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(71) Applicant: **De Molli Giancarlo Industrie S.p.A.**
21040 Castronno (VA) (IT)

(72) Inventor: **De Molli, Romeo**
21040 CASTRONNO (VARESE) (IT)

(74) Representative: **Tarabbia, Luigi**
Bugnion S.p.A
Viale Lancetti, 17
20158 Milano (IT)

(54) External braking servomechanism associable with hinges

(57) An external braking servomechanism for doors/wings comprises a braking assembly adapted to generate a rotation-resisting force having a first value within a starting rotation arc of the door/wing included between a maximum closure angle and a first threshold angle, a second value greater than the first value within a central rotation arc of the door/wing included between the first threshold angle and a second threshold angle, and a third value within a final rotation arc of said door/wing included between the second threshold angle and a maximum opening angle.

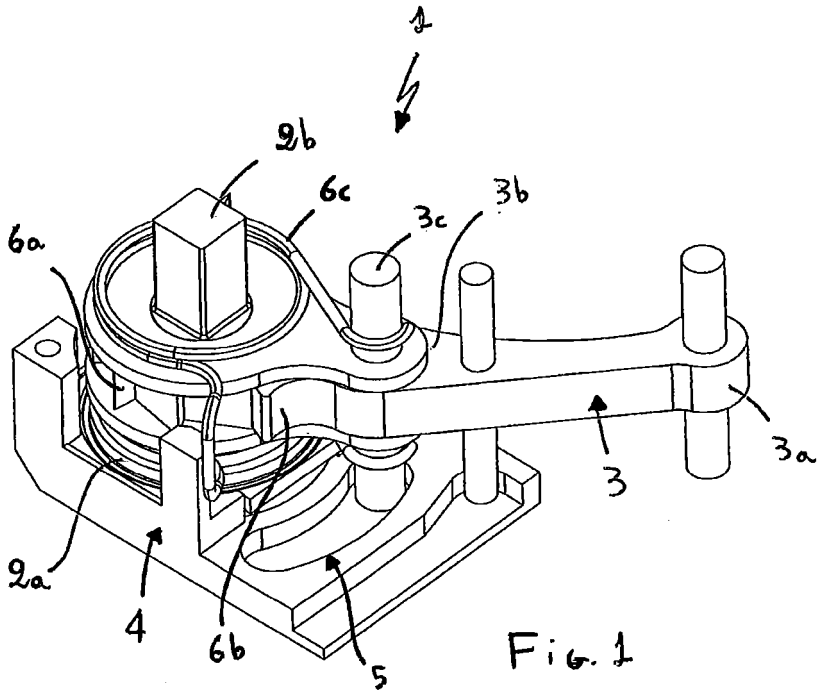

Fig. 1

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Description

[0001] The present invention relates to an external braking servomechanism associable with vehicle doors/hatchbacks or furniture doors/wings (or more generally to similar devices).

[0002] It is known that for opening and closure of doors/wings an operator (or a motor) is required to exert some force that simultaneously must ensure movement of the door/wings and keep the velocity and angular acceleration thereof under control, to avoid violent impacts in the vicinity of an end of stroke.

[0003] The force amount to be applied to the door/wing during rotation thereof can therefore be varied, both for ergonomic/anthropometric purposes (low "starting efforts" are required for starting movement, for example) and for mechanical purposes (a great control of the stroke in rotation in its central part is required, for example).

[0004] To enable the above mentioned requirements to be met, different braking devices are known that practically increase the resisting twisting moment on the hinge axis of the door/wing.

[0005] Although the above described known art is differently implemented, it has some drawbacks: generally these devices are not able to ensure a different intervention as a function of the different "intermediate" rotation angles (i.e. included between the closure angle and opening angle) and therefore high efforts are required from the operator or the motor.

[0006] On the contrary, braking devices such sized as to offer low resistance to twisting are unable to avoid impacts and/or sharp interruption of the door/wing stroke in the vicinity of the opening or closure angles.

[0007] It should be finally pointed out that often the requirement of obtaining better control of the opening/closure strokes arises after assembling and setting up of the door/wing; in these cases, it is not always possible to modify the rotation hinges to obtain the desired kinematic effect.

[0008] Accordingly, the present invention aims at conceiving an external braking servomechanism associable with hinges which is able to obviate the above mentioned limits.

[0009] Mainly, the present invention aims at conceiving a braking servomechanism having a differentiated braking action based on the different stretches of the opening/closure stroke of a door/wing, and ensuring low resistance to rotation in the vicinity of the opening or closure angles for example, at the same tine ensuring high resistance to rotation (and therefore an effect of stabilisation of the door/wing) in a central part of the opening/closure stroke.

[0010] It is a further aim of the present invention to conceive a braking servomechanism that can be easily also mounted to and associated for operation with doors/wings already installed, without modifying the structure and/or position of the constraints of hinges already in operation on the door/wing.

[0011] The present invention also aims at conceiving a braking servomechanism of simple and cheap construction.

[0012] The technical task mentioned and the aims specified are substantially achieved by an external braking servomechanism associable with doors/wings having the features reproduced in one or more of the appended claims.

