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(54) **System for opening and closing of a closure and for maintaining the same in an intermediate position**

(57) The present invention concerns a system for the opening/closing of one opening, such as a tailgate, able to realize :

- the automatic opening/closing of the opening,
- to authorize the manual opening/closing of the opening, and
- to maintain the aforementioned opening in an intermediate position between the position of total opening of the opening and its closed position, comprising a clutch, sup-

plied with at least one engine, able to solidarize/disunite at least two parts of the actuation chain of opening, characterized in that it includes moreover a mechanical braking means (6,), acting only when the clutch is not supplied by the engine, able to deliver a force being opposed to the movement/displacement of at least part of the actuation chain of opening so that the opening remains in an intermediate position.

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Description

[0001] The present invention relates to a system for the opening/closing of one opening, such as a tailgate, trunk or analogue, intended to authorize the automatic opening/closing of the aforesaid opening, its manual actuation by a user and more particularly its maintenance/keeping in stable intermediate position, more or less independent from the environmental conditions, between the two extreme positions of closing and opening.

[0002] The tailgates of motor vehicles classically use systems with gas under pressure to help a user to handle it. The gas filled struts apply a force on the tailgate which is directed against the gravitational force. These systems with gas provide a torque which is weaker than the gravitational torque when the tailgate is opened with less than one third of its maximum opening and which is higher than the gravitational force when the tailgate is in position of opening to more than one third of the maximum opening so that respectively the tailgate drops in the first case until its position of total closing or rises until its position of total opening. This characteristic of balancing the forces on the tailgate helps the user to close relatively easily and to keep tailgate open in order to allow the access through the opening. On the other hand, this type of devices of opening/closing of the tailgate of vehicle does not authorize the fixed maintenance in intermediate position of the tailgate.

[0003] One knows systems which claim to make it possible to authorize the maintenance in position of the tailgate, its automatic opening/closing and the free displacement of the tailgate by the user, namely the systems based on hydraulic cylinders and the systems based on electromechanical actuators.

[0004] In the systems with hydraulic cylinders, one uses a hydraulic pump actuated by an electric motor. By moving the fluid, one carries out a movement of the actuation cylinder(s) of the tailgate. Owing to the fact that, in these systems, the actuation cylinders are filled with liquid, a static pressure exists even when the actuation motor(s) which commonly drive(s) the pump(s) is/are off. Furthermore this static pressure is kept without any need for electricity. This static pressure in the cylinders makes it possible to maintain the tailgate in the intermediate position reached by electrical actuation. On the other hand, the disadvantage of these systems lies in an effort much greater for the user when he wishes to handle the tailgate manually, which makes these systems very uncomfortable especially under low temperatures.

[0005] The electromechanical actuated systems use other means to carry out automatic actuation for the opening/closing of the tailgate and the manual handling of the tailgate. Indeed, the automatic movement is carried out thanks to electrical drive(s) which applies/y torque to an actuation wheel. Usually, a clutch connects the motor or motor gear unit output shaft, when required for the actuation, with one second actuation shaft and the kinematics transforms the rotational movement into a linear

displacement, a combined movement or in another rotational movement to transmit displacement to the tailgate. In certain cases, cables, flexible shafts or levers are used to transmit the forces to the tailgate. The majority of the vehicles use an electromagnetic activated clutch in the actuation systems of the tailgate, which makes it possible not to transmit, contrary to the hydraulic systems, any force when the clutch [the engine(s)] is/are not activated and the user thus can freely and easily handle the tailgate. In these systems, the clutch is only engaged for automatic movement of the tailgate. On the other hand, this type of systems does not allow, unlike the hydraulic systems, to maintain the tailgate in intermediate position, between the extreme positions of total opening and total closing.

[0006] One can also imagine using an additional clutch in combination with a drive wheel of friction which provides a sufficient force to maintain the tailgate in position when the actuation engine(s) of the system is/are not active any more.

[0007] Nevertheless, this solution requires a second clutch and a relatively complex device which make the system much more expensive. Moreover, this unit is not inevitably effective in all types of environmental conditions, in particular when the surrounding temperature is extremely high or low.

