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(71) Applicant: **Roger Technology S.R.L.**
31021 Mogliano Veneto (TV) (IT)

(72) Inventor: **FLORIAN, Dino**
31021 Mogliano Veneto (Treviso) (IT)

(74) Representative: **Piovesana, Paolo**
Via F. Baracca, 5/a
30173 Venezia-Mestre (IT)

(54) **ACTUATING APPARATUS FOR SLIDING BARRIERS**

(57) Actuator apparatus (1) for sliding barrier characterized in that it comprises an electric motor which is a torque motor (2) operated by a control and command unit and configured to cause the rotation of its output shaft (10) which is provided with a pinion (14) designed to be coupled directly with a linear gear (16) integral with said barrier, said actuating apparatus (1) being also characterized in that it comprises a locking device comprising:
- at least one engagement member (26) which is mounted on a fixed part (4) of said actuator apparatus (1),
- a locking member (22) acting on the shaft (10) of said torque motor (2) by means of a damping mechanism (18, 18', 20, 20', 24),
- means (28, 29) for moving said engagement member (26) between an engagement position of said locking member (22) and a disengagement position therefrom, said means being configured to automatically bring said engagement member (26) in said engagement position when said torque motor (2) is not powered.

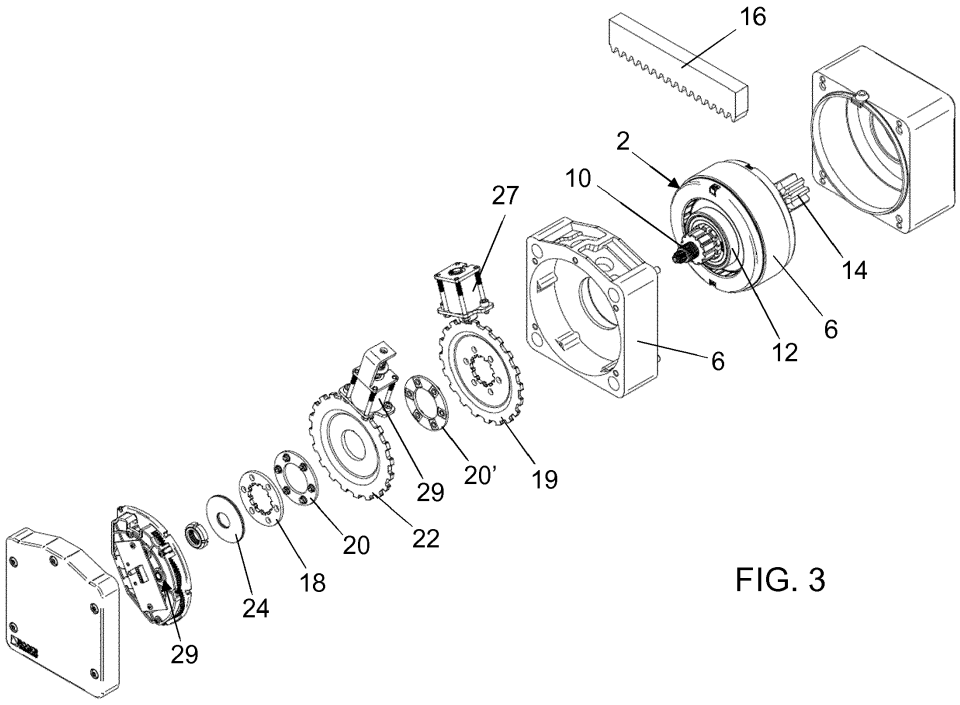

FIG. 3

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Description

[0001] The present invention relates to an actuator apparatus for sliding barriers such as doors, gates, and the like.

[0002] There are known actuators for sliding barriers comprising an electric motor and a reduction gear, which has the input shaft coupled with the output shaft of the electric motor and the output shaft provided with a pinion. Generally, the electric motor and the reducer constitute a single unit (geared motor), which is connected to a specific base, usually made out of concrete, arranged near the sliding barrier to be moved, so that the output pinion can engage a rack integral with the barrier itself.

[0003] The rotation of the motor in either directions causes the barrier to open and close.

[0004] The need to couple the motor to a gearbox is linked to the fact that a normal electric motor fed by the network and designed to drive a sliding barrier has a rotation speed that is too high and unable to directly drive a pinion coupled to the barrier rack, and at the same time, given its necessarily limited size for reasons of space, generates a low torque, sometimes insufficient to move the barrier.

[0005] For this reason, the gearbox has the function of reducing the speed of rotation of the motor and increasing the torque at the same time, thus allowing a small electric motor powered by the network and suitable to perform a function that without the gearbox would hardly be able to perform.

[0006] An actuator of this type is, for example, described in US 4887205 in which the pinion associated with the output shaft of the engine is coupled to a series of gears for reducing the rotation speed of the engine; in particular, then, the last gear engages the links of a chain which is integral with the barrier to be moved.

[0007] The gearbox also performs the important function of making the geared motor unit irreversible, since the high reduction ratio of the motor means that any attempt to rotate the pinion by direct thrust on the barrier is prevented by the nature of the gear unit itself. Consequently, if the motor is not powered, the movement of the barrier due to direct stress on the same is prevented, and therefore a forced opening of the barrier is prevented.

[0008] The so-called torque motors, or "torque motors", are also known, that are engines of particular conception which develop a high torque at low rotation speed and which, thanks to these characteristics, would be directly usable in all those applications requiring this type of performance.

[0009] However, these torque motors have never been used until now to barriers, although they have characteristics of speed and torque suitable for this use, as they are not irreversible and that does not prevent the movement of the barrier by direct stress instead of by using the actuator on the same.

[0010] The object of the invention is to propose an actuator apparatus which allows overcoming the drawbacks and limitations present in traditional solutions.

[0011] Another object of the invention is to propose an actuator apparatus which allows to actuate a sliding barrier with a torque motor, which, with respect to a traditional actuator comprising a traditional electric motor and a reduction gear, is of simpler embodiment.

[0012] Another object of the invention is to propose a more compact actuator apparatus.

[0013] Another object of the invention is to propose a more economical actuator apparatus.

