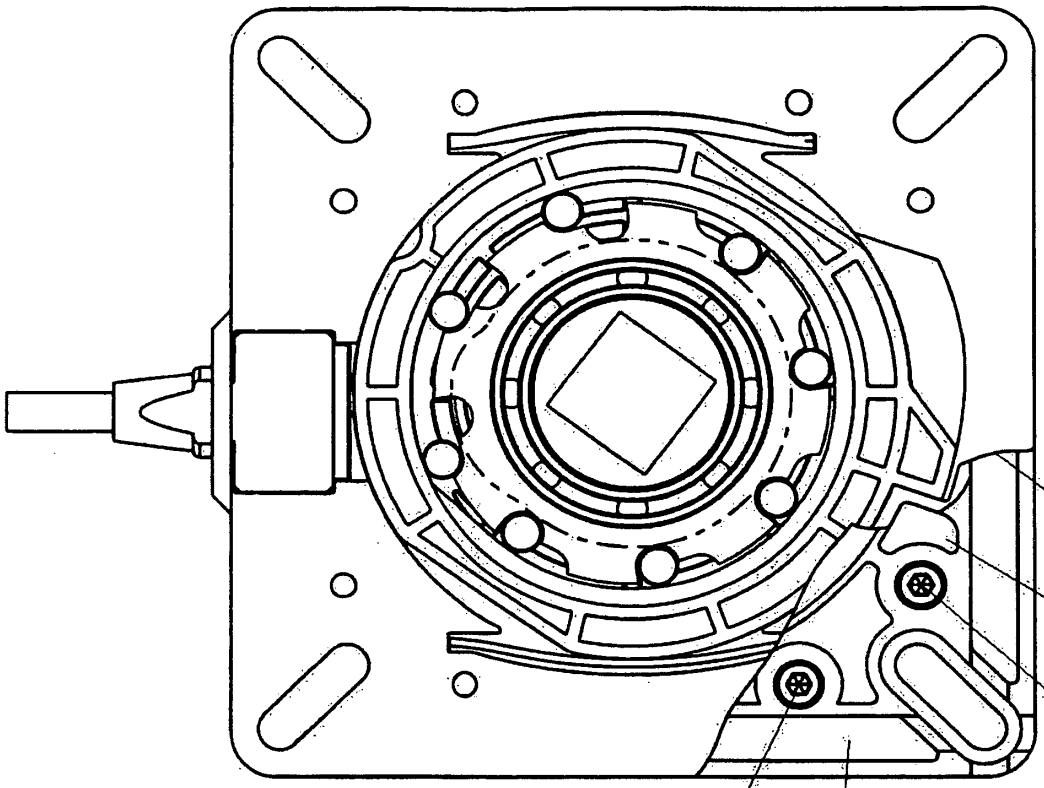


FIG. 4

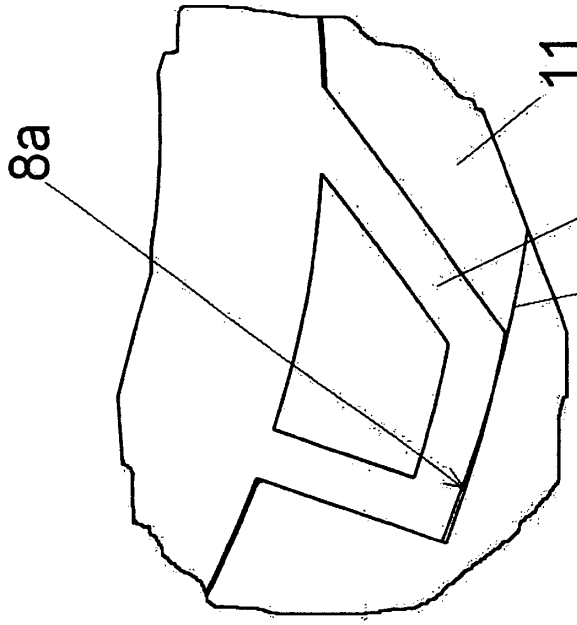


FIG. 4A

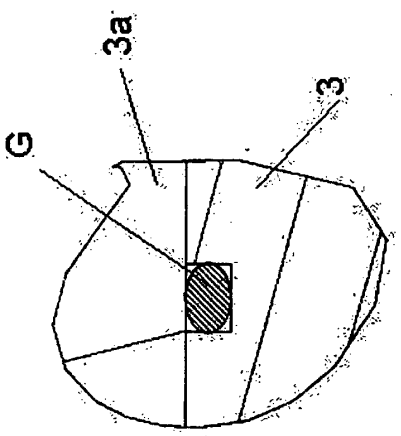


Fig.5a