[0008] One can furthermore imagine to add just a frictional element without a clutch to provide sufficient force to maintain the tailgate. Again the disadvantage is the efficiency decrease of the drive unit, since the friction will last permanent and requires extra effort of the motor.

[0009] The present invention aims at curing the disadvantages of the current devices of automatic actuation of tailgate by proposing a system at the same time inexpensive and reliable.

[0010] Thus, the present invention relates to a system for the opening/closing of one opening, such as a tailgate, able to realize:

- the automatic opening/closing of the opening,
- to authorize the manual opening/closing of the opening, and
- to maintain the aforementioned opening in an intermediate position between the position of total opening of the opening and its closed position, comprising a clutch, supplied with at least one motor, able to solidarize/disunite at least two parts of the actuation chain of opening, characterized in that it includes moreover a mechanical braking means, acting only when the clutch is not supplied by the motor, able to deliver a force being opposed to the movement/displacement of at least part of the actuation chain of opening so that the opening remains in an intermediate position.

[0011] It should be understood that the expression "braking means" is here used to define a means that is acting only if a certain movement is carried out, or ex-

ceeded a certain threshold, on the tailgate. This means for instance that the braking function of said braking means starts after a small displacement of the tailgate.

[0012] As an example, the displacement of the tailgate for the actuation of the braking means would be between 3° and 10° angular displacement of the clutch position. A gear drive with a gear ratio of 60 transmits the torque from the clutch unit to a tailgate. This means on the clutch are 15 rounds required for a 90° movement of the tailgate. Therefore 1° on the clutch represents 1°/60 on the tailgate. Due to the need of activating the brake another 3 to 10° angle of movement back is required. So a maximum of 0,166° on the tailgate is needed which represents 2,6 mm movement for a 1000mm size tailgate. This will be noticed as increased free play in the connection between tailgate and clutch.

[0013] One notes that the word "clutch" comprises all kind of devices that can unite/disunite two parts, for example clutches using hydraulic fluid like oil, and/or transmits a force/torque for instance through friction surfaces disposed on the end of both parts to be united/disunited.

[0014] According to a possibility offered by the invention, the system comprises a connexion means able to maintain the two aforesaid parts interdependent when the clutch is not fed by the motor.

[0015] Preferably, the aforesaid connexion means consists of a permanent magnet or a preloaded spring or special shape form fit elements

[0016] According to one embodiment of the invention, the mechanical braking means consists of a torsion spring having at least one end of contact.

[0017] In this embodiment, the coil spring is ideally located pressurised, or prestressed, in a fixed casing and the system includes connexion means able to connect, or transmit, efforts, between the actuation chain of the opening and the torsion spring.

[0018] According to another embodiment of the invention, the braking means consists of at least one brake located at the second part of the actuation chain connected to the tailgate. In this case, the clutch consists of an eccentric acting on the braking wing to activate its function of unite/disunite of the actuation chain, the eccentric being able to rotate.

[0019] According to another embodiment of the invention, the mechanical braking means includes a rotary drum (31) in which a wheel with driver pins(30) is assembled and which are connected to brake sprags (38); the internal geometry of the brake sprags (38) being complementary to the geometry of the curved disc (37). The wheel and is first put in rotation by the motor taking the sprags (38) and the curved disc (37) along with the shaft (36) with it.

[0020] When the motor is off and the output shaft (36) is driven from the reverse side of the drive chain the brake sprags (38) are forced outwards against the drum (38) thereby locking the output shaft (36) with the drum (31).

[0021] The invention will be better understood with the reading of the description that will follow, and that will be

given only as example while referring to the appended drawings in which:

- figure 1 is a cross-section of the system of the invention according to the first embodiment;
- figure 2 is a sight burst of the elements of the system of the invention according to a second embodiment;
- figure 3 is a perspective view of the elements represented on figure 2, mounted and assembled;
- figure 4 is a perspective view of the system of the invention mounted represented on figure 2;
- figure 5 is a sight burst of the elements of the system of the invention according to a third embodiment;
- the figures 6a, 6b, 6c are a front view of the system represented on figure 5 in three successive states;
- figure 7 is a perspective view of the system of the invention according to the third embodiment of the invention.