[0013] Description of a preferred but not exclusive embodiment of an external braking servomechanism associable with doors/wings according to the invention is given hereinafter by way of non-limiting example, illustrated in the accompanying drawings, in which:

- Fig. 1 is a perspective view of a first embodiment of the servomechanism according to the invention;
- Fig. 2 is a partial perspective view of the servomechanism according to claim 1;
- Fig. 3 shows a top view of the servomechanism in Fig. 1;
- Fig. 4 is a side view of the servomechanism in Fig. 1; and
- Fig. 5 is a sectional view of the servomechanism in Fig. 1 taken along line V-V in Fig. 4;
- Fig. 6 shows an enlarged view of a detail seen in Fig. 5;
- Fig. 7 shows a perspective view of part of a second embodiment of the servomechanism of the invention;
- Fig. 8 is a perspective view of a detail seen in Fig. 7;
- Fig. 9 is a sectional view of a third embodiment of the present servomechanism incorporating the first and second embodiments shown in the preceding figures;
- Fig. 10 is a perspective view of another embodiment of the present invention; and
- Figs. 11 and 12 show sectional views of a further embodiment of the present invention.

[0014] With reference to the accompanying drawings, the braking servomechanism according to the present invention has been denoted by reference numeral 1 and it substantially comprises a braking assembly 2 (adapted to generate a rotation-resisting force) and a kinematic interface mechanism.

[0015] From a structural point of view, the kinematic interface mechanism 3 has a first end 3a adapted to bear on a surface of a door/wing and a second end 3b opposite to said first end 3a, operatively connected to the braking assembly 2 for transferring the force resisting to rotation of the door/wing to the door/wing itself.

[0016] From a functional point of view, the braking assembly 2 is able to impose a variable resisting force as a function of the different geometric/kinematic conditions in which the door/wing can be; in particular, to the aims of the present invention the rotation-resisting force can change between at least the following values (at least in terms of intensity):

- a first value within a starting rotation arc of the door/wing included between a maximum closure angle and a first threshold angle;
- a second value greater than the aforesaid first value within a central rotation arc of the door/wing (this rotation angle is included between the first threshold angle and a second threshold angle); and
- a third value different from at least the aforesaid second value, within a final rotation arc of the door/wing (this rotation arc is included between said second threshold angle and a maximum opening angle).

[0017] More generally, in device 1 according to the invention, the first, second and third values of the rotation-resisting force can selectively vary as a function of an angular position of the door/wing.

[0018] Due to this selective variation, it is then possible to have an influence on movement of the door/wing to achieve the optimal features of easy starting on opening or closure and simultaneously achieve a "central" stage of the rotation stroke characterised by high control and steadiness.

[0019] It should be noted that the selective intervention of the braking assembly 2 can generate a value of rotation-resisting force proportional to the rotation angle of the door/wing or, depending on the different cases (and the control degree that is wished to be given), it is also possible that the above listed force values be constant along the respective rotation arcs; for instance, only two values of rotation-resisting force can be defined, and in particular the first and third values of rotation-resisting force can be substantially identical (and remarkably smaller than the second value, reduced by a scale factor included between 3:1 and 5:1, for example).

[0020] Going back to the structural details of the invention, it is possible to see that the braking assembly 1 comprises a predetermined number of friction elements 2a (that are mutually interfaced and are also adapted to generate the rotation-resisting force by mutual rubbing) and a fitting shaft 2b operatively interposed between the friction elements 2a and the kinematic interface mechanism 3.

[0021] In a first possible embodiment of the braking assembly 2, the friction elements 2a comprise a plurality of packed discs in mutual contact at the coronal surfaces 2c thereof; the relative rotation of these packed discs (resulting from the action exerted by the kinematic interface mechanism 3 when it is pressed by the door/wing) is therefore converted to relative mutual-rubbing motions of the packed discs 2a.

[0022] In addition, still in accordance with the invention, it is possible to insert friction increasing or reducing means between the friction elements 2a, in order to obtain a predetermined optimal friction coefficient (grease, fluids having suitable properties, and so on).

[0023] In order to ensure the necessary structural coherence to device 1, the above mentioned plurality of discs is coaxially mounted on a fitting shaft 2b receiving suitable mechanical and kinematic interactions from the kinematic interface mechanism 3 (as better detailed in the following).

[0024] If a great amount of friction were wished to be generated, operating surfaces as much reduced as possible being available, the packed discs can conveniently comprise friction-increasing means positioned on the coronal surfaces 2c; with reference to one of the possible embodiments shown in the figures, this friction-increasing means can include undulations and/or surface roughness variations and/or a plurality of elevations and depressions that can be mutually coupled between two packed discs.

[0025] Still with reference to the figures, it is possible to notice the presence of a supporting shell 4 housing the braking assembly 2 and the kinematic interface mechanism 3; this supporting shell 4 can be mounted to suitable parts of a system, such as the door-holding frame of a vehicle or a piece of furniture.

[0026] In a second embodiment of the braking assembly 2, it is possible to see that it instead comprises a servomechanism in which said friction elements include a dish 2d fitted on the fitting shaft 2b and having a predetermined number of shaped housing cavities 2e circumferentially formed relative to the fitting shaft 2b and a corresponding number of rolling balls 2f interposed between the dish 2e and the supporting shell 4.

[0027] The geometry of these cavities 2e enables them to ensure, at suitable operating moments, steady housing (or "to a minimum potential energy") of the rolling balls 2f as well as circumferential movement of same (i.e. along a relative motion line substantially parallel to and inscribed in the perimeter of the dish 2d); for example with reference to the drawings, it is possible to see that these cavities have an ovoid surface, in which the "deeper" spherical part is the ovoid "base", while the part with decreasing section acts as the ascent and movement ramp for the balls 2f.

