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(54) **Tubular motor reducer for winding roller shutters and sunblinds integrated with anti-fall device**

Rohrmotor mit Getriebe mit eingebauter Fallbremse zum Wickeln von Rolläden und Rollos

Moto-réducteur tubulaire avec frein anti-chute intégré pour l'enroulement de volets et stores roulants

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Description

[0001] The present patent application for utility model relates to a tubular motor reducer for winding roller shutters integrated with an anti-fall device, of inertial type.

[0002] Tubular motor reducers are currently used for the motor-driven winding of roller shutters in general. The tubular motor reducers are inserted inside one end of the tubular shaft used to wind the roller shutters.

[0003] In particular, the motor reducers usually include a multi-step epicyclic reduction gear housed inside a fixed sleeve, whose internal wall features a crown gear on which the crown wheels of the various steps of the epicyclic reduction gear engage. The epicyclic reduction gear is dragged into rotation by an electric motor fixed at one end of the sleeve, from whose other end the pin for the power takeoff projects.

[0004] The adapter designed to drag the winding shaft of the roller shutter into rotation is splined on the pin, with the adapter recessed and fixed inside the winding shaft.

[0005] A motor reducer of this type is illustrated in the Italian patent publication no IT 244 838.

[0006] Due to safety reasons and in compliance with the current regulations, the other end of the winding shaft features a safety device used to stop automatically and immediately the roller shutter in case of accidental fall, due to a fault of the reducer or the brake, which is always provided on the tubular motor reducer, since the motion transmission from the electric motor to the pin for power takeoff is not irreversible. This requires the presence of a safety braking system, designed to permanently maintain the roller shutter in raised position, thus avoiding the risk of accidentally starting the unwanted dangerous down travel of the roller shutter in an uncontrolled way because of its own weight.

[0007] The safety devices mentioned above are usually referred to as "parachute". Among the various models of "parachutes", the types which fully comply with the current safety regulations are defined as "cushioned parachutes", since their operation is basically based on a self-blocking system which, before stopping the winding shaft of the roller shutter, makes a short braking travel to dissipate through friction part of the kinetic energy acquired by the winding shaft because of the free fall of the roller shutter.

[0008] Before the final blocking of the winding shaft, the braking action reduces the strength of the stop impact, thus preventing the entire structure from suffering mechanical stress peaks, which can be high and harmful.

[0009] The European patent no. 0671543 registered by the applicant illustrates a particular model of "cushioned parachutes" belonging to the category of "inertial parachutes", based on the use of a special toothed wheel, splined on the winding shaft, which houses a series of cylindrical bodies in its perimetral compartments and turns inside a friction ring located between a pair of

lateral covers, which enclose the toothed wheel.

[0010] The friction ring is characterised by the fact that its internal circumference features a loop where the cylindrical bodies that are normally housed in the peripheral compartments of the toothed wheel are fitted and engaged in case of free fall of the roller shutter. The bodies are automatically ejected from the peripheral compartments because of centrifugation when the rotation speed of the winding shaft becomes too high— and not because of the dragging power of the motor reducer.

[0011] Also EP-A-0774561 describes an anti-fall device of inertial type.

[0012] As mentioned above, the "parachutes" are installed on the winding shaft on the opposite end compared to the tubular motor reducer. More exactly, the parachutes are installed in the place of the bearing which usually supports the winding shaft if the anti-fall devices are not present.

[0013] This means that two different operations are necessary to install the roller shutter: the assembling of the tubular motor reducer at one end of the winding shaft and the assembling of the "parachute" on the opposite end.

[0014] The purpose of the present invention is to create a tubular motor reducer for roller shutters integrated with an anti-fall device, of inertial type, in order to simplify and reduce the installation operations of the winding shaft.

[0015] Another purpose of the present invention is to create a tubular motor reducer for roller shutters integrated with an anti-fall device, of inertial type, whose cost is lower than the amount that is currently necessary to separately purchase the tubular motor reducer and the "cushioned parachute".

[0016] The tubular motor reducer according to the present invention features a traditional construction, since it comprises a fixed sleeve which houses the epicyclic reduction gear, from which the pin for power takeoff projects at one end, with the adapter for the dragging of the winding shaft of the roller shutter splined on the pin.

[0017] The peculiarity of the tubular motor reducer according to the present invention is the incorporation of a "parachute" of inertial type, located at one end of the sleeve, in intermediate position between the adapter and the sleeve.