[0022] As illustrated on figure 1, the first embodiment of the invention includes an engine or motor 1 rigidly fixed thanks for example to screws, not represented on the drawings, on a base plate 2. This engine 1 comprises an output rotational shaft 3 which is connected to a drive means 4. The output rotational shaft 3 includes a finger 5 which contacts a spring 6 when the output shaft 3 is turned. The drive means 4 includes 2 flanges 9 designed to contact the spring legs 8. The spring 6 is laid out in a fixed casing 7 and the spring 6 is prestressed inside this casing 7. The casing 7 cannot turn because of its fixing to a fixed support 2 or thanks to a specific means not represented.

[0023] The spring 6 is here a torsion spring having at its ends two legs 8. The finger 5, fixed rigidly to the output shaft 3, consists in a lever shaped device able to transmit the force, or the efforts, between the spring, via its legs 8, the output shaft and the flanges 9 of the drive means 4. Thus, a connexion between the output shaft 3 of the engine and the drive means 4 is only possible through the spring 6 ; this latter 6 transmitting a force if it is released by the finger of the output shaft, and blocking the connexion/transmission if it is moved by the flanges 9 of the drive means 4, forbidding then the rotation of the means 4 and so of the tailgate.

[0024] Thus, when the engine 1 rotates its output shaft 3, the torsion spring 6 authorize the rotation of the drive means 4 for the actuation of the tailgate, while if a force is applied in the opposite direction to the cinematic actuation chain, from the other side of the actuation chain, i.e. the part of the actuation chain connected to the tailgate and not to the engine 1, primarily because of the force of gravity, the spring 6 blocks this rotation and the tailgate thus remains fixed in the intermediate position.

[0025] The system of this invention includes moreover the elements complementary to the system of actuation as described in patent EP 1516130, namely in particular a clutch fixed at the actuation chain on tailgate side.

[0026] Of course, any other type of embodiment will

be possible insofar as the system includes a clutch and that the two parts of this clutch remains in contact one with the other when the engine 1 is inactive, thanks for example to one or more permanent magnet(s) or springs and keeping the two parts together with a defined torque.

[0027] The second embodiment of the invention is illustrated on figures 2 to 4. In this embodiment of the invention, the mechanical braking means consists of a brake 18 working mechanically or electromechanically. This conventional brake is not described in more detail as already well known. It can be placed rigidly fixed to the output shaft. Instead of this the function of the clutch is explained more in details: The clutch function is realized by wings 10 which authorize the rotation of the actuation chain in both direction of rotation, when the engine is active to actuate the tailgate automatically. The clutch allows manual movement of the tailgate by allowing free rotation when it is activated from tailgate side. Depending on the used brake type you have either to overcome the brake friction or it is released electromechanically.

[0028] As illustrated in the figure 2, the clutch mechanical means are here constituted of two wings 10 as well as an eccentric 11 with an oblong shape. The others elements of the whole system comprise the output shaft 12 presenting a housing with a basin shape 13 to house the mechanical means carrier 17, wings 10, a input shaft 14 with a fixed excenter 11, concentrically guided to the output shaft 12 and a cylindrical housing 15 having sliding supports 16.

[0029] Indeed, in the case of automatic movement, the connecting wings 10 are spread thanks to an eccentric 11 and come into contact with the interior wall of the housing 13 with a basin shape of the output shaft 12, accelerating or connecting to the surface of this latter 13 and therefore enabling the tailgate to be moved by the engine.

[0030] Thus, the housing with a basin shape 13 is fixed on the output shaft 12 or forms a part of said shaft 12, while the input shaft 14 is connected to an eccentric 11. This eccentric 11 presents a form substantially ovoid, or elliptic, and is fixed to the input shaft 14 so as to turn with the latter 14.

[0031] In the example chosen to illustrate the invention, the system includes two connecting wings 10, each one having approximately the same shape in "bean seed", in "banana" or U flattened and having a centre of rotation parallel on the longitudinal axis of the shafts 12, 14, free rotational fixed on a carrier 17. The centre of rotation of the eccentric 11 is the longitudinal axis of the shafts 12, 14. The connecting wings 10 present forms adapted to the cooperation with the eccentric 11 so that this latter 11 can move the aforementioned wings 10 when it is turned according to a direction of rotation/displacement thanks to the engine of the system.