[0028] As to the rolling balls 2f, due to the relative motion to which they are submitted relative to dish 2d, they are adapted to be reversibly configured between the following conditions:

- a disengagement condition at which they are substantially contained in said shaped housing cavity 2e: in this condition the rolling balls 2f generate a first value of minimum or zero rotation-resisting force (since their mechanical pressure on the supporting shell 4 is minimum or zero);
- a transfer condition at which they are submitted to displacement (by effect of rotation of dish 2d that in turn results from the fact that the kinematic interface mechanism 3 is moving under thrust from the door/wing) between one shaped housing cavity 2e and a circumferentially following shaped housing cavity; in this condition, the rolling balls 2f (that practically are moving upwards along the ovoid portion of decreasing section and therefore exert pressure on the sup-

porting shell 4) generate a second value of rotation-resisting force greater than said first value (and preferably maximum, at least as to the technical effects that may be obtained by the present invention); and finally

- a re-arrangement condition substantially corresponding to said disengagement condition at which they are contained (or better, terminate their movement by fall) in the shaped cavities 2e circumferentially following those (2e) occupied in the (starting) disengagement condition; in the last-mentioned condition, the rolling balls 2f generate a third value of minimum or zero rotation-resisting force (or, more generally, a value of rotation-resisting force corresponding to that generated in their previous disengagement condition).

[0029] During the opening and/or closure stroke of the door/wing, therefore, different sequential transition actions of balls 2f in these three conditions can occur and therefore a rotation-resisting force is generated that has a "pulsed" development; it is however possible to obtain more accuracy in terms of "intermediate locking" possibilities of the door/wing, due to the mechanical interference between the cavities 2e and the balls 2f.

[0030] The kinematic interaction underlying this embodiment can be also obtained with elements suitable for coupling, having different shape and/or nature; for example coupling between suitable tooth-shaped protrusions matching the shape of the housing cavities can be provided, instead of utilising balls 2f.

[0031] Advantageously, the two embodiments of the braking assembly described above (and hereinafter claimed) can be used independently of each other and can also be used in simultaneous cooperation, as shown for example in the accompanying drawings: in particular, it is possible to conceive a servomechanism 1 having the two different braking assemblies 2 operating in kinematic/operational association with the same fitting shaft 2b but disposed in opposite half-spaces relative to an ideal midline plane of the servomechanism itself.

[0032] The described "double" configuration can be useful if particularly high rotation-resisting forces are wished to be obtained (while maintaining the overall sizes of the servemechanism 1 very reduced) or if differentiated actions for the "opening" or "closing" strokes of the door/wing are wished.

[0033] Conveniently, in order to adjust or predetermine the width (as well as the beginning and/or end) of the previously mentioned central rotation arc), selection means 5 of the central rotation arc is advantageously present; this selection means 5 is adapted to determine the first and second threshold angles and acts at least on the braking assembly 2 and/or the kinematic interface mechanism 3.

[0034] In greater detail, it is possible to see that the selection means 5 comprises a slot 5a formed in the supporting shell 4 and having a curvilinear extension axis 5b (this extension axis can be an arc of a circumference or also a different geometrical figure, also a compound figure, and of such a nature as to subtend a predetermined angular aperture).

[0035] Depending on the possible geometry of the extension axis 5b, the angular aperture 5a therefore defines the first and second threshold angles, that in turn can be fixed or adjustable, by suitable stops for example that can be locked to different positions inside the slot 5a itself.

[0036] Finally, also to be noted is the presence of a connecting pin 5c that is fitted in the second end 3b of the kinematic interface mechanism 3 and is simultaneously engaged in slot 5a; in this manner, the stroke imposed to the kinematic mechanism by the door/wing is such as to feel the effect of the reaction force to rotation generated by the braking assembly 2 only at those angles determined by the geometric features of slot 5a.

[0037] In order to ensure appropriate operation in both the opening and closure strokes of the door/wing, conveniently present in device 1 is kinematic reversal means 6 interposed between the kinematic interface mechanism 3 and the braking assembly 2; this kinematic reversal means comprises a toothed wheel 6a formed around the fitting shaft 2b (for instance, this toothed wheel 6a is integrally formed in the fitting shaft 2b), at least one engagement tooth 6b emerging from the second end 3b of the kinematic interface mechanism 3 and suitable to be fitted onto the toothed wheel 6a, and an elastic counter-element 6c operatively interposed between the braking assembly 2 and the kinematic interface mechanism 3.

[0038] Depending on the profile of the wheel teeth, in a given movement direction of the rotation stroke the kinematic interface mechanism 3 may cause rotation of the packed discs (and therefore friction generation), while in the opposite movement direction of the rotation stroke the kinematic mechanism 3 (also due to the combined effect of the elastic counter-element 6c) "skips" the wheel teeth and therefore does not set the packed discs in action.

[0039] In addition, depending on current requirements, the kinematic reversal means can be used for amplifying the braking effect within a predetermined rotation arc.

[0040] In order to improve connection between the servomechanism 1 and the door/wing on which it has to act, also contemplated is the presence of a hooking element 3c (a pin passing through the first end 3a of the kinematic interface mechanism 3, for example) mounted on the kinematic interface mechanism 3 and adapted to connect the servomechanism 1 to the door/wing under operating conditions.

[0041] A further embodiment of the present invention can consist, in terms of braking assembly 2, of packed braking discs, which discs exert a damping effect that is variable based on the opening angle of the door/wing: actuation of this discs can be correlated with movement of the door/wing and can take place in different ways, through a rack or a lever, for example (or any other kinematic transmission mechanism) interposed between

the braking mechanism and the door/wing.