[0014] Another object of the invention is to propose an actuator apparatus for actuating a sliding barrier which, with the same barrier, results in less absorption of electrical energy.

[0015] Another object of the invention is to propose an actuator apparatus for actuating a sliding barrier with fewer components, to avoid or limit failures and malfunctions.

[0016] Another object of the invention is to propose an actuator apparatus for actuating a sliding barrier which ensures a mechanical locking of the barrier in any intermediate position between its extreme positions.

[0017] Another object of the invention is to propose an actuator which is perfectly in line with the safety requirements imposed by the sector legislation.

[0018] Another object of the invention is to propose an actuator that improves and/or is alternative to traditional ones.

[0019] Another object of the invention is to propose an actuator apparatus that is simple, quick and inexpensive to install.

[0020] Another object of the invention is to propose a sliding barrier which is provided with an actuator apparatus which is simple to manufacture, has a small size and is not expensive to manufacture and install.

[0021] All these objects, considered either individually or in any combination thereof, and others which will result from the following description are achieved according to the invention with a sliding barrier actuator as defined in claim 1, as well as with a sliding barrier as defined in claim 15.

[0022] The present invention is hereinafter further clarified in some of its preferred embodiments, which are given purely by way of non-limiting example with reference to the attached tables of drawings, in which:

- Figure 1 shows an assembled perspective view of an actuator according to the invention,
- Figure 2 shows it in the same view of fig. 1 after removing the encoder assembly,
- Figure 3 shows it in an exploded perspective view,
- Figure 4 shows it in front view at the output pinion side,
- Figure 5 shows it in a front view opposite to the previous one,
- Figure 6 shows it according to the longitudinal section VI-VI of fig. 4
- Figure 7 shows it according to the longitudinal section VII-VII of fig. 4, e
- Figure 8 shows it in the same view of fig. 5 in a different

embodiment.

[0023] As can be seen from the figures, the actuator apparatus 1 for a sliding barrier, according to the invention, comprises an electric motor which is a torque motor 2 configured to cause the rotation of its output motor shaft 10. Appropriately, the torque motor 2 is brushless and synchronous.

[0024] Advantageously, the actuator apparatus 1 comprises a housing 4 which houses the stator 6 of the motor 2 and supports, by means of bearings 8, the motor shaft 10, to which the rotor 12 of the motor 2 is integral. Suitably, the torque motor 2 comprises only two functional elements: the stator 6 and the rotor 12, which is coupled directly to the shaft 10 to be rotated.

[0025] Appropriately, the motor 2 is intended to be connected and managed by a control and command unit. Conveniently, said control and command unit comprises at least one electronic board.

[0026] Appropriately, the maximum rotation speed of the torque motor 2 under normal operating conditions is not higher than 600 revolutions per minute.

[0027] A pinion 14 is fitted together with the shaft 10, or preferably they are made of a single body, intended to be coupled with a linear gear, preferably a rack 16 (but it could also be a chain), which is applied to the sliding barrier to be moved, not represented.

[0028] In particular, the output of the motor shaft 10 of the motor 2 is provided with a pinion 14 which directly engages - that is, without the interposition of a transmission unit, a gear or other gears - the linear gear 16, preferably a rack, which is integral with the sliding barrier to be moved.

[0029] Conveniently, the pinion 14 has a number of teeth comprised between eight and seventeen. Advantageously, the pinion 14 has a number of teeth not greater than seventeen, preferably not more than twelve and even more preferably not more than eight.

[0030] It is evident from what has now been described that, when the torque motor 2 is supplied, it causes the rotations of the pinion 14 in one direction or the other, and therefore the opening or closing movement of the sliding barrier, to which the linear gear 16, preferably a rack, coupled directly with the pinion 14 associated with the output from the motor shaft 10.

[0031] The actuator apparatus 1 also comprises a locking device comprising:

- at least one engagement member 26, preferably a bolt, which is mounted on a fixed (i.e. non-rotating) component of said actuator apparatus 1,
- a locking member 22 acting on the shaft 10 of said torque motor 2 by means of a damping mechanism,
- means 28, 29 for moving said engagement member 26 between a position in which it engages said locking member 22 and a disengagement position therefrom and, suitably, these means are configured to automatically bring said engagement member 26 into said engagement position when the torque motor 2 is not powered.

[0032] Preferably, the engagement member 26 is mounted on the housing of the torque motor 2.

[0033] Preferably, the locking member 22 is mounted on the shaft 10 of said torque motor 2. Preferably, said locking member 22 comprises a toothed wheel 22 which is mounted in neutral on the shaft 10 of the torque motor 2.

[0034] Preferably, said damping mechanism is interposed between the shaft 10 of the torque motor 2 and the locking member 22. Advantageously, the locking member comprises a toothed wheel 22, in which at least one tooth is designed to be engaged by said engagement member 26 (preferably with bolt), when said torque motor 2 is not supplied; appropriately, said engaging member 26 is associated with an electromagnetic actuator 29 of the monostable type, which brings it in a disengaged condition from said toothed wheel 22 when it is powered and allows that the elastic reaction of at least one elastic element, preferably a spring 28, brings it in an engaged condition when it is not powered.

[0035] Advantageously, said damping mechanism comprises at least one body 18 or 19 which is integral in rotation with the output shaft 10 and which is kept in contact with the locking member 22.

[0036] Advantageously, said damping mechanism comprises at least one friction element 20 or 20' which is interposed between the locking member and said body 18 or 19 which is integral with rotation with the output shaft 10.

[0037] Preferably, said damping mechanism comprises a pair of jaws 18, 19 that are integral with rotation to the output shaft 10 and placed on both sides of said toothed wheel 22 and held elastically clamped thereto. Preferably, each jaw 18, 19 is provided on the side facing said toothed wheel 22 of a friction element 20, 20'.

[0038] Advantageously, the actuator apparatus 1 comprises a further locking member 19 integral with rotation to the output shaft 10 of the torque motor 2 and associated with a further engagement member 25 which is moved by a further electromagnetic actuator 27 which can be operated between one engagement condition of said further locking member 19, when said motor 2 is stationary, and a condition for disengaging said additional locking member 19 when said motor 2 is supplied. Conveniently, the switching of said further electromagnetic actuator 27, being controlled by said control and command unit, coincides with the passage of motor 2 from the condition supplied to the unpowered condition and vice versa.