[0032] On the other hand, if the engine is not activated and a displacement is applied from tailgate side the output shaft 12 is rotating free inside the housing 15, while the carrier 17 remains in position, due to the connecting wings 10 not pressed on the inner surface of the basin

13 of the output shaft 12.

[0033] According to the third embodiment of the invention, represented on figures 5 to 7, the mechanical braking means consist of a wheel with driver pins 30, brake sprags 38, and a curved disc 37 assembled in a drum 31; the brake sprags 38 and the curved disc 37 presenting approximately complementary forms. The set of 6 brake sprags 38 assembled in a circle present a hexagonal form here while the curved disc 37 presents a housing also with hexagonal form, dimensions of these two elements allowing the insertion of the brake sprags 38 and the curved disc 37 in the housing of the drum 31.

[0034] The output shaft 36 is connected to one side of the actuation chain while the wheel with drive pins 30 is connected to the other side of the actuation chain, where is located the motor of the system, not represented on the appended drawings.

[0035] The wheel with drive pins 30 has an external surface comprising teeth of gears for the transmission of displacement/rotation forces coming from the motor of the system for the automatic actuation of the tailgate.

[0036] In addition, a band of braking 33 is fixed on the external circumference of the drum 31 and is prestressed against the latter by a compression spring 34, mounted fixed on a supporting shaft 35. The supporting shaft 35 is fixed rigidly to a housing. This band of braking makes it possible to provide a residual torque to the drum/wheel assembly. A user moving the tailgate manually will feel this force but it will be sufficiently weak not to be an obstacle, in any case, for the handling of the tailgate.