[0042] In other words, in the embodiment of the invention herein described, the kinematic interface mechanism 3 consists of a toothed wheel meshing with a rack which in turn can be connected to the door/wing.

[0043] More generally, it is to be noted that, depending on the type of kinematic transmission mechanism interposed between the servomechanism 1 and the door/wing, the kinematic interface mechanism 3 may be replaced with operatively equivalent motion transferring and/or converting means, provided this means is adapted to convert the motion into opening and/or closure of the door/wing through a relative rotation of the packed discs (or more generally, adapted to enable actuation of the braking assembly 2).

[0044] As an additional general technical remark on the packed discs constituting the braking assembly 2, it is possible to note that the outer diameter of one or more discs can be greater than the so-called "efficient contact diameter" between the toothed wheel and the rack, so as to obtain a damping effect amplified by the braking assembly 2: this takes place due to the fact that displacement of the surfaces in mutual contact between the packed discs (that can be defined as "damping stroke") is greater than the rack stroke.

[0045] In other words, the position of the connecting pin of the rack on the lever and of the rotation axis of the packed discs, as well as the kinematics of their relative movement, allow a damping effect to be obtained that is variable based on the position of the hinge and the door; this effect can be zero with an open door/wing, maximum in the central closing stage and non-zero but with "reduced" intensity in the final closing stage.

[0046] Conveniently, it is possible to see that in the hitherto described embodiment the damping effect is the same in the opening and closure stages and no elastic return elements are present.

[0047] Therefore the braking effect can be differentiated "at the opening" relative to "at the closure", by introducing one-way connecting means operatively acting at least on the braking assembly 2 as a function of the rotation direction (on closure and on opening) of the door/wing; this one-way connecting means can for example comprise (interposed between the toothed wheel and the packed-disc driving shaft) a freewheel, a pawl coupling, a spring with one-way locking and so on.

[0048] In other words, in the present invention the servomechanism 1 is provided to exert a differentiated braking effect on threshold angles having different values depending on the fact that it is covering an opening stroke or a closure stroke of the door/wing.

[0049] For instance, the damping effect can remain substantially constant during closure, but during opening the effect can vary as follows: remaining zero until about a first opening threshold angle (preferably, this first opening threshold angle corresponds to one third of the maximum opening angle), taking an "intense" or even "maximum" value until a second opening threshold angle (preferably equal to about two thirds of the maximum opening angle) an finally becoming zero (or "minimum") again from this second opening threshold value until the maximum opening angle.

[0050] To maximise the application flexibility, the servomechanism 1 can be mounted for operation to already installed hinges or can be supplied in the form of a preassembled module, insertable as an alternative to the already installed hinge.

[0051] The invention achieves many advantages.

[0052] In fact, due to the particular construction architecture of the present device it is possible to obtain (and if necessary, adjust) a "central part" of the door/wing stroke in which the resistance is high, while the other parts of the door/wing stroke that are subtended between the opening (or closure) angles and the extreme angles of the mentioned "central part" of the stroke are submitted to low reaction forces; this allows easy "starting" of the movement of the door/wing and at the same time enables great control on the movement after starting (or before arrival).

[0053] In addition, due to the possibility of adjusting the beginning and end angles of the "central part" of stroke in which a high resistance to rotation is generated, the servomechanism of the present invention can be adapted to a wide range of applications.

[0054] In addition, the possibility of having high resistance to rotation can be utilised for maintaining the door/wing, when required, to a relatively steady intermediate opening position, so that the door/wing is more functional.

[0055] Finally, it should be appreciated that the present invention enables low manufacturing costs and does not involve particular complications or modifications and adaptations even on doors/wings of known type, which is advantageous for the production economy and the final price of the product.

Claims

1. An external braking servomechanism associable with doors and/or wings **characterised in that** it comprises:

   - a braking assembly (2) adapted to generate a rotation-resisting force having at least:

     • a first value within a starting rotation arc of said door/wing included between a maximum closure angle and a first threshold angle;
     • a second value greater than said first value within a central rotation arc of said door/wing included between said first threshold angle and a second threshold angle; and
     • a third value within a final rotation arc of said door/wing included between said second threshold angle and a maximum open-

ing angle, and

- a kinematic interface mechanism (3) having a first end (3a) adapted to bear on a surface of a door/wing and a second end (3b) opposite to said first end (3a) and operatively connected to said braking assembly (2) for transferring said first, second and third values of rotation-resisting force to said door/wing as a function of an angular position of the door/wing itself.

2. A servomechanism as claimed in claim 1, wherein the first and third values of rotation-resisting force are substantially identical.

3. A servomechanism as claimed in claim 1 or 2, wherein the braking assembly comprises:

- a predetermined number of mutually interfaced friction elements (2a) adapted to generate the resisting force; and
- a fitting shaft (2b) operatively interposed between said friction elements (2a) and the kinematic interface mechanism (3).

4. A servomechanism as claimed in anyone of the preceding claims, wherein said friction elements (2a) comprise a plurality of packed discs in mutual contact at the coronal surfaces (2c) thereof, said plurality of discs being coaxially mounted on said fitting shaft (2b).

5. A servomechanism as claimed in claim 4, wherein said packed discs comprise friction increasing means positioned on said coronal surfaces (2c), said friction increasing means preferably comprising undulations and/or surface-roughness variations and/or a multiplicity of depressions and elevations that can be mutually coupled between one packed disc and the other and more preferably comprising insertion of friction increasing or reducing means such as grease and/or fluids with suitable properties, said materials being adapted to determine a predetermined optimal friction coefficient.