[0039] Preferably, said further locking member 19 is constituted by a body of said damping mechanism which is integral in rotation with the output shaft 10 and which is kept in contact with the first locking member 22.

[0040] Advantageously, said bodies of the damping mechanism comprise an annular jaw 18 and a further toothed wheel 19 which, preferably, acts as a jaw. In particular, advantageously, the annular jaw 18 is coupled to

the shaft 10 which is configured to be integral in rotation with the shaft itself and also to perform reciprocal movements parallel to the longitudinal direction of development of the rotation axis of the shaft 10. Moreover, suitably, said further (second) toothed wheel 19 is fitted together with the shaft 10. Conveniently, between the jaw 18 and the further toothed wheel 19 is interposed the first toothed wheel 22 (which defines said locking member), which however it is neutral on the shaft 10.

[0041] Advantageously, both the jaw 18 and the further toothed wheel 19 are associated, on the side facing the first toothed wheel 22, with friction rings 20, 20'.

[0042] Advantageously, the annular jaw 18 is pushed in the direction of the further toothed wheel 19 by one or more springs 24, preferably adjustable in order to regulate the force, with which the interposed first toothed wheel 22 is pressed between the two.

[0043] Advantageously, to the housing 4 of the motor 2 at the first toothed wheel 22 it is applied a first bolt 26 axially movable between the engagement position of the teeth of the second toothed wheel 22 and a position of disengagement therefrom.

[0044] Advantageously, the first bolt 26 is associated with a second monostable electromagnet 23; preferably, for this purpose, a spring 28 is provided, which tends to keep said second bolt in the engagement position of the second toothed wheel 22, from which it is removed when its electromagnet 23 is energized by the same supply current of the torque motor 2.

[0045] Advantageously, a second bolt 25 movable axially between the engagement position of the teeth of the first toothed wheel 19 and a position of disengagement therefrom can also be applied to the housing 4 of the motor 2 at the second toothed wheel 19. Advantageously, the second bolt 25 is associated with a first bistable type electromagnet 27.

[0046] Conveniently, in the illustrated example both the bolts 25, 26 are provided with a single space engagement tooth delimited by two successive teeth of the respective toothed wheel 19, 22, but an analogous result could also be obtained with two bolts 25', 26' (see Fig. 8), having several teeth simultaneously engaged between several spaces delimited by several successive teeth of the two toothed wheels 19, 22 respectively; on the contrary, advantageously, in this case the engagement between bolts and toothed wheels could be easier, safer and more immediate.

[0047] Advantageously, a gear chain can be associated to the output shaft 10 of the torque motor 2, indicated as a whole with the reference 29, with a revolving gear reduction effect.

[0048] Appropriately, at least part of said gears of the chain 29 and/or of the respective rotation shafts are provided with magnetic means 50, 52, 54 cooperating with sensors connected to said control and command unit for processing the signals generated by said sensors for determining the position of said barrier during its travel. Preferably, said magnetic means are constituted by a magnet 50 housed within the output shaft 10 of the pinion 14 and/or by magnets 52 and 54 housed within the rotation shaft 38 and 48 of the respective gears 36 and 46, and having magnetization axis oriented in diametral direction.

[0049] Advantageously, the housing 4 of the torque motor 2 extends into a cylindrical portion 30, which in addition to housing both the toothed wheels 19, 22 also houses the chain of gears 29 having the function of controlling the movement of the sliding barrier.

[0050] Preferably, in the embodiment shown, this gear chain 29 comprises a first gear 32 integral with the driving shaft 10 and a second gear 34, coupled to the first gear 32 and such that the reduction ratio between the first gear 32 and the second gear 34 is preferably comprised between 1: 3 and 1: 4. To the same shaft 38, which supports the gear 34 with respect to the cylindrical portion 30 of the housing 4, a smaller third gear 35 is also fitted together, which is coupled to a fourth gear 37, with which it has a coupling ratio preferably comprises between 1: 3 and 1: 4. Also the shaft 38, which supports the fourth gear 37, is fitted together a fifth gear 40, of smaller diameter, which is coupled to a sixth gear 42, of a larger diameter and such that also in this case the coupling ratio between the fifth gear 40 and the sixth gear 42 is preferably between 1: 3 and 1: 5. A seventh gear 45 is fitted together with the shaft 44 supporting this sixth gear 42, which in turn is coupled to an eighth gear 46 with a coupling ratio preferably of 1: 3 - 1: 5. Therefore, preferably, the total coupling ratio between the first gear 32 and the eighth gear 46 is preferably between 1:81 and 1: 400.

[0051] Advantageously, moreover, in the shaft 10 of the first gear 32, in the vicinity thereof, in the shaft 38 of the fourth gear 37 and in the shaft 48 of the eighth gear 46 is housed a small cylindrical magnet respectively 50, 52, 54, with the two diametrically opposed N and S polarities, interacting with corresponding sensors connected to the control and command unit (and in particular to a corresponding electronic board) that processes the signals received from them.

[0052] The operation of the actuator apparatus 1 according to the invention is as follows: in normal operating conditions, when the barrier is closed, the second electromagnet 27 maintains the second bolt 25 engaged with the second toothed wheel 19 and the first electromagnet 23, which is not powered, allows the elastic element (preferably spring-loaded) 28 to maintain the first bolt 26 engaged with the second toothed wheel 22. The overall result is that the two bolts 25, 26 keep the motor 2 blocked, preventing the actuation of the barrier by direct manual thrust on it.

[0053] If the barrier is to be opened from this condition, it is sufficient to provide a suitable direct or radio command to the system management and control unit, which supplies the two electromagnets 27, 23 and the motor 2.

[0054] Conveniently, the activation of the first electromagnet 27 causes its stable switching in the disengagement position of the second bolt 25 from the second toothed wheel 19; the activation of the first electromagnet

23 causes the temporary disengagement of the first bolt 26 from the first toothed wheel 22 in contrast with the elastic reaction of the spring 28.