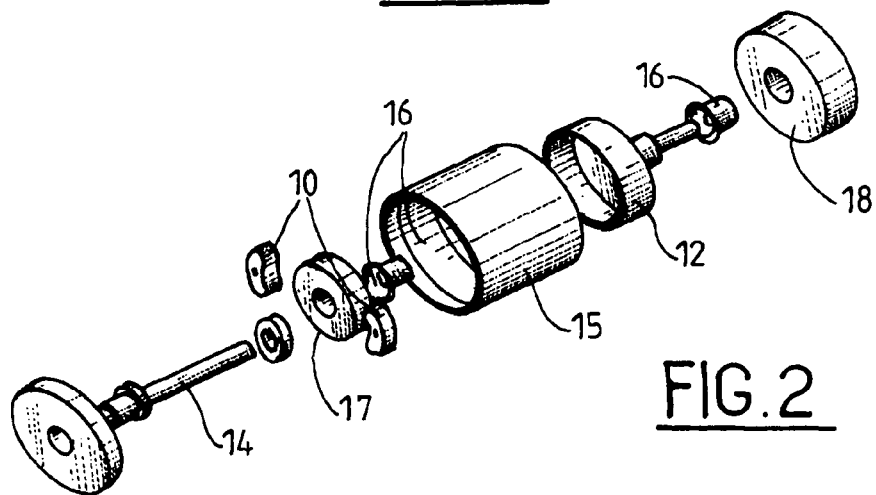
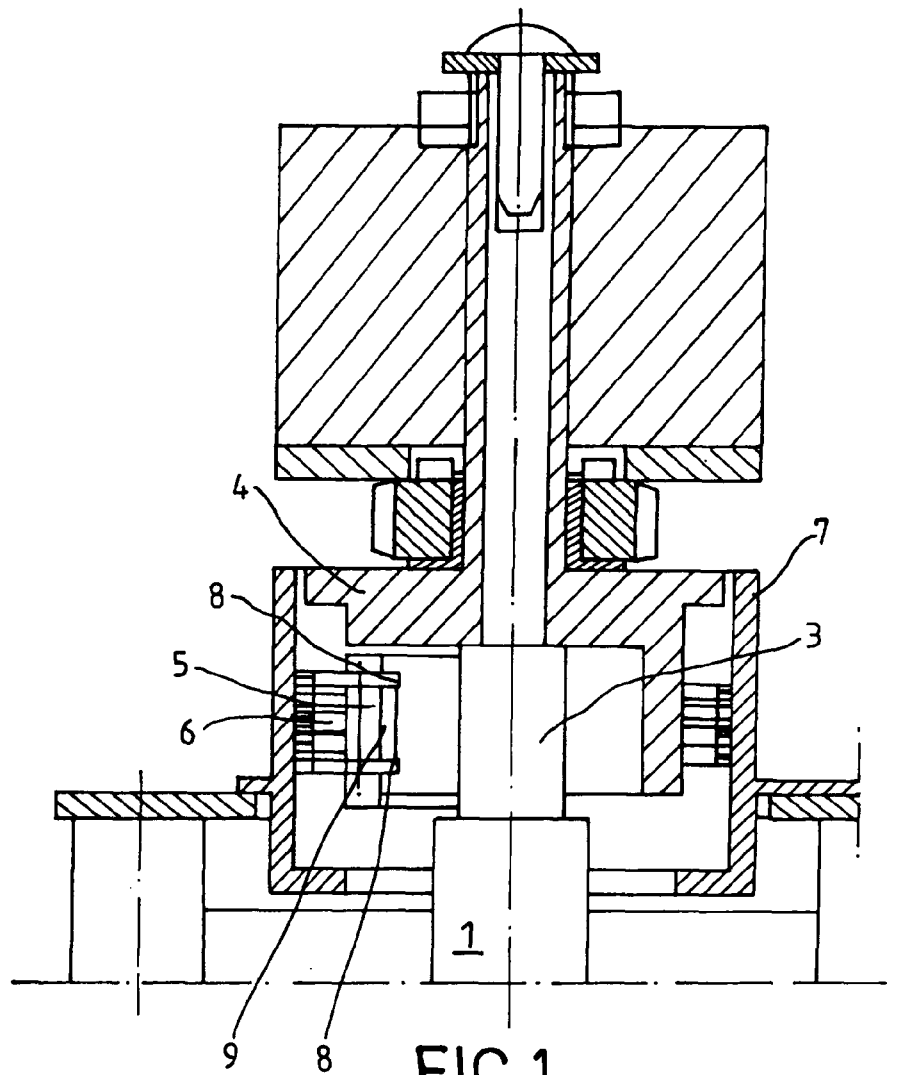
[0037] The drum 31 is put in rotation only when torque is transmitted from the driven side of the system, the output shaft 36 transmits its rotation to the curve disc 37 forcing the brake sprags 38 against the drum 31 inner surface causing the drum 31 to interlock with the output shaft.

[0038] On the other hand, when the rotation strength comes from the driving shaft 36 connected to the wheel with drive pins 30, for example under the effect of the force of inertia, the wheel with drive pins 30 turns slightly until the drive pins come to the end of the circular slots in the brake sprags 38 and pick them up, as that is visible on the figure 6b. As the sprags 38 inner shape correlates to the one of the curve disc 37 the latter one is picked up and consecutively the output shaft 36 allowing to freely transmit torque from the motor to the output shaft without being blocked by the drum and the braking band 33.

[0039] As soon as the motor is not in action, rotation of the output shaft 36 will cause the curve disc 37 to rotate while the drum 31, the wheel with the drive pins 30, and the brake sprags stand still. The movement of the curve disc 37 relative to the brake sprags will force the latter ones to move outwards radially causing the brake sprags 38 and the curve disc 37 to interlock with the drum 31 so that the drum 31 transmits a resistance torque to the output shaft 36, and thus to the driven side of the actuation chain, allowing the tailgate to keep its position.