[0018] More exactly, first the parachute and then the adapter are inserted into the power takeoff pin of the epicyclic reduction gear.

[0019] The "parachute" comprises an opposite pair of circular covers, between which a friction ring is located and tightened. A special toothed wheel freely turns inside the friction ring and is splined on the power takeoff pin of the epicyclic reduction gear. The pin length allows for going through and farther than the pair of covers, so that the adapter can be splined at the end of the pin.

[0020] In a different embodiment of the present invention, the power takeoff pin of the reduction gear does

not feature an extended length and is simply coupled with the special toothed wheel of the "parachute", which in turns features a pin on which the adapter used to drag the winding shaft of the roller shutter is fixed.

[0021] One cover is provided with means used to fix it to the end of the sleeve that houses the epicyclic reduction gear.

[0022] Finally, it must be noted that thanks to the appropriate design, the "parachute" integrated in the tubular motor reducer according to the present invention is capable of operating in the two rotation directions of the special toothed wheel, unlike the ordinary "parachutes" of known type, which usually operate in one direction only.

[0023] This particular design of the "parachute" according to the present invention derives from the fact that the tubular motor reducers must be capable of being indifferently assembled on the right or left end of the winding shaft, in order not to impose any restrictions on the installer who is free of deciding the most appropriate assembling position.

[0024] It appear obvious that the inversion of the end used to apply the tubular motor reducer causes the inversion of the rotation directions of the winding shaft, which correspond to the up and down travels of the roller shutter.

[0025] For clearer explication purposes, the description of the model according to the present invention as described by the appended claims continues with reference to the enclosed drawings whereby:

- Fig. 1 is an exploded axonometric view of the tubular motor reducer integrated with a "parachute" according to the present invention and according its first preferred embodiment;
- Fig. 2 is a cross-section with an axial plane of the "parachute" and the adapter, both assembled and fixed on one end of the motor reducer;
- Fig. 3 is the transversal cross-section of Fig. 2 with the plane III-III;
- Fig. 4 is an exploded axonometric view of the tubular motor reducer integrated with a "parachute" according to the present invention and a different constructive version;
- Fig. 5 is a cross-section with an axial plane of the "parachute" and the adapter, in the version shown in Figure 5, both assembled and fixed on one end of the motor reducer;
- Fig. 6 is the transversal cross-section of Fig. 5 with the plane VI-VI;

Figs. 7 and 8 are a view of the same section of the special toothed wheel and the friction disk contained in the "parachute", but refer to a different operating moment of the "parachute": a passive moment in the rest phase and an active moment in the working phase.

[0026] With reference to the above mentioned figures the tubular motor reducer according to the present in-

vention comprises a fixed cylindrical sleeve (1) which houses an epicyclic reduction gear and from which the power takeoff pin (2) projects at one end, on which the adapter (3) which drags the winding shaft of the roller shutter is splined (not shown in the endosed figures).

[0027] The peculiarity of the tubular motor reducer according to the present invention is the incorporation of a "parachute" of inertial type (4) fixed at one end of the sleeve (1) in intermediate position between the adapter (3) and the sleeve.

[0028] The "parachute" (4) comprises an opposite pair of circular covers (4a), between which a friction ring (4b) is located and tightened. A special toothed wheel (5) freely turns inside the friction ring and is splined on the power takeoff pin (2) of the epicyclic reduction gear. The length of the pin (2) allows for going through and farther than the pair of covers (4a), so that the adapter (3) can be splined at the end of the pin (2). The adapter is provided with a hub (3a) with two faceted sections, which exactly houses the pin (2) provided with two opposite plane faces (2a).

[0029] The adapter (3) is permanently fixed at the end of the pin (2) by means of a screw (6) with washer (7) that is screwed into a threaded hole (2b) located in the centre of the ending section of the pin (2).

[0030] The fixing of the adapter (3) with the screw (6) indirectly determines the permanent stop of the "parachute" (4) which remains blocked between the adapter (3) and the sleeve (1).

[0031] The two covers (4a) are tightened from opposite parts against the intermediate friction ring (4b) by means of peripheral screws (4c). One of the covers (4a) is provided with means used to fix it at the end of the sleeve (1) which houses the epicyclic reduction gear.

[0032] In particular, the cover (4a) features a tubular configuration with suitable diameter in order to be externally inserted on the sleeve (1) for a short section, which ends with a grid bottom (1b) from which the power takeoff pin (2) centrally projects.