[0055] Appropriately, the power supply of the motor 2 causes the rotation of its pinion 14 which, by engaging directly with the linear gear 16 (preferably a rack), causes the opening movement of the barrier.

[0056] During this movement the gear chain 29 and the interaction between the rotating magnets 50, 52, 54 and the respective sensors allows the control and command unit to control the position of the barrier at any time.

[0057] Therefore, when the barrier has reached the limit switch in opening, the control and command unit itself detects this situation and, in addition to commanding the interruption of the power supply of the motor 2, commands the interruption of the power supply of the first electromagnet 23, so that the elastic reaction of the spring 28 controls the first bolt 26 to engage the teeth of the first toothed wheel 22. Conveniently, when the barrier has reached the end of stroke, the control and command unit also controls the commutation of the second electromagnet 27, so that the second bolt 25 engages the teeth of the second toothed wheel 19.

[0058] For the movement of the closing barrier, the same operations are carried out in a similar manner, with the rotation, however, of the motor 2 in the opposite direction.

[0059] In order to block the barrier in an intermediate position between the extreme ones (i.e. complete closing or full opening), it is planned to give the control and command unit a suitable manual or radio control, so that this acts as if the barrier were in an end position.

[0060] Advantageously, the slowest gear 46 of said gear chain 29 is configured to have a rotation period inferior to the duration of the travel of said barrier between the closed condition and the open condition. Preferably, in the embodiment described and represented, a complete rotation of the magnet 54 mounted on the shaft 48 of the eighth gear 46 corresponds to the maximum linear design excursion of the sliding barrier and this in order to maintain a biunique correspondence between the linear position of the barrier and the angular position of the magnet 54.

[0061] Advantageously, the magnet 50 of the shaft 10 determines and also controls the rotation of the magnetic field, which causes rotation of the torque motor 2.

[0062] Should the power supply to motor 2 suddenly fail for any reason while this is operating to move the barrier, the second bolt 25 would remain disengaged from the second toothed wheel 19 while the first bolt 26 would be immediately activated while the barrier continues to move forward due to inertia, with the risk of damaging the first bolt 26 and/or the first toothed wheel 22, from this engaged. Advantageously, to avoid this, the damping coupling, and suitably frictioned, between the shaft 10 of the motor 2 and the first toothed wheel 22, which allows the shaft 10, which is mechanically coupled directly with the linear gear 16 (preferably rack), to continue its rotation by the inertia of the whole moving part, even if the first toothed wheel 22 is locked.

[0063] What has been outlined now shows how it is possible to use as a torque motor a sliding barrier actuator, never used for this specific application, and to eliminate all the drawbacks linked to the non-irreversibility of this type of movement.

[0064] An advantage of the invention consists in the reduced overall dimensions of the actuator apparatus, thanks to the elimination of the reduction gear, which in the traditional actuators entails a significant encumbrance.

[0065] Another advantage of the invention, linked to the previous one, consists in the fact that the elimination of the gear reducer in addition to reducing costs for the elimination of an expensive component, also entails a greater reliability of the actuator 1, since each further component involves further risks of breakdowns or breakages due to its presence.

[0066] In particular, unlike US4887205, in the actuator apparatus 1 according to the present invention the motor is of the torque type and is coupled directly - without the interposition of transmission or reduction units - with the linear gear integral with the sliding barrier and this is particularly advantageous in that it allows completely eliminating all the intermediate gears which, in US 4887205, are interposed between the pinion secured to the output of the driving shaft and the chain integral with the sliding barrier. More in detail, the engine of US 4887205 is not a torque engine as it requires precisely the presence of a plurality of gears to reduce the rotation speed of the shaft of the engine and to increase the torque at the same time. Moreover, unlike US4887205, in the actuation apparatus 1 according to the present invention a locking member is provided which acts on the rotation shaft of the torque motor by means of a damping mechanism.

[0067] Another advantage of the invention consists in the possibility of having a secure mechanical locking of the barrier at both ends as well as in any desired intermediate position.

Claims

1. Actuator apparatus (1) for sliding barrier **characterized in that** it comprises an electric motor which is a torque motor (2) operated by a control and command unit and configured to cause the rotation of its output shaft (10) which is provided with a pinion (14) designed to be coupled directly with a linear gear (16) integral with said barrier, said actuating apparatus (1) being also **characterized in that** it comprises a locking device comprising:

    - at least one engagement member (26) which is mounted on a fixed part (4) of said actuator apparatus (1),
    - a locking member (22) acting on the shaft (10)

of said torque motor (2) by means of a damping mechanism (18, 18', 20, 20', 24),
- means (28, 29) for moving said engagement member (26) between an engagement position of said locking member (22) and a disengagement position therefrom, said means being configured to automatically bring said engagement member (26) in said engagement position when said torque motor (2) is not powered.

2. Actuator apparatus (1) according to claim 1 **characterized in that** said torque motor (2) is configured to cause the rotation of said output shaft (10) at a rotation speed not higher than 600 rpm.

3. Actuator apparatus (1) according to one or more of the previous claims **characterized in that** said locking member (22) is mounted neutral on said shaft of said torque motor (2) and **in that** said damping mechanism (18, 18', 20, 20', 24) is interposed between said shaft (10) of said torque motor (2) and said locking member (22) and comprises at least one body (18, 19) which is integral with the rotation of the output shaft (10) and which is maintained in direct or indirect contact with said locking member (22).

4. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** said locking member comprises a toothed wheel (22) of which at least one tooth is designed to be engaged by a bolt engagement member (26) when said torque motor (2) is not powered, to said bolt engagement member (26) being associated with an electromagnetic actuator (23) of the monostable type which brings it in a disengaged condition from said toothed wheel (22), when it is powered, and it allows the elastic reaction of at least one elastic element (28) to bring it into a engaged condition when it is not powered.

5. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** said damping mechanism comprises at least one friction element (20, 20') which is interposed between the locking member (22) and said body (18, 19) that is integral with the rotation of the output shaft (10).

6. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** said locking member comprises a toothed wheel (22) mounted neutral on said shaft of said torque motor (2) and **in that** said damping mechanism comprises a pair of jaws (18, 19) integral in rotation to the output shaft (10), placed on both sides of said toothed wheel (22) and held elastically clamped thereto.