Claims

1. System for the opening/closing of one opening, such as a tailgate, able to realize: - the automatic opening/closing of the opening, - to authorize the manual opening/closing of the opening, and - to maintain the aforementioned opening in an intermediate position between the position of total opening of the opening and its closed position, comprising a clutch, supplied with at least one engine, able to solidarize/disunite at least two parts of the actuation chain of opening, **characterized in that** it includes moreover a mechanical braking means (6, 18, 30/31 33/37/38), acting only when the clutch is not supplied by the engine, able to deliver a force being opposed to the movement/displacement of at least part of the actuation chain of opening so that the opening remains in an intermediate position. 5
2. System according to claim 1, **characterized in that** it comprises a connexion means able to maintain the two aforesaid parts interdependent when the clutch is not fed by the engine. 10
3. System according to claim 2, **characterized in that** the aforesaid connexion means consists of a permanent magnet or a preloaded spring. 15
4. System according to one the previous claims, **characterized in that** the braking means consists of a torsion spring (6) having at least one end of contact (8). 20
5. System according to claim 4, **characterized in that** the torsion spring (6) is located prestressed/preloaded in a fixed casing (7). 25
6. System according to the claim 4 or 5, **characterized in that** it includes a connexion means (5) able to connect, or to transmit, efforts between the actuation chain of opening and the torsion spring (6). 30
7. System according to one of the claim 1 to 3, **characterized in that** the braking means includes a rotary drum (31) in which is assembled a wheel with rollers (30) ; the external geometry of the wheel with rollers (30) being complementary to the geometry interns drum (31). 35
8. System according to claim 7, **characterized in that** the engine actuates first the drum (31) while the other side of the actuation chain actuates first the wheel with rollers (30). 40
9. System according to claim 8, **characterized in that** the drum (31) is put in rotation by the engine. 45
10. System according to any of claims 7 to 9, **characterized in that** a braking band (33) is fixed on the drum (31) to provide a residual torque to the latter (31). 50
11. System according to the claim 1, **characterized in that** the braking means consists of at least one damper (18). 55
12. System according to the preceding claims, **characterized in that** the clutch consists of an eccentric (11) acting on the connecting wings (10) to activate its function of unite/disunite of the actuation chain.