[0033] The centring of the cover (4a) on the sleeve (1) is favoured by an annular series of front teeth (4d) located inside the cover (4a) and designed to match with the corresponding slots (1c) of the grid bottom (1b).

[0034] The free extraction of the cover (4a) from the sleeve (1) is prevented by some radial screws (8).

[0035] With particular reference to Figures 7 and 8, it must be noted that the toothed wheel (5) is exactly centred and freely slides inside the friction ring (4b). The perimeter of the toothed wheel (5) features a regularly spaced series of identical compartments (9) with each compartment housing a cylindrical body (10), whose diameter is the same as the maximum depth of each compartment (9), in which each body is exactly housed.

[0036] More exactly, each cylindrical body (10) is housed inside a semicircular housing (9a) located in the centre of each compartment (9), which is preceded and followed by two identical symmetrical arched chamfers (9b), inclined towards the centre of the semicircular

housing (9a).

[0037] The internal edge of the friction ring (4b) features a loop (11) with symmetrical profile, which extends for a double length with respect to each compartment (9) of the wheel (5) and has a constant depth, lower than the diameter of the cylindrical bodies (10). In case of centrifugation, the cylindrical bodies (10) fit against the loop (11) and engage between one end of the loop (11) and one chamfer (9b) of the compartments (9) - as shown in Figure 8. This determines the origin of a braking action exercised by the friction ring (4b) against the wheel (5) and thus indirectly on the winding shaft, on which the wheel (5) is splined.

[0038] Number (4c) indicates the slots located on the friction ring (4b) for the passage of the screws (4c) which tighten the covers (4a) against the ring (4b).

[0039] The constructive version of the model according to the present invention shown in Figures 4, 5 and 6 differs from the model illustrated above only because it adopts a special "parachute" (40), especially designed for this specific application.

[0040] The adoption of the special "parachute" (40) does not impose a longer length of the power takeoff pin (2) of the reduction gear. In this way it is not necessary to design two different models of reducer, that is a model capable of directly dragging the adapter (3) only - as it currently occurs — and another model capable of simultaneously dragging the wheel (5) of the "parachute" and the adapter (3), as provided in the present invention.

[0041] The "parachute" (40) is housed inside a sleeve (12) whose diameter allows for externally inserting it on the sleeve for a short section.

[0042] The centring of the sleeve (12) on the sleeve (1) is favoured by an annular series of front teeth (12a) located inside one end of the sleeve (12) and designed to match with the corresponding slots (1c) of the grid bottom (1b) of the sleeve (1).

[0043] The free extraction of the sleeve (12) from the sleeve (1) is prevented by some radial screws (8).

[0044] The "parachute" (4) comprises an opposite pair of circular covers (40a), between which a friction ring (40b) is located and tightened. A special toothed wheel (50) freely turns inside the friction ring and is splined on the power takeoff pin (2) of the epicyclic reduction gear. The tightening pressure of the covers (40a) against the friction ring (40b) is provided by means of a spring (13) positioned between the parachute (40) and the cover plug (14) of the sleeve (12). The plug (14) is inserted and blocked on the opening of the sleeve (12) by means of an elastic ring (15) which is housed inside an annular groove located on the internal edge of the opening.

[0045] The wheel (5) only differs from the wheel (5) because it features a hub on which a second pin (20) is fitted and aligned with the pin (2), projecting from the central hole (14a) of the plug (14) in order to be inserted into the hub (3a) of the adapter (3).

[0046] The adapter (3) is permanently fixed to the end

of the pin (20) by means of a screw (6) with washer (7), screwed into a threaded hole (20b) provided in the centre of the ending section of the pin (20).

Claims

1. Tubular motor reducer for winding roller shutter integrated with an anti-fall device of inertial type comprising:

- a tubular motor reducer of the type made up of a cylindrical sleeve (1) which houses an epicyclic reduction gear and from which the power takeoff pin (2) projects;
- an adapter (3) to be inserted and fitted inside the winding shaft of the roller shutter;
- a "cushioned parachute" (4 or 40);

tubular motor reducer **characterized in that** said parachute (4 or 40) is of inertial type and is located between the adapter (3) and the tubular motor reducer, fixed to the sleeve (1) on the end from which the pin (2) projects, on which a turning wheel (5 or 50) of the "parachute" is splined.

2. Tubular motor reducer for winding roller shutters integrated with an anti-fall device of inertial type, according to the previous claim, **characterised in that** one (4a) of the fixed covers of the "parachute" (4) features a tubular configuration with suitable diameter in order to be externally inserted for a short section on the sleeve (1), which ends with a grid bottom (1b) from which the power takeoff pin (2) centrally projects; it being provided that an annular series of front teeth (12a) is located inside the cover (4a), capable of matching to the corresponding slots (1c) of the grid bottom (1b).