7. Actuator apparatus (1) according to the previous claim **characterized in that** each jaw (18, 19) is provided on the side facing said toothed wheel (22) of a friction element (20, 20').

8. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** at least one of said bodies (18, 19), that is integral with the rotation of the output shaft (10), is associated with at least one adjustable elastic element (24) for adjusting the pushing force of at least one of said bodies (18, 19) against said locking member (22).

9. Actuator apparatus (1) according to one or more of the preceding claims, **characterized in that** to the output shaft (10) of said torque motor (2) is associated a chain (29) of gears (32, 34, 35, 37, 40, 42, 45, 46) with a revolving rotor, in which at least part of said gears and/or respective rotation shafts are provided with magnetic means (50, 52, 54) cooperating with sensors connected to said control and command unit for processing the signals generated by said sensors for determining the position of said barrier during its travel.

10. Actuator apparatus (1) according to one or more of the preceding claims, **characterized in that** the slowest gear (46) in said chain (29) of gears (32, 34, 35, 37, 40, 42, 45, 46) is configured to have a rotation period equal to and/or less than the travel duration of said barrier between the closing condition and the opening condition.

11. Actuator apparatus (1) according to one or more of the preceding claims, **characterized in that** said magnetic means are constituted by a magnet (50, 52, 54) housed within the rotation shaft (10, 38, 48) of the respective gear (14, 36, 46) and having the magnetization axis oriented in diametrical direction.

12. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** it comprises a further locking member (19) integral with the rotation of said shaft (10) of said torque motor (2) and associated to a further engagement member (25) which is moved, by a further electromagnetic actuator (27) having a bistable operation, between a condition of engagement of said further locking member (19), when said motor (2) is stationary, and a condition of disengagement of said further locking member (19) when said motor (2) is powered, the switching of said further electromagnetic actuator (27) being controlled by said control and command unit and coinciding with the passage of said motor (2) from the powered condition to the unpowered condition, and the other way around.

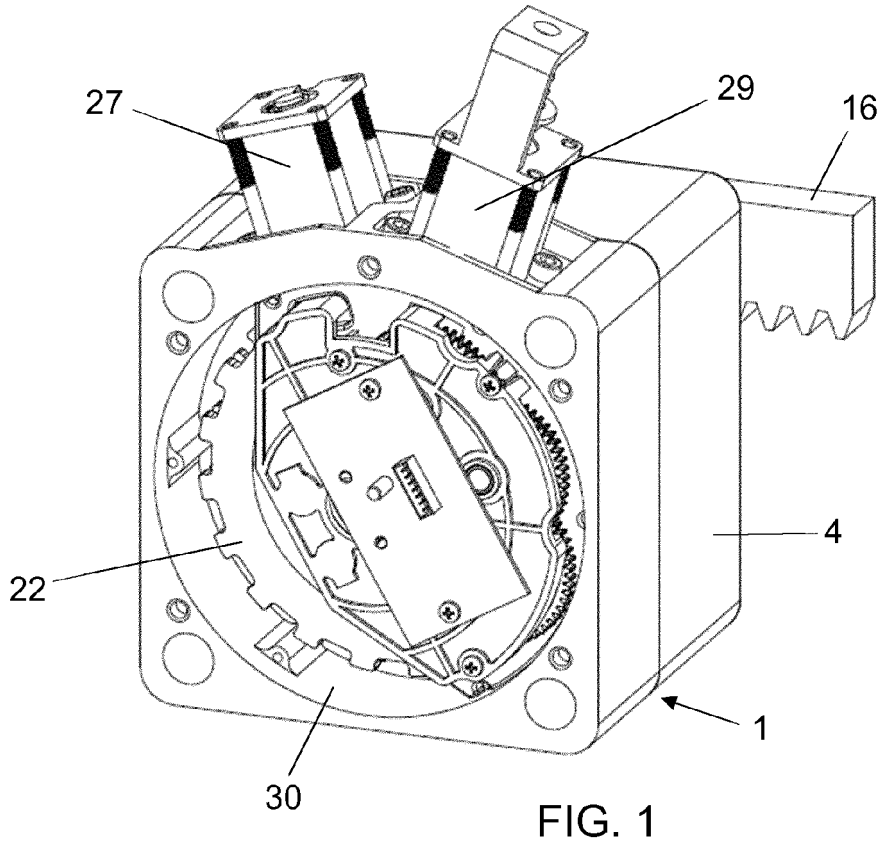
13. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** said further locking member comprises a further toothed

wheel (19) which is mechanically constrained and integral with the shaft (10) of said torque motor (2) and that said further engagement member comprises a bolt (25) configured to engage at least one tooth of said further toothed wheel (19).

14. Actuator apparatus (1) according to one or more of the preceding claims **characterized in that** one of said bodies (18, 19), which is integral with the rotation of the output shaft (10), of said damping mechanism comprises said further locking member (19).

15. Installation of closing an access or a passage, comprising:

- a sliding barrier integral with a linear gear (16), and
- an actuator apparatus (1) according to one or more of the preceding claims in which the pinion (14) provided at the output of said shaft (10) is coupled directly, without reduction gear and/or other transmission gears, to said linear gear (16), and
- a unit for commanding and controlling the electric motor (2) and the locking device of said actuator apparatus.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22
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FIG. 1