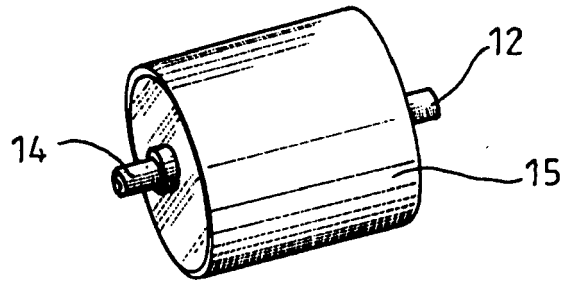


FIG. 3

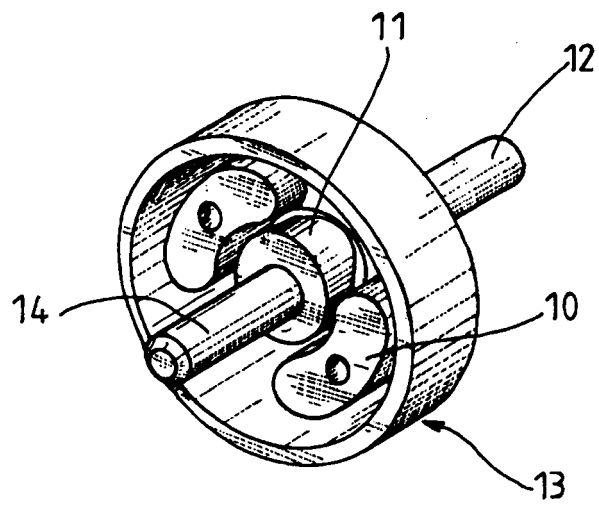


FIG. 4

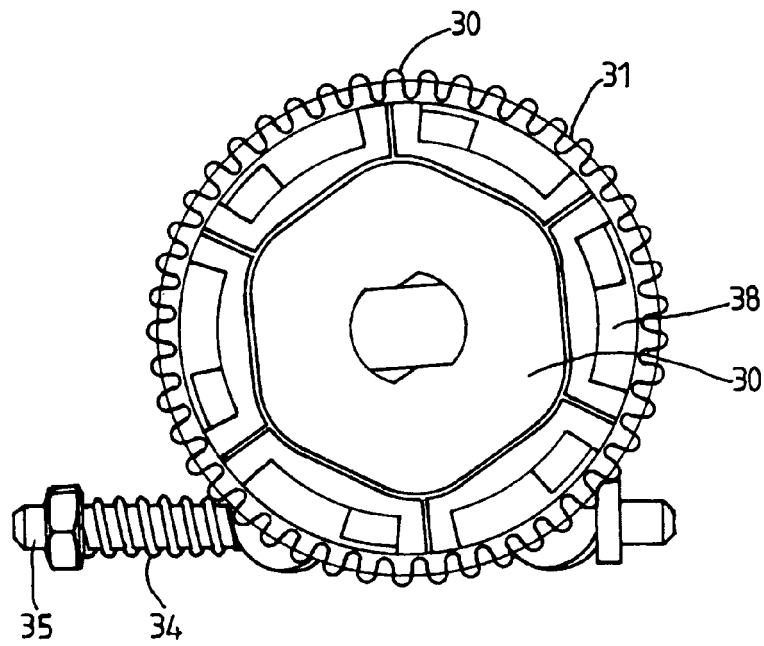
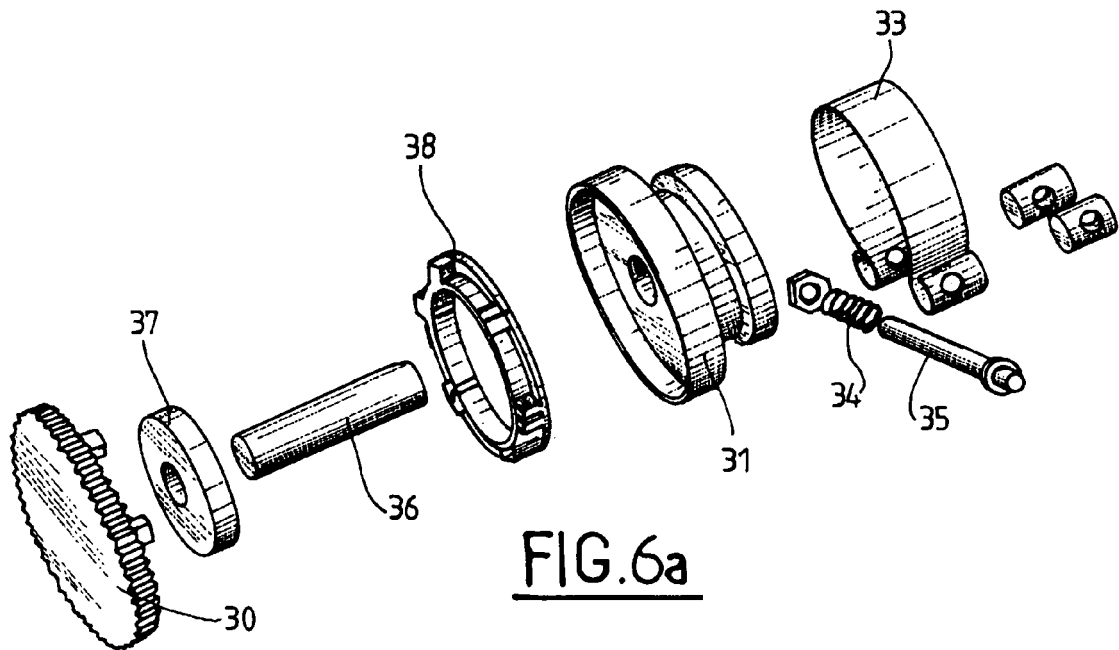