6. A servomechanism as claimed in anyone of the preceding claims, wherein also present is a supporting shell (4) housing the braking assembly (2) and the kinematic interface mechanism (3).

7. A servomechanism as claimed in claims 3 and 6, wherein said friction means comprises:

- a dish (2d) fitted on the fitting shaft (2b) and having a predetermined number of shaped housing cavities (2e) circumferentially formed relative to the fitting shaft (2b); and
- a corresponding predetermined number of rolling balls (2f) interposed between the dish (2e) and the supporting shell (4), said rolling balls (2f) being adapted to be reversibly configured between:

  • a disengagement condition at which they are substantially contained in said shaped housing cavity (2e), the rolling balls (2f) in said disengagement condition generating a first value of minimum or zero rotation-resisting force;
  • a transfer condition at which they are submitted to displacement between one shaped housing cavity (2e) and a circumferentially following shaped housing cavity, the rolling balls (2f) in said transfer condition generating a second value of rotation-resisting force greater than said first value and preferably maximum; and
  • a re-arrangement condition substantially corresponding to said disengagement condition at which they are contained in shaped cavities (2e) circumferentially following those (2e) occupied at the disengagement condition, the rolling balls (2f) in said disengagement condition generating a third value of minimum or zero rotation-resisting force.

8. A servomechanism as claimed in anyone of the preceding claims, wherein also present is selection means (5) of said central rotation arc, said selection means (5) being adapted to determine the first and second threshold angles and being also active at least on the braking assembly (2) and/or the kinematic interface mechanism (3).

9. A servomechanism as claimed in claim 8, wherein the selection means (5) comprises:

- a slot (5a) formed in said supporting shell (4) and having a curvilinear extension axis (5b) with a predetermined angular opening, said angular opening defining the first and second threshold angles; and
- a connecting pin (5c) fitted in said second end (3b) of the kinematic interface mechanism (3) and being engaged in said slot (5a).

10. A servomechanism as claimed in anyone of the preceding claims, wherein also present is kinematic reversal means (6) interposed between the kinematic interface mechanism (3) and the braking assembly (2), said kinematic reversal means (6) comprising:

- a toothed wheel (6a) preferably integrally formed around the fitting shaft (2b);
- at least one engagement tooth (6b) emerging from the second end (3b) of the kinematic inter-

face mechanism (3) and suitable to be fitted on said toothed wheel (6a); and
- an elastic counter-element (6c) operatively interposed between the braking assembly (2) and the kinematic interface mechanism (3).