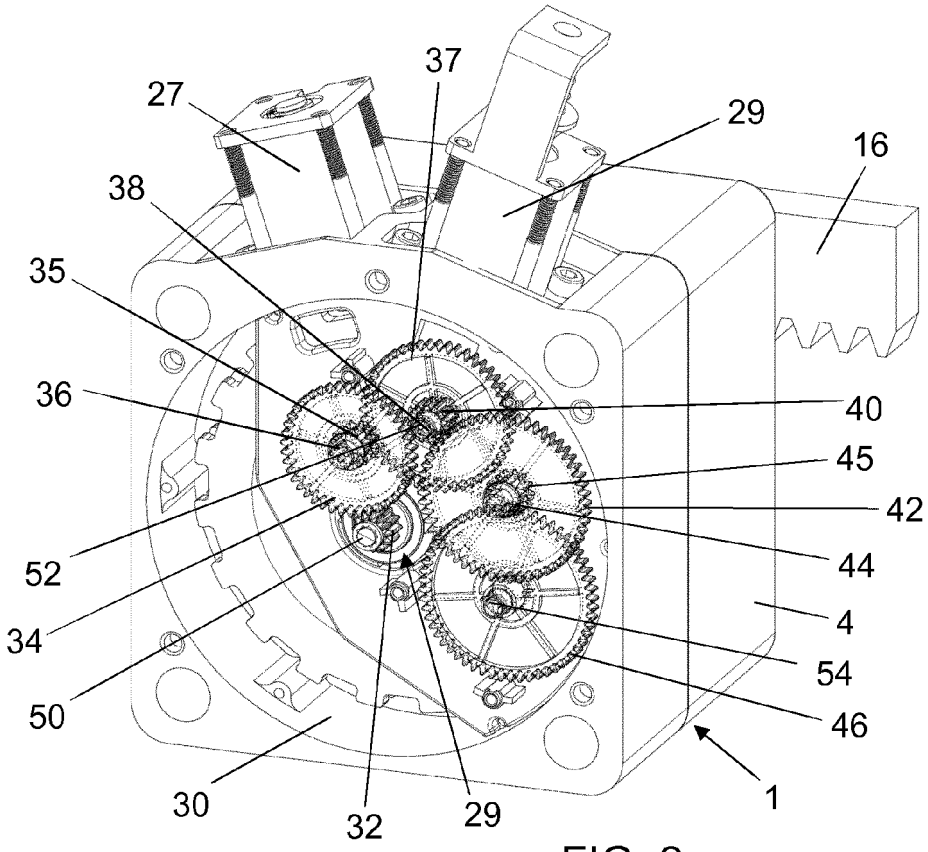
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FIG. 2