3. Tubular motor reducer for winding roller shutters integrated with an anti-fall device of inertial type, according to the previous claims, **characterised in that** the cover (4a) of the "parachute" (4) is fixed to the sleeve (1) with radial screws (8).

4. Tubular motor reducer for winding roller shutters integrated with an anti-fall device of inertial type, according to claim 1, **characterised in that** the "parachute" (4 or 40) comprises:

- an opposite pair of circular covers (4a or 40a), between which a friction ring (4b or 40b) is located and tightened;
- a special wheel (5 or 50) which freely turns inside the friction ring (4b or 40b) and features a regularly spaced series of identical compartments (9) with each compartment housing a cylindrical body (10), whose diameter is the same

as the maximum depth of each compartment (9), which is exactly housed in a semicircular housing (9a) located in the centre of each compartment (9), which is preceded and followed by two identical symmetrical arched chamfers (9b), inclined towards the centre of the semicircular housing (9a);

- a friction ring (4b or 40b) whose internal edge features a loop (11) with symmetrical profile, which extends for a double length with respect to each compartment (9) of the wheel (5 or 50) and has a constant depth, lower than the diameter of the cylindrical bodies (10).

5. Tubular motor reducer for winding roller shutters integrated with an anti-fall device of inertial type, according to claims 1 and 4, **characterised in that** the "parachute" (40) comprises:

- a sleeve (12) which houses the parachute (40), whose diameter allows for externally inserting it on the sleeve (1), featuring an annular series of front teeth (12a) located inside one end and designed to match with the corresponding slots (1c) of the grid bottom (1b) of the sleeve (1), to which the sleeve (12) is fixed with radial screws (8);
- a spring (13) which is positioned between the parachute (40) and the cover plug (14) of the sleeve (12), with the plug (14) inserted and blocked on the opening of the sleeve (12) by means of an elastic ring (15) which is housed inside an annular groove located on the internal edge of the opening;
- a wheel (50) featuring a hub on which a second pin (20) is fitted and aligned with the pin (2), projecting from the central hole (14a) of the plug (14) in order to be inserted into the hub (3a) of the adapter (3).

Patentansprüche

1. Rohrförmiger Getriebemotor für Rollläden, der mit einer Inertial-Fallschutzvorrichtung ergänzt ist und folgendes umfasst:

- einen rohrförmigen Getriebemotor des Typs, der aus einer festen Zylindermuffe (1) besteht, in welcher ein Epizykloid-Untersetzungsmotor beherbergt ist und aus dessen einem Ende die Zapfwelle (2) hervorsteht;
- ein Adapter (3), der in die Welle zum Aufwickeln des Rollladens eingesteckt und befestigt wird;
- ein "gedämpfter Fallschirm" (4 oder 40); rohrförmiger Getriebemotor, **dadurch gekennzeichnet, dass** der Inertial-Fallschirm (4 oder 40) zwischen den Adapter (3) und den rohrförmigen

Getriebemotor eingesetzt ist, der an der besagten Muffe (1) an dem Ende befestigt ist, aus dem die Welle (2) hervorsteht, auf welche ein drehbares Rad (5 oder 50) des "Fallschirms" (4 oder 40) aufgepresst ist.

2. Rohrförmiger Getriebemotor für Rollläden, der mit einer Inertial-Fallschutzvorrichtung ergänzt ist, gemäß vorstehendem Anspruch, **dadurch gekennzeichnet, dass** einer (4a) der festen Deckel des "Fallschirms" (4) eine rohrförmige Ausformung mit einem solchen Durchmesser besitzt, dass er für einen kurzen Abschnitt außerhalb der Muffe (1) aufgesteckt werden kann, welche in einem Gitterboden (1b) endet, aus welchem in der Mitte die Zapfwelle (2) hervorsteht; wobei vorgesehen ist, dass im Innern des Deckels (4a) eine Reihe von ringförmig angeordneten, frontalen Zähnen (4d) herausgearbeitet ist, die dazu dienen, in die entsprechenden Schlitz (1c) des Gitterbodens (1b) einzugreifen.