FIG. 6b

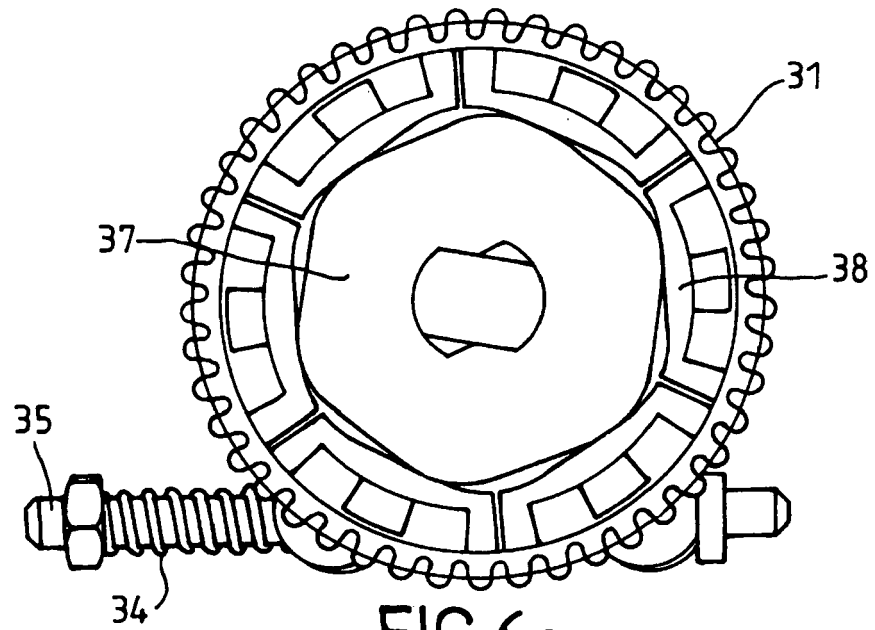


FIG. 6c

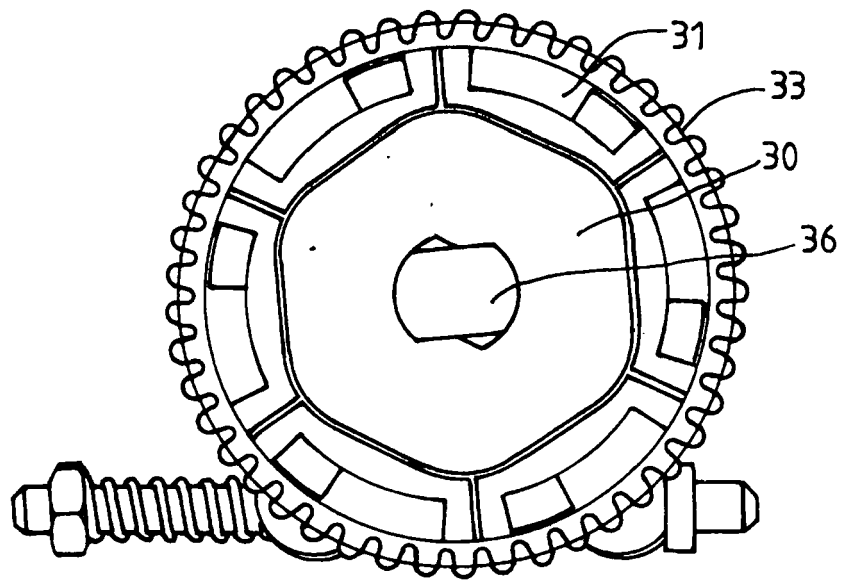


FIG. 6d

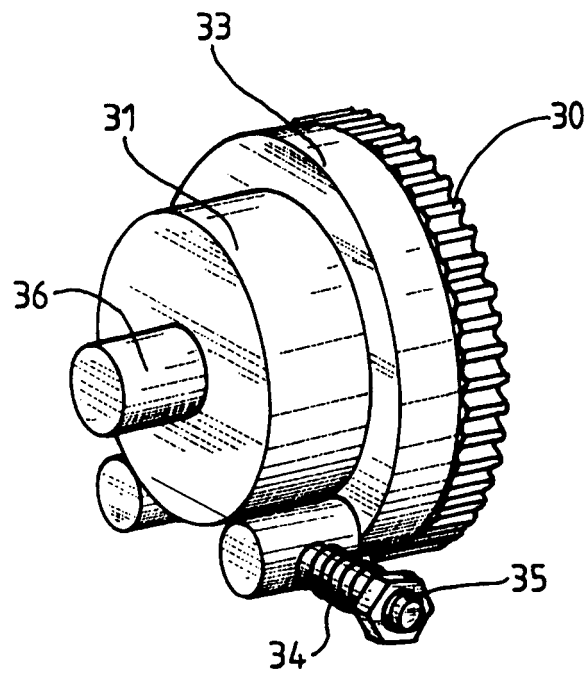


FIG. 7



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Place of search The Hague		Date of completion of the search 7 June 2006	Examiner Van Kessel, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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