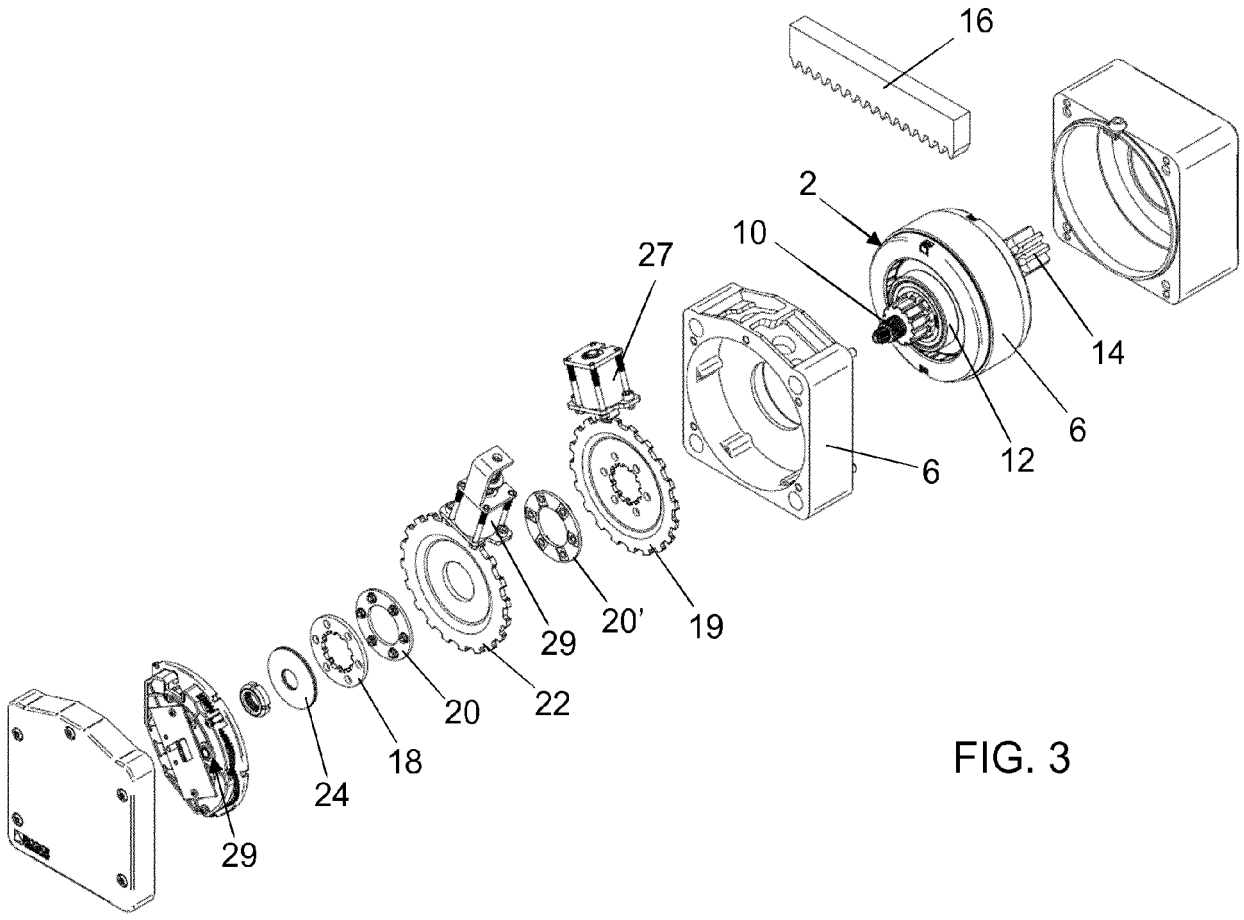


FIG. 3

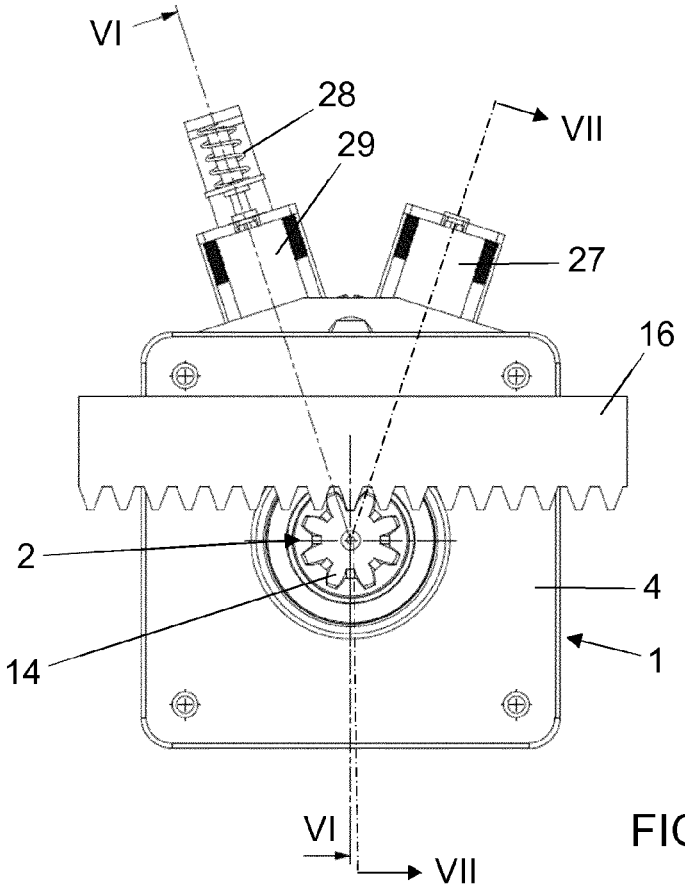


FIG. 4

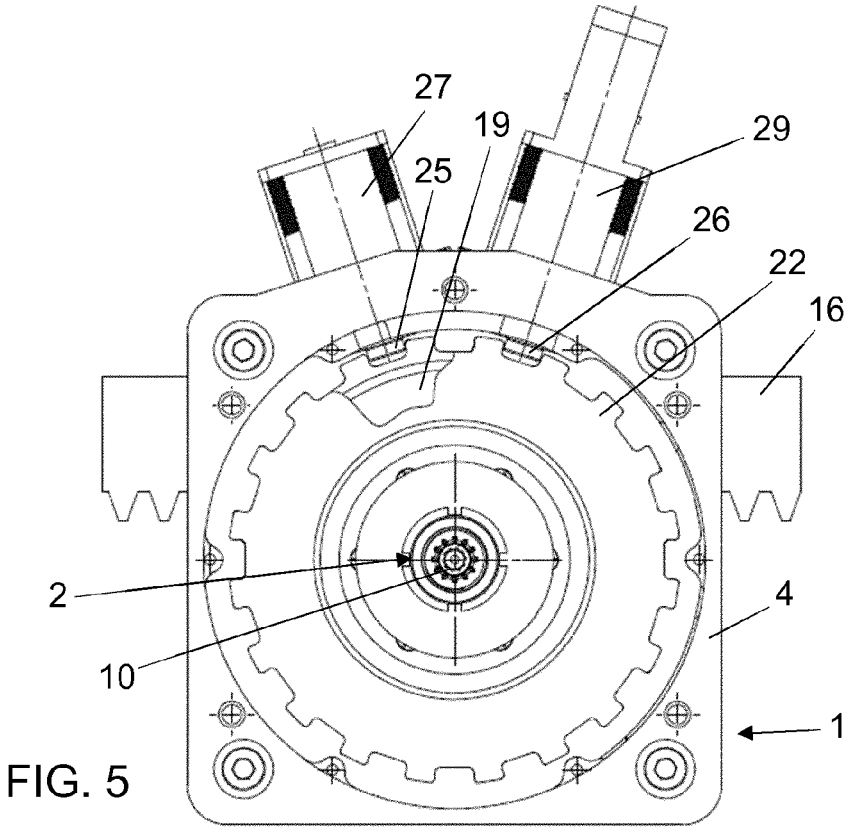
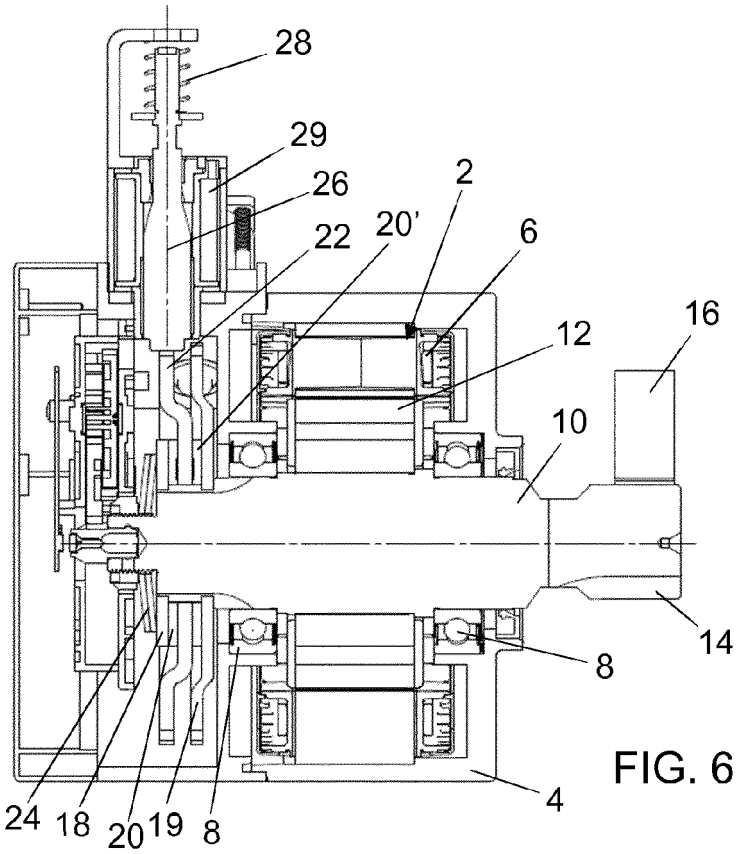


FIG. 5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29
26
22
20'
2
6
12
16
10
14
8
4
24
18
20
19
8