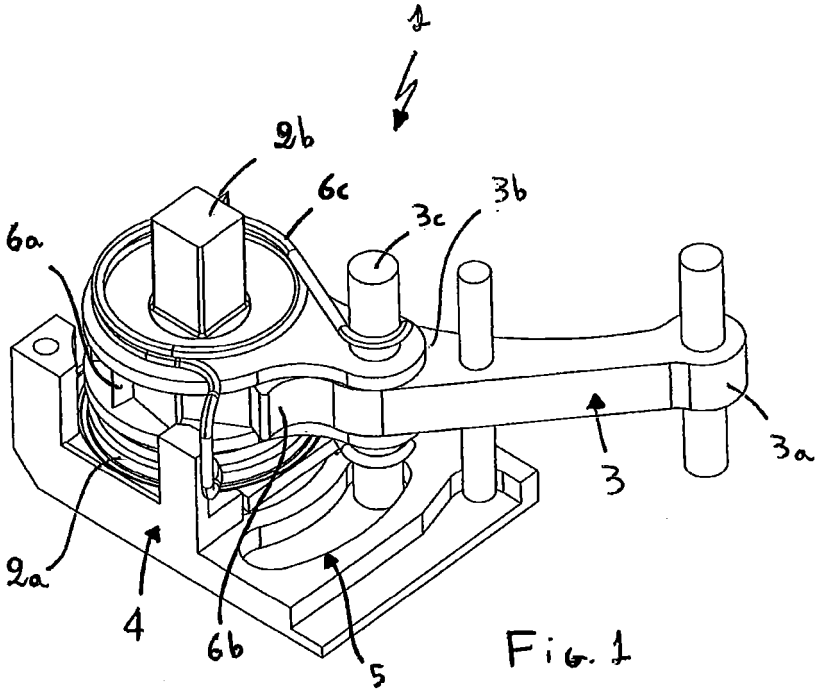

Fig. 1

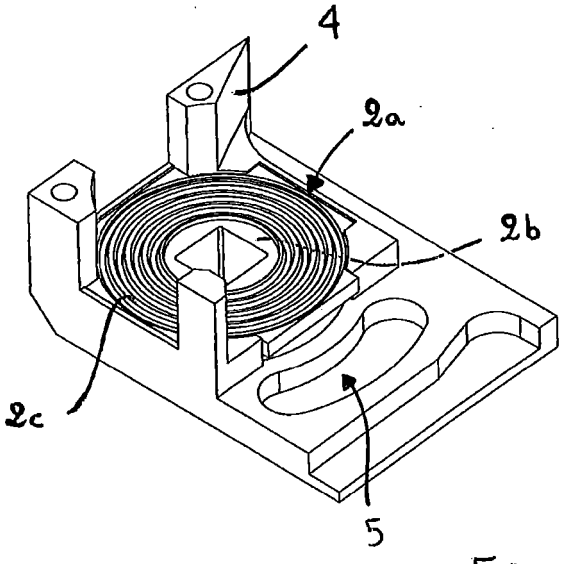

Fig. 2

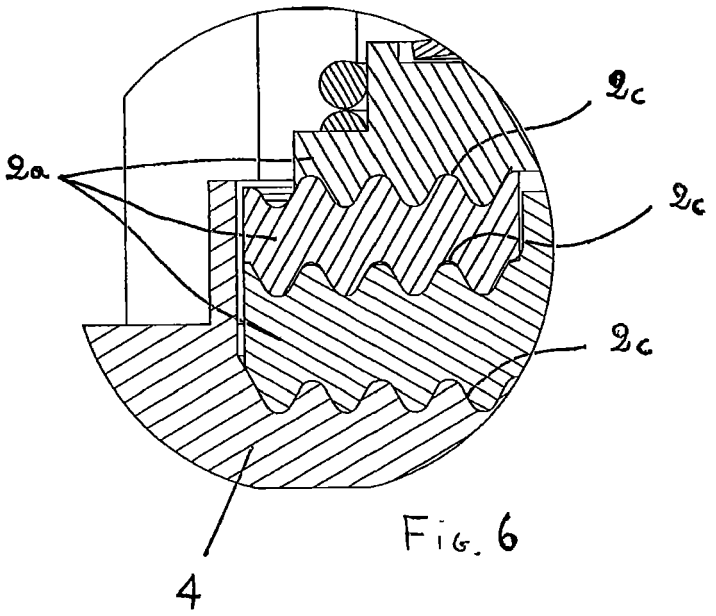

Fig. 6

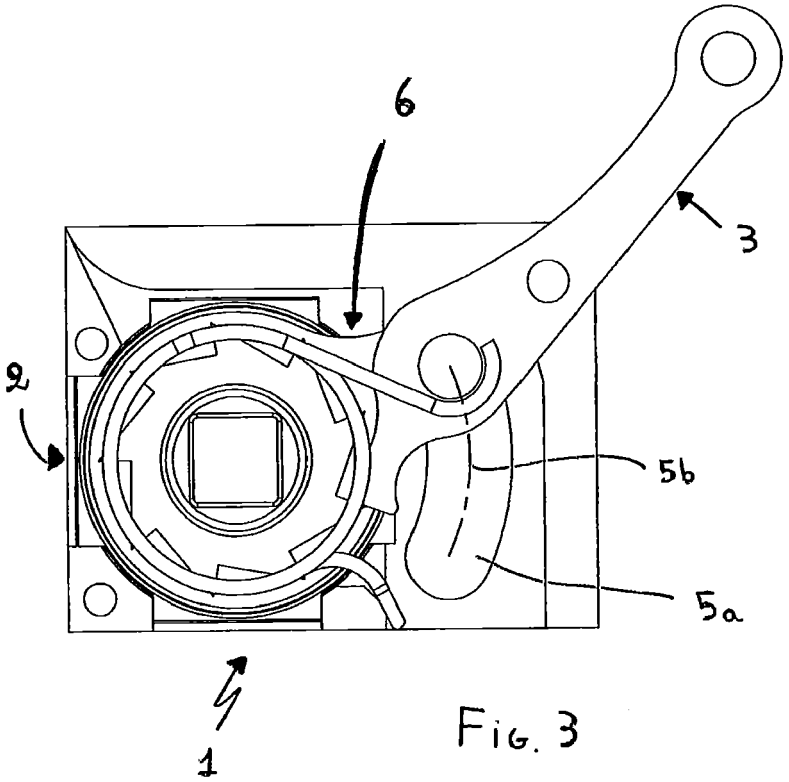

Fig. 3

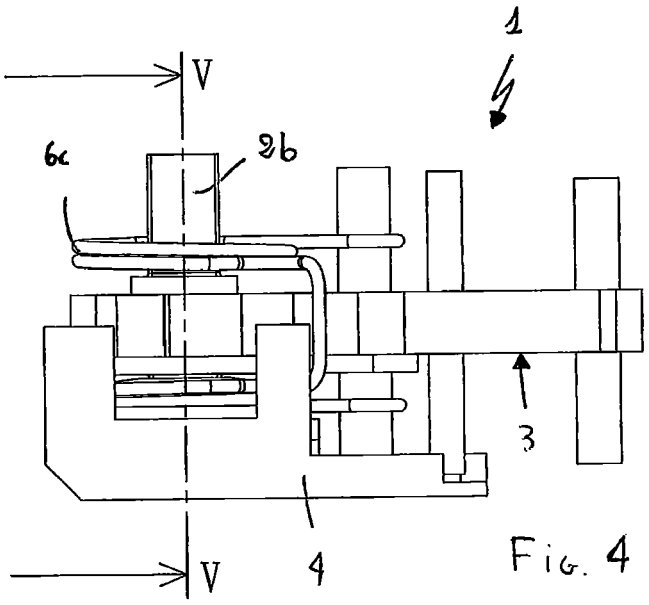

Fig. 4

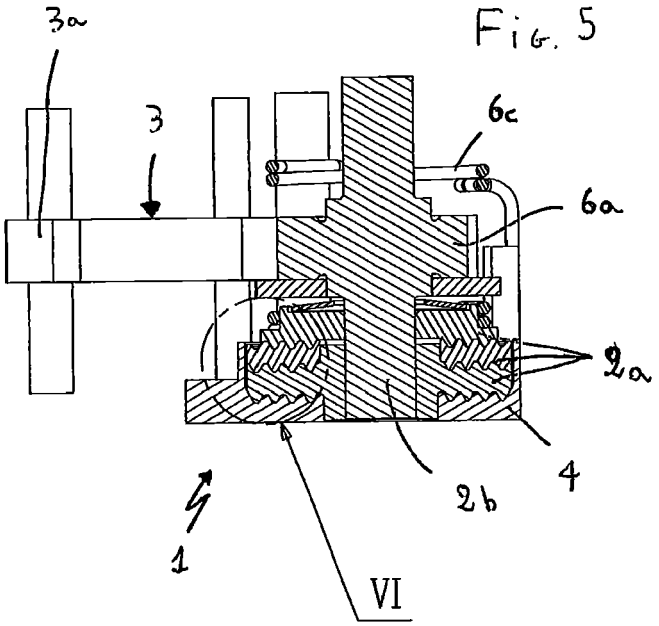

Fig. 5

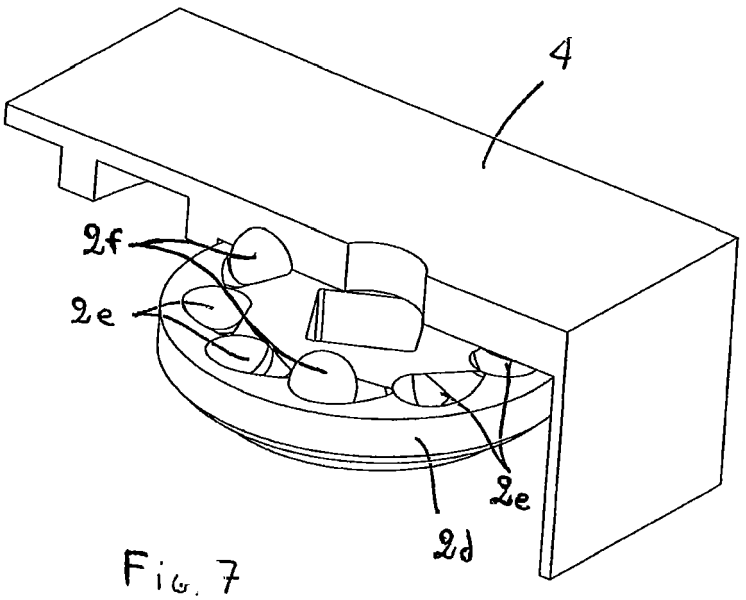

Fig. 7

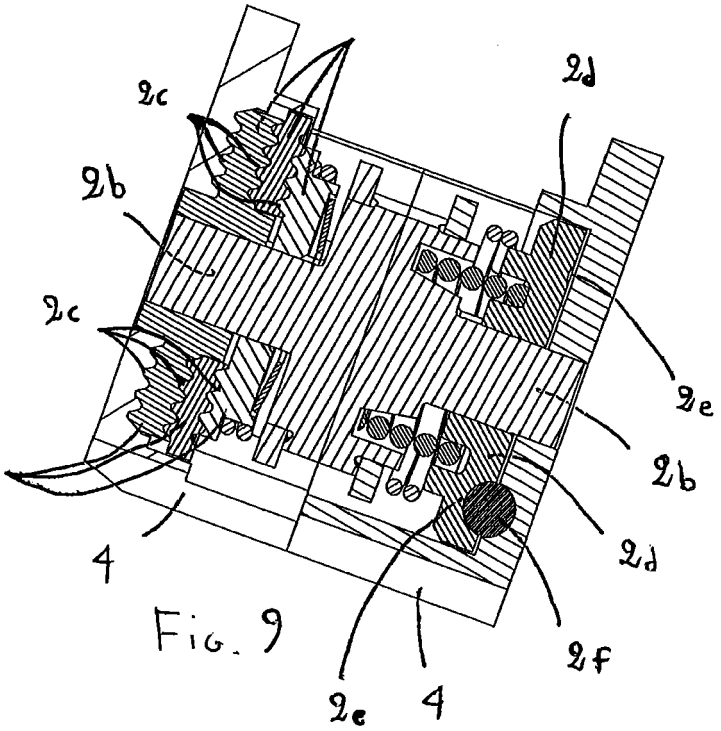

Fig. 9

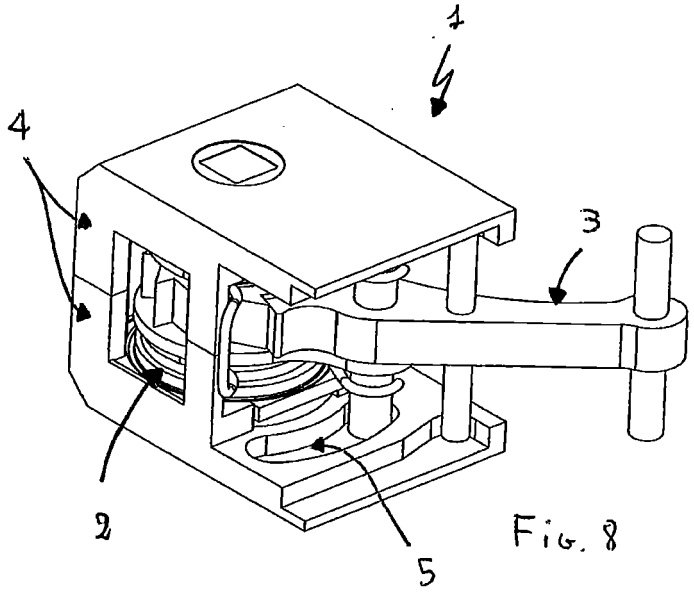

Fig. 8

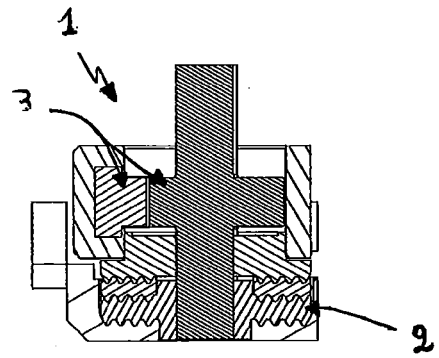

Fig. 12

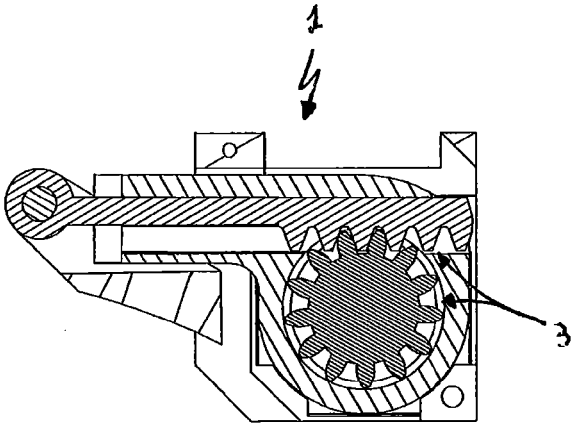

Fig. 11

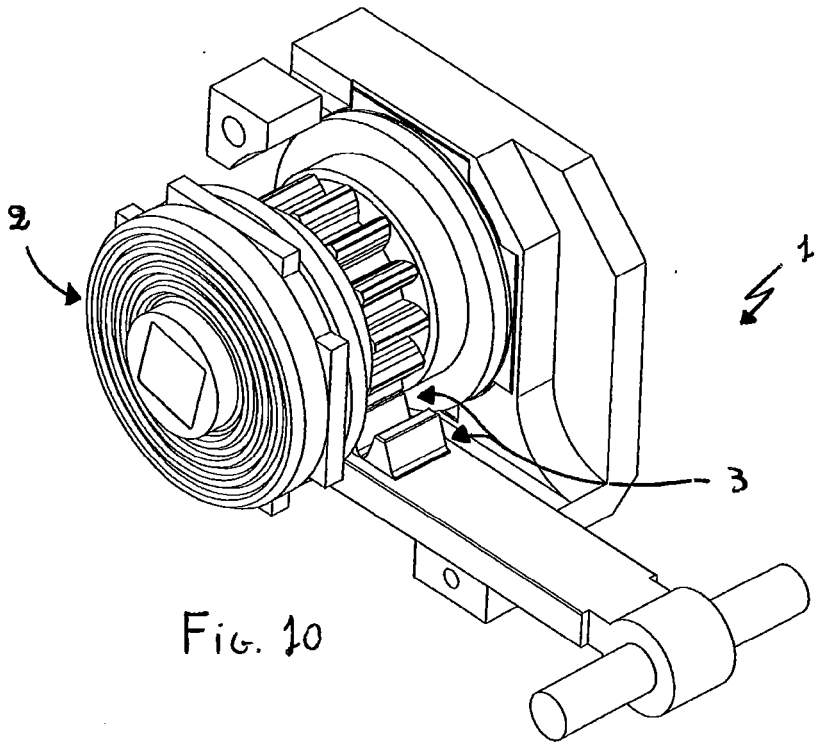

Fig. 10

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 8937

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	WO 2007/066527 A1 (ADVANEX INC [JP]; CHIKASHIGE KIYOSHI [JP]) 14 June 2007 (2007-06-14) * figures 5-9 *	1-4,6 5,7,10 8,9	INV. E05F5/00