3. Rohrförmiger Getriebemotor für Rollläden, der mit einer Inertial-Fallschutzvorrichtung ergänzt ist, gemäß den vorstehenden Ansprüchen, **dadurch gekennzeichnet, dass** der Deckel (4a) des "Fallschirms" (4) mit mehreren Radialschrauben (8) an der Muffe (1) befestigt ist.

4. Rohrförmiger Getriebemotor für Rollläden, der mit einer Inertial-Fallschutzvorrichtung ergänzt ist, gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der "Fallschirm" (4 oder 40) folgendes umfasst:

- ein Paar gegenüberliegende, runde Deckel (4a oder 40a), zwischen denen ein Friktionsring (4b oder 40b) eingeklemmt ist;
- ein Spezialrad (5 oder 50), welches sich frei im innern des Friktionsrings (4b oder 40b) drehen kann und eine Reihe von umlaufenden, in regelmäßigem Abstand voneinander befindliche, identische Hohlräume (9) besitzt, in welchen jeweils ein zylindrischer Körper (10) sitzt, dessen Durchmesser der Höchsttiefe eines jeden Hohlraumes (9) entspricht und welcher genau von einem halbkreisförmigen Sitz (9a) aufgenommen wird, der in der Mitte eines jeden Hohlraumes (9) herausgearbeitet ist, vor und nach welchem Sitz sich zwei identische und symmetrische, gebogene Kanten (9b) befinden, welche beide zur Mitte des halbkreisförmigen Sitzes (9a) hin geneigt sind;
- ein Friktionsring (4b oder 40b), welcher entlang seiner Innenkante eine Schlaufe (11) mit symmetrischem Profil besitzt, welche sich über einen Bogen von beinahe doppelter Länge wie die einzelnen Hohlräume (9) des Rades (5 oder 50) erstreckt und eine gleichmäßige Tiefe be-

sitzt, die jedoch geringer als der Durchmesser des zylindrischen Körpers (10) ist.

5. Rohrförmiger Getriebemotor für Rollläden, der mit einer Inertial-Fallschutzvorrichtung ergänzt ist, gemäß den Ansprüchen 1 und 4, **dadurch gekennzeichnet, dass** der "Fallschirm" (40) folgendes umfasst:

- eine Muffe (12), die einen Fallschirm (40) beherbergt, dessen Durchmesser es ermöglicht, auf die Muffe (1) aufgesteckt zu werden und welcher eine Reihe von ringförmig angeordneten, frontalen Zähnen (12a) besitzt, die im Innern eines ihrer Enden herausgearbeitet sind und dazu dienen, in die entsprechenden Schlitzze (1c) des Gitterbodens (1b) der Muffe (1) einzugreifen, an welcher die Muffe (12) mittels einiger Radialschrauben (8) befestigt wird;
- eine Feder (13), die zwischen den Fallschirm (40) und den Stopfen (14) der Muffe (12) eingeschoben wird, in deren Öffnung (12b) der Stopfen (14) eingesteckt und mittels eines elastischen Rings (15) arretiert wird, der in einer entsprechenden ringförmigen Kehle sitzt, die auf dem inneren Rand der genannten Öffnung herausgearbeitet ist;
- ein Rad (50), welches eine Nabe besitzt, in die eine zweite Welle (20) einrastet, die mit der Welle (2) gefluchtet ist, die aus dem mittleren Loch (14a) des Stopfens (14) hervorsteht und auf welche der Adapter (3) aufgezogen und befestigt ist.

Revendications

1. Motoréducteur tubulaire pour rideaux à enroulement, intégré par un dispositif antichute du type inertiel comprenant :

- un motoréducteur tubulaire du type formé par un manchon cylindrique (1), fixe, dans lequel est logé un réducteur épicycloïdal et duquel dépasse, à l'une des deux extrémités, le pivot de prise de puissance (2) ;
- un adaptateur (3) à enfiler et fixer dans l'arbre d'enroulement du rideau ;
- un "parachute amorti" (4 ou 40) ;

motoréducteur tubulaire **caractérisé en ce que** le dit "parachute" (4 ou 40) est u type inertiel et qu'il est interposé entre l'adaptateur (3) et le motoréducteur tubulaire, fixé au dit manchon (1) en correspondance de l'extrémité de laquelle dépasse le pivot (2), sur lequel une roue pivotante (5 ou 50) du "parachute" (4 ou 40) est embrevée.