FIG. 6

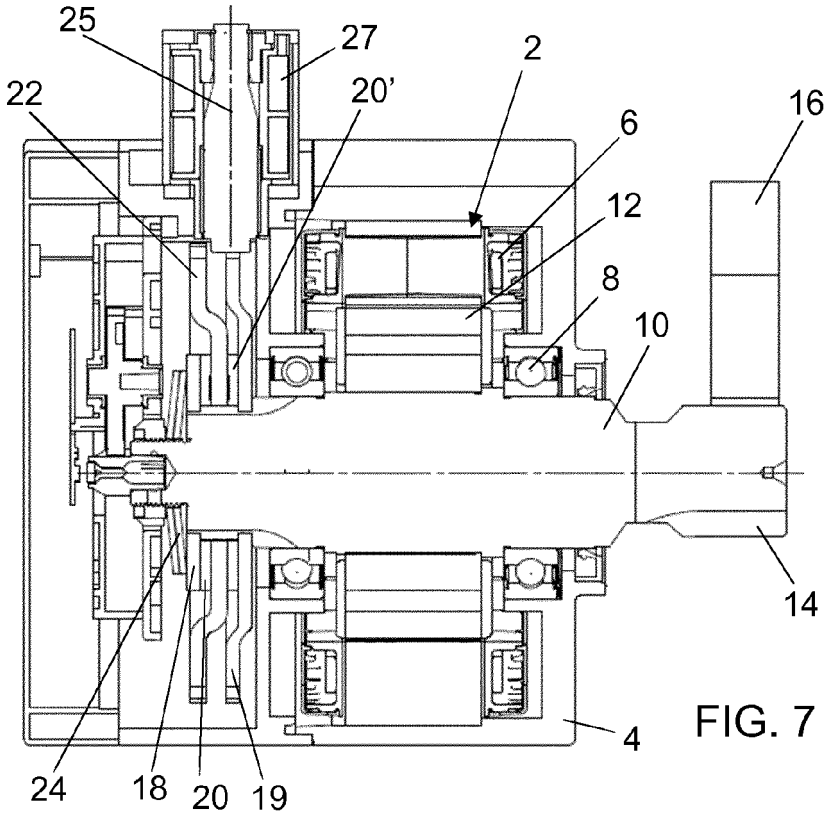
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FIG. 7

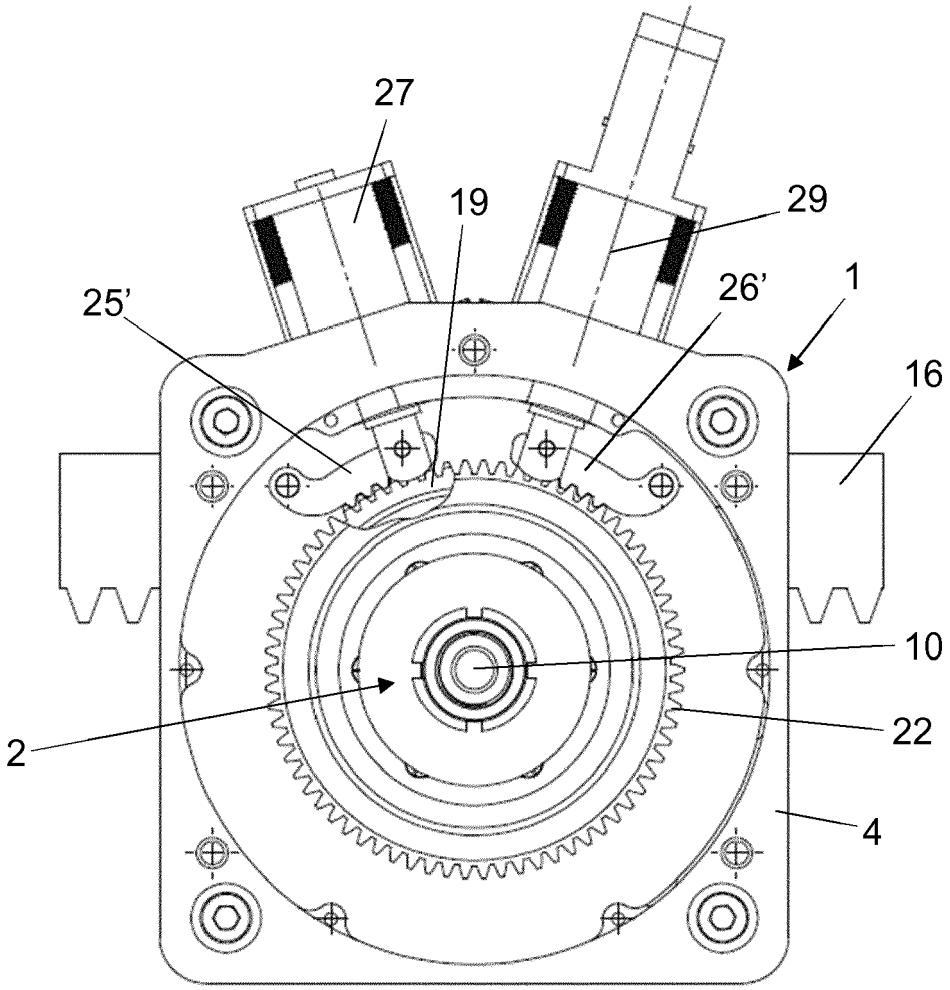

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 18 21 4123

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 A	US 4 887 205 A (CHOU TOM M [US]) 12 December 1989 (1989-12-12) * column 3, line 49 - column 4, line 37; figure 1a *	1-4, 9-12,15 5-8,13, 14	INV. E05F15/635
X	DE 10 2005 051722 A1 (ELKA TORANTRIEBE GMBH & CO BET [DE]) 10 May 2007 (2007-05-10) * paragraphs [0021], [0024], [0033]; figures 1,3,4 *	1-4,12, 15	
A	EP 1 770 238 A2 (ROGER TECHNOLOGY S N C DI FLOR [IT]) 4 April 2007 (2007-04-04) * paragraph [0010]; figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (IPC) E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 May 2019	Klemke, Beate

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10-05-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4887205 A	12-12-1989	NONE	
DE 102005051722 A1	10-05-2007	NONE	
EP 1770238 A2	04-04-2007	EP 1770238 A2	04-04-2007
		IT VE20050029 U1	24-03-2007

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Patent documents cited in the description

- US 4887205 A **[0006] [0066]**