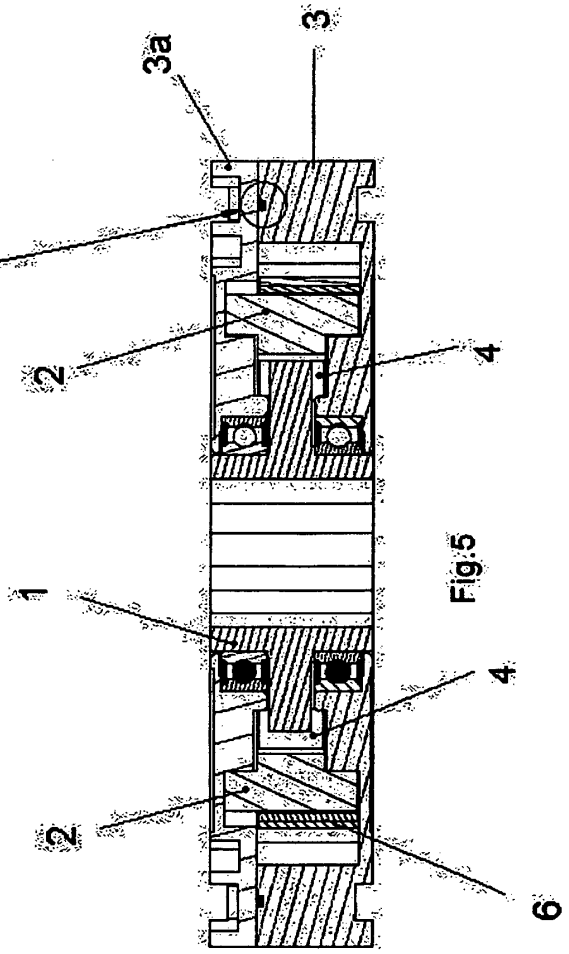


Fig.5

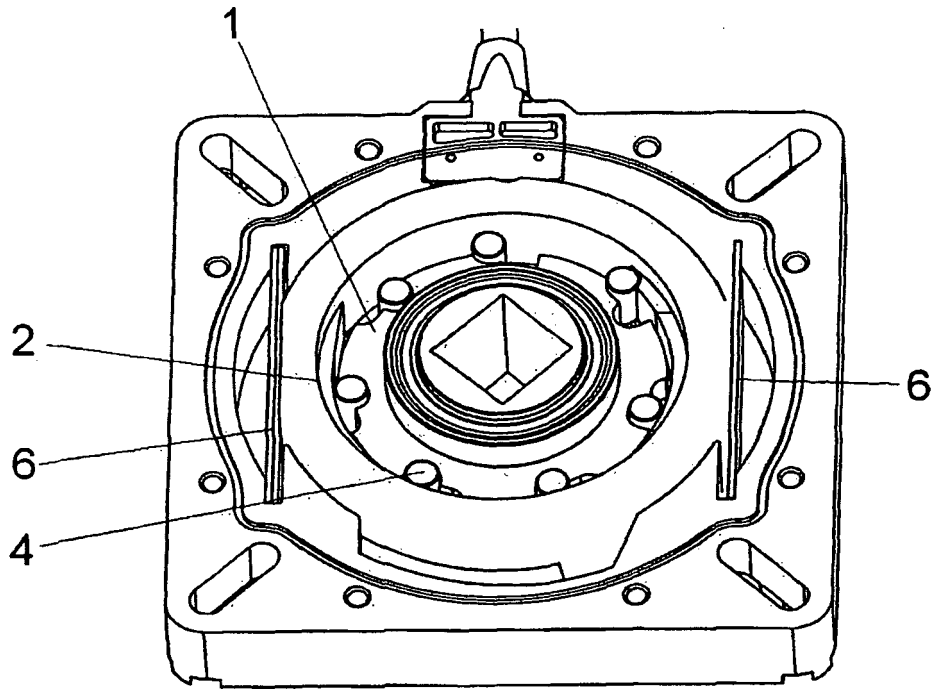


FIG .6

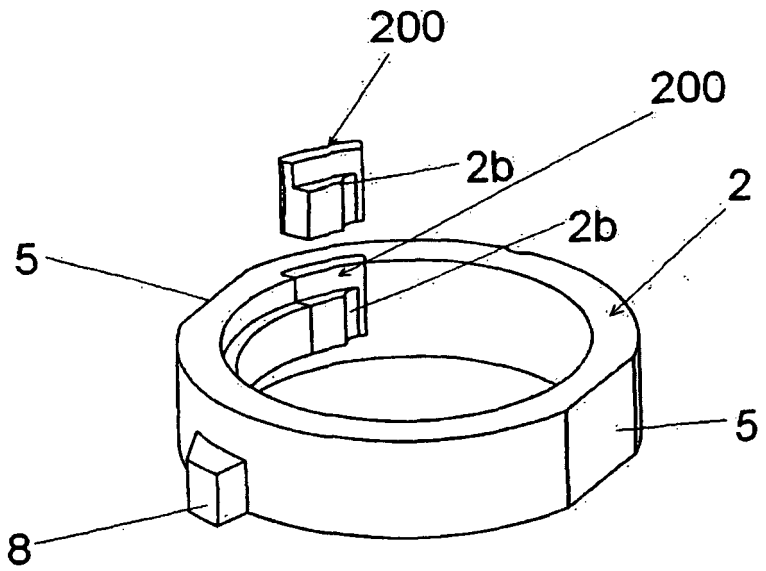


FIG. 6A

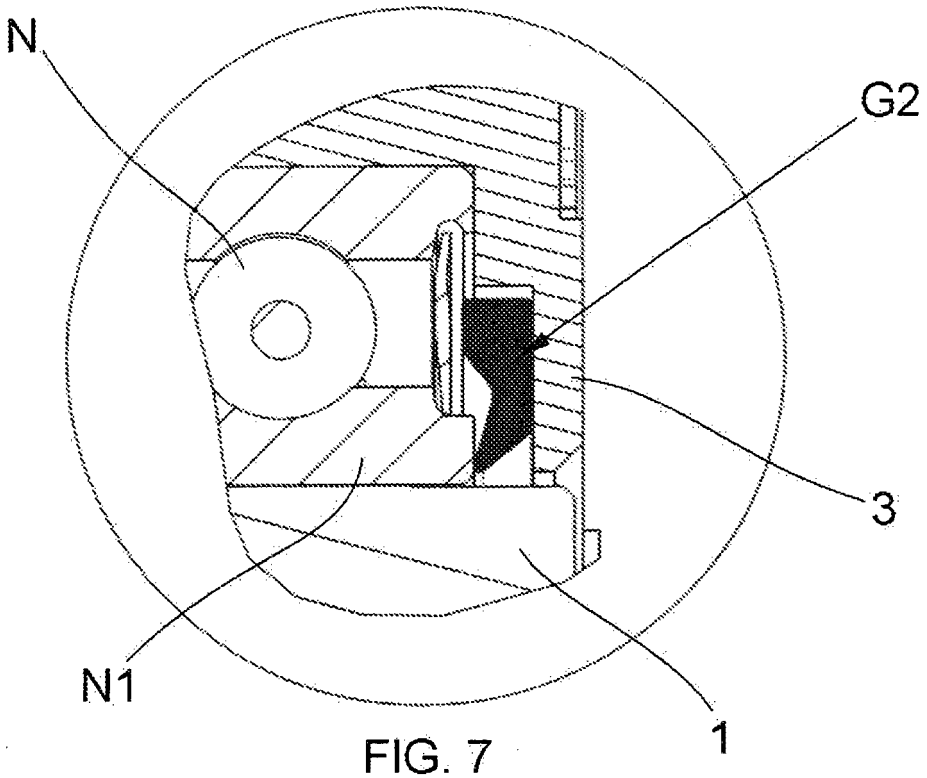


FIG. 7

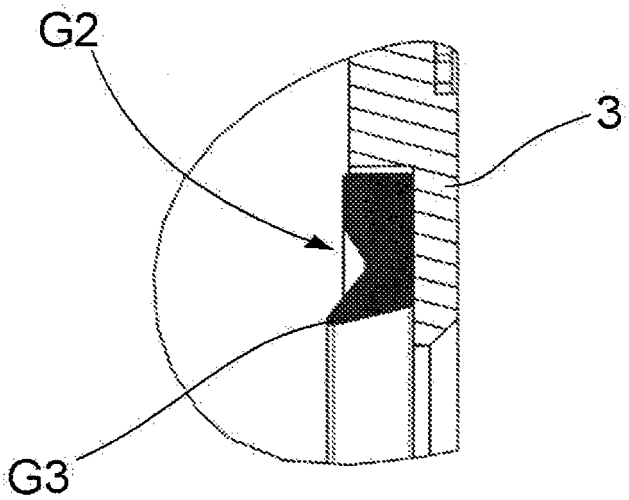


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 3140792 **[0004]**
- EP 0671543 A **[0010]**
- DE 7901982 U **[0011]**