2. Motoréducteur tubulaire pour rideaux à enroulement, intégré par un dispositif antichute, du type inertiel, selon la revendication précédente, **caractérisé en ce que** l'un (4a) des capots fixes du "parachute" (4) présente une conformation tubulaire de diamètre tel à pouvoir être enfilé, pour un bref segment, à l'extérieur du manchon (1) qui termine par un fond grillagé (1b) duquel dépasse centralement le pivot de prise de puissance (2) ; étant prévu qu'une série annulaire de dents frontales (4d) soit réalisée à l'intérieur du dit capot (4a), les dites dents étant aptes à se coupler avec les fentes (1c) correspondantes et conformes du dit fond grillagé (1b).

3. Motoréducteur tubulaire pour rideaux à enroulement, intégré par un dispositif antichute, du type inertiel, selon les revendications précédentes, **caractérisé en ce que** le capot (4a) du "parachute" (4) est fixé au manchon (1) par le biais de vis radiales (8).

4. Motoréducteur tubulaire pour rideaux à enroulement, intégré par un dispositif antichute, du type inertiel, selon la revendication 1, **caractérisé en ce que** le "parachute" (4 ou 40) comprend :

- une paire opposée de capots circulaires (4a ou 40a) parmi lesquels une bague de friction (4b ou 40b) est interposée ;
- une roue spéciale (5 ou 50) qui est libre de pivoter à l'intérieur de la bague de friction (4b ou 40b) et qui présente sur le périmètre une série, régulièrement espacée, de logements identiques (9), dans chacun desquels est logé un corps cylindrique (10), dont le diamètre est égal à la profondeur maximum de chaque logement (9), dit corps cylindrique (10) étant exactement logé dans un siège semi-circulaire (9a) réalisé au centre de chaque logement (9), précédé et suivi par deux chanfreins courbés identiques et symétriques (9b), les deux étant inclinés vers le centre du siège semi-circulaire (9a) ;
- une bague de friction (4b ou 40b) qui présente le long de son bord interne une anse (11), ayant profil symétrique, dont l'extension de son arc de longueur est pratiquement le double de celle de chaque logement (9) de la roue (5 ou 50) et dont la valeur de la profondeur est constante, mais inférieure au diamètre des corps cylindriques (10).

5. Motoréducteur tubulaire pour rideaux à enroulement, intégré par un dispositif antichute, du type inertiel, selon les revendications 1 et 4, **caractérisé en ce que** le "parachute" (40) comprend :

- un manchon (12) dans lequel est logé le parachute (40) de diamètre tel à pouvoir être enfilé

sur le manchon (1) et présentant une série annulaire de dents frontales (12a), réalisées à l'intérieur d'une de ses extrémités et destinées à se coupler aux fentes (1c) correspondantes et conformes du fond grillagé (1b) du manchon (1) auquel le dit manchon (12) résulte fixé par le biais de vis radiales (8) ;

- un ressort (13), interposé entre le parachute (40) et le bouchon de fermeture (14) du manchon (12) dans l'embouchure (12b) duquel le dit bouchon (14) est enfilé et arrêté par le biais d'une bague élastique (15) logée dans une gorge annulaire prévue à cet effet et creusée sur le bord interne de la dite embouchure ;
- une roue (50) qui présente un moyeu sur lequel s'embraye un second pivot (20), aligné au pivot (2), qui sort du trou central (14a) du bouchon (14) et sur lequel l'adaptateur (3) résulte embrevé et fixé.