Y	WO 2009/115171 A1 (SALICE ARTURO SPA [IT]; SALICE LUCIANO [IT]) 24 September 2009 (2009-09-24) * page 9, paragraph 2; figure 1 *	5	
Y	WO 03/062573 A1 (KRAL JOSEPH MICHAEL [AU]) 31 July 2003 (2003-07-31) * page 5, paragraph 3; figure 2 *	7	
Y	DE 20 2004 003320 U1 (MIWE MICHAEL WENZ GMBH [DE]) 6 May 2004 (2004-05-06) * claims 1-3; figures *	10	
A	EP 2 025 557 A1 (DELPHI TECH INC [US]) 18 February 2009 (2009-02-18) * paragraph [0039]; figures *	1	TECHNICAL FIELDS SEARCHED (IPC) E05F F16F E05D
A	US 6 125 509 A (HARTIGAN MICHAEL J [US] ET AL) 3 October 2000 (2000-10-03) * figure 15 *	1,7	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 February 2012	Witasse-Moreau, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

& : member of the same patent family, corresponding document

1 EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 18 8937

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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06-02-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007066527 A1	14-06-2007	NONE	
WO 2009115171 A1	24-09-2009	CN 101952532 A	19-01-2011
		EP 2265787 A1	29-12-2010
		JP 2011515599 A	19-05-2011
		KR 20100138872 A	31-12-2010
		TW 200940801 A	01-10-2009
		WO 2009115171 A1	24-09-2009
WO 03062573 A1	31-07-2003	GB 2399862 A	29-09-2004
		US 2005125947 A1	16-06-2005
		WO 03062573 A1	31-07-2003
DE 202004003320 U1	06-05-2004	NONE	
EP 2025557 A1	18-02-2009	NONE	
US 6125509 A	03-10-2000	NONE	

EPO FORM P0459

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