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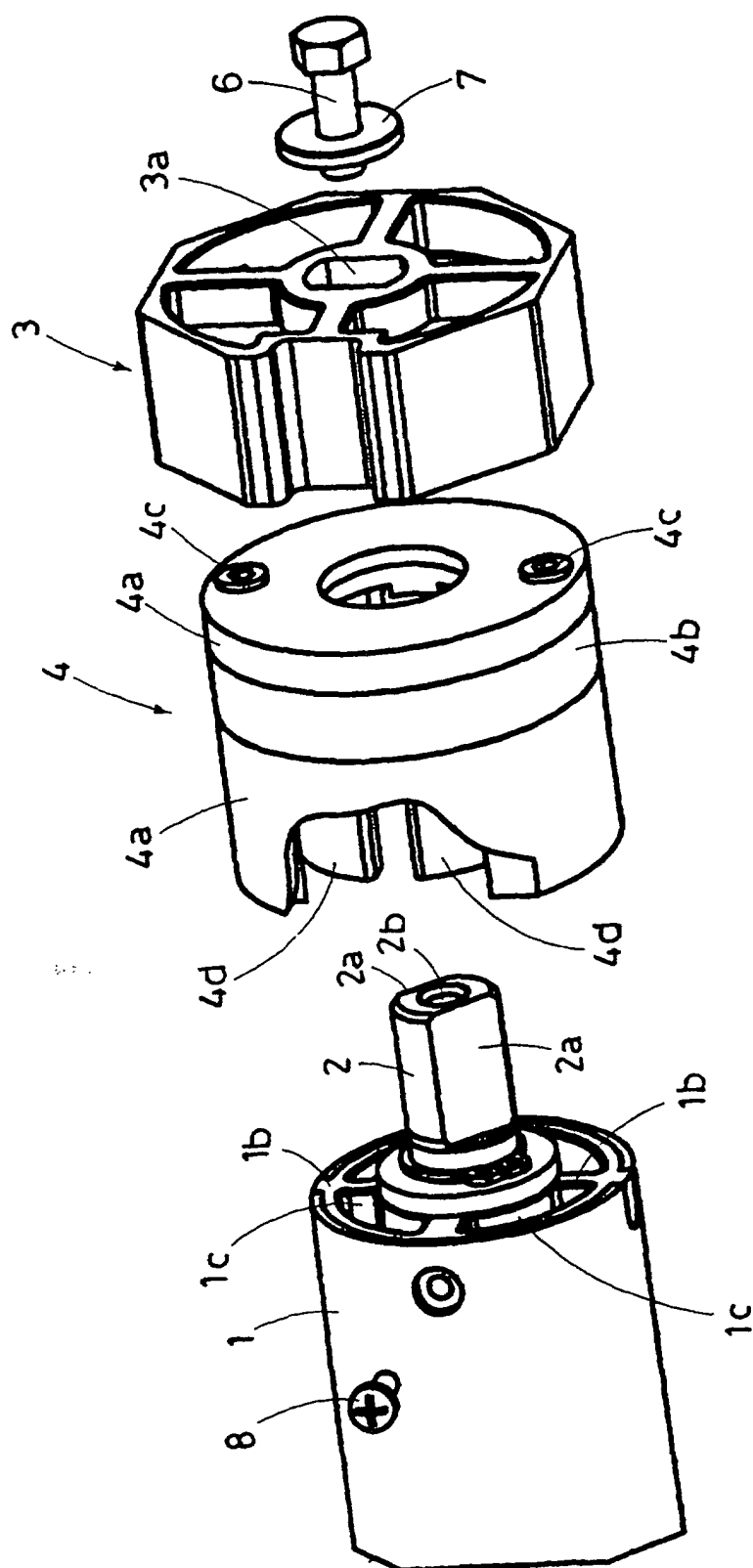


FIG. 1

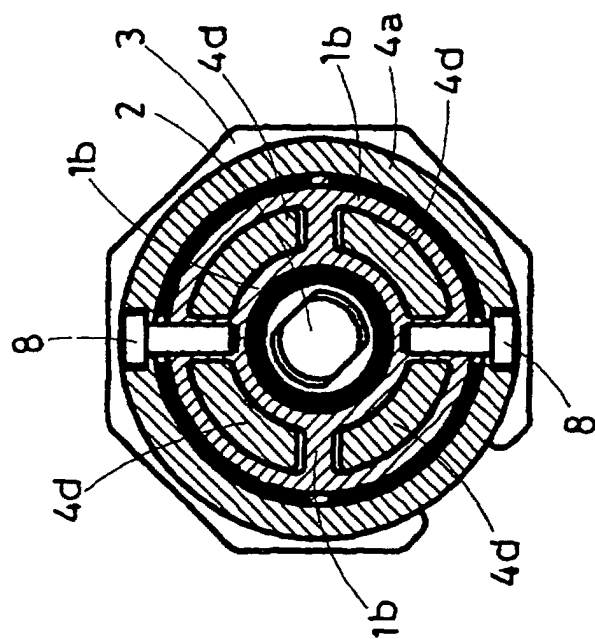


FIG. 3

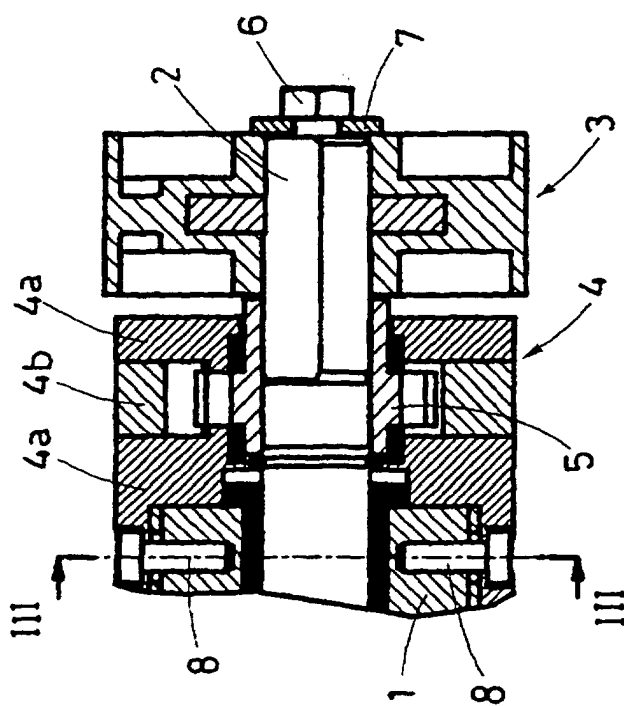


FIG. 2

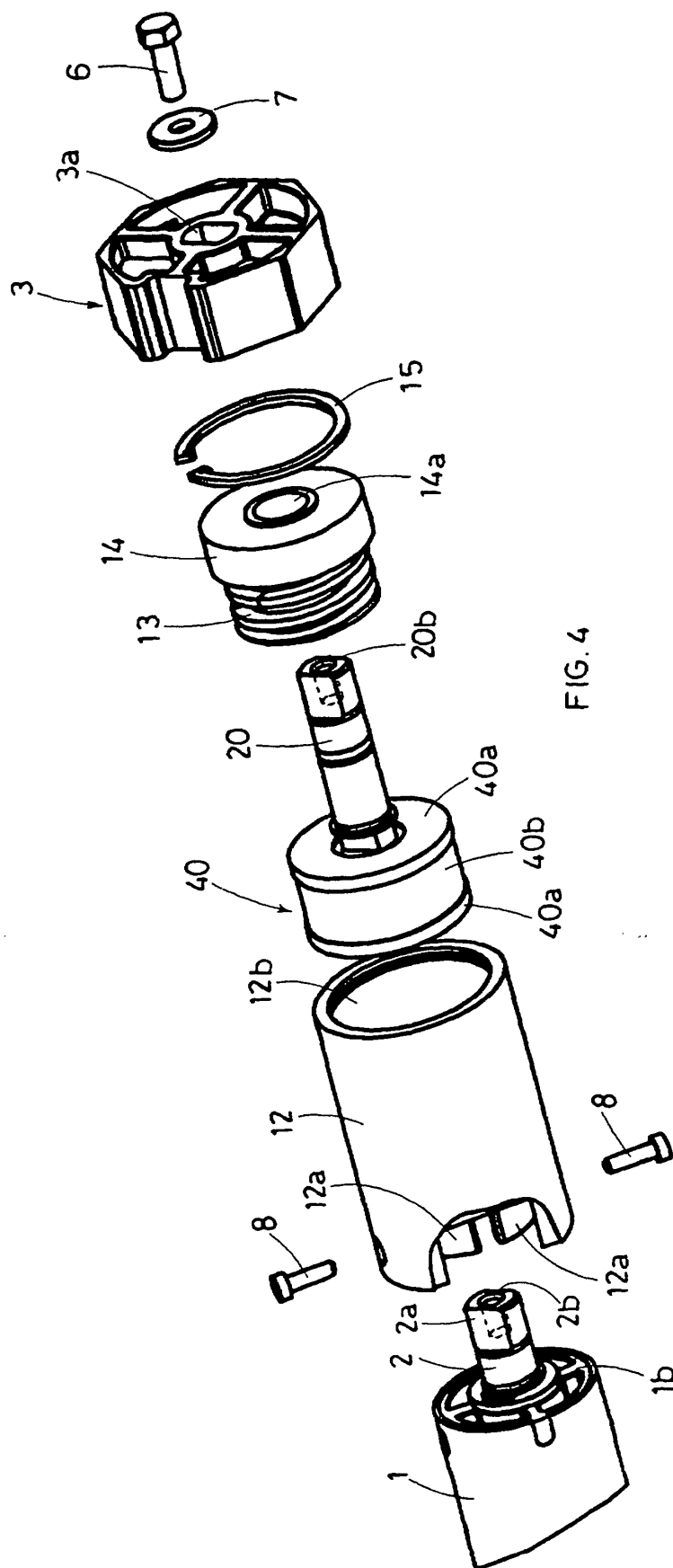


FIG. 4

