(19) Europäisches Patentamt
European Patent Office
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(11) **EP 2 754 848 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.07.2014 Bulletin 2014/29

(51) Int Cl.:
E06B 9/84 *(2006.01)*

(21) Application number: **13198740.6**

(22) Date of filing: **20.12.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **14.01.2013 IT MC20130002**

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(54) **A shock-absorbed stop device for rolling shutters or sectional doors**

(57) A shock-absorbed stop device or rolling shutters or sectional doors, capable of automatically intervening in case of accidental descend of the shutter, and adapted to dissipate by friction the kinetic energy accumulated by the shutter. Said device (A) comprises a bearing case (1) wherein a cursor (B) is enclosed and braked by a pair of jaws (15) associated with a tightening screw (14) contained inside the bearing case (1), the head (14a) of which can be anyhow accessed from the outside of the case (1) through a hole (1 c) obtained on one (1 b") of the two lateral walls (1 b' and 1 b") of the case (1), which is also provided with a window (10) through which the cursor (B) can be reloaded.

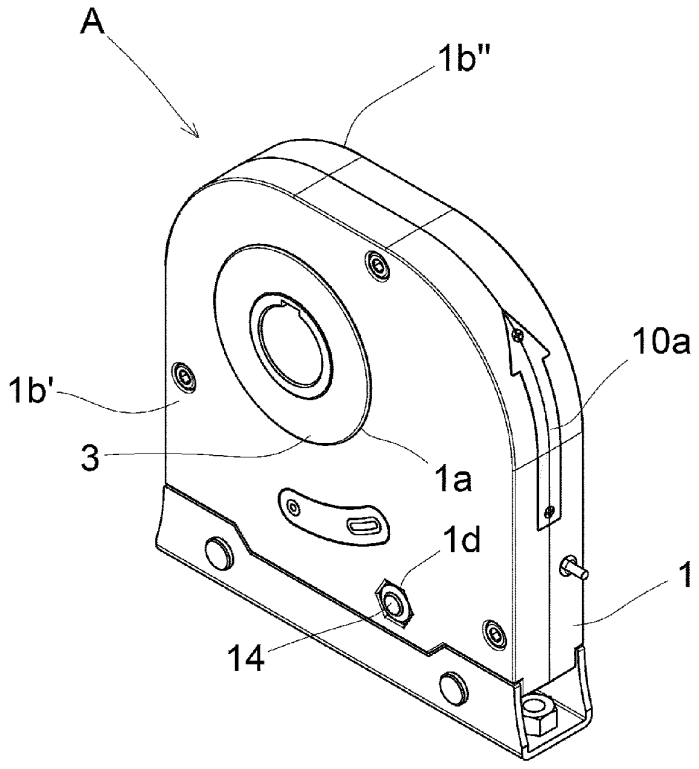

FIG. 1

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Description

[0001] The present patent application for industrial invention relates to a shock-absorbed stop device for rolling shutters or sectional doors, capable of automatically intervening in case of accidental descend of the shutter, and adapted to dissipate by friction the kinetic energy accumulated by the shutter. The device in question may be defined as an emergency automatic brake, which is technically defined as "cushioned parachute".

[0002] The working of this type of emergency brakes is fundamentally based on a self-blocking system that, before the rolling shutter comes to a halt following to free descent, provides for a short braking stroke during which part of the kinetic energy acquired by the rolling shaft of the shutter as a result of its uncontrolled descend is dissipated, usually by friction.

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

[0004] In the German patent No. DE 3140792 a "cushioned parachute" is described, which comprises a special toothed wheel, keyed in the rolling shaft of the shutter and enclosed within an opposite pair of round-shaped side covers, tightened one against the other by means of an annular series of bolts that also cross a revolving ring positioned between the covers and exactly enclosing said toothed wheel.

[0005] This ring is housed, with the possibility of freely rotating, within a hole made on a fixed supporting plate, which is slightly thicker than said ring, so that the edges of the side covers adhere to the two faces of said fixed plate and not to the faces of the ring that it contains.

[0006] Within the spaces that separate the teeth of the aforementioned toothed wheel, there are positioned cylindrical rollers that, should the shutter accidentally descend, are expelled by centrifugal force from their housing and remain embedded within a space provided along the internal circumference of the aforementioned ring, which is driven into rotation by the toothed wheel by means of the cylindrical rollers embedded therein.

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

[0008] When the covers start to rotate, this immediately brings about a braking action on said ring, due to the fact that the edge of said covers comes into contact with the faces of the fixed support plate, thereby dissipating energy through friction. The blocking of the toothed wheel, at the end of the braking stroke, takes place indirectly, thereby causing the blocking of the ring by means of a rabbet pin fitted on the fixed support plate, but sliding within a seat grooved along the external circumference of the ring, the blocking of which therefore follows the mechanical interference of said pin with one of the two end corners of said seat. The "cushioned parachutes" of known type are impaired by an inconvenience, which consists in the fact that they cannot be reloaded easily and quickly, after they have been actuated and exerted their braking and blocking action against the shutter in accidental free descent.

[0009] As illustrated above, said braking action derives from the interference between two surfaces that are interfaced and clamped one against the other, which belong to two parts of the brake that are normally stopped, between which a relative motion is accidentally generated, so that one of said parts remains stopped, whereas the other one is suddenly moved, with consequent high energy dissipation by friction due to the strong rubbing between the two interfaced surfaces.

[0010] Once the "parachute" has started to operate and the shutter has been stopped, it is evident that in order to reload the safety brake, the part that has suddenly started to move must undergo a backward travel until it is brought back to its initial idle position.

[0011] Obviously, such a backward travel can only take place by overcoming the high friction force that had allowed to slow down the free descent of the shutter in a very few seconds during the intervention of the emergency brake.

[0012] The friction force is so high that it is impossible to reload the device on the spot, without dismounting the "parachute" from the rolling shaft of the shutter. As a matter of fact, the device must be normally reloaded in the workshop, after dismounting the old "parachute" and replacing it with a new one.

[0013] The primary purpose of the present invention is to devise a shock-absorbed stop device for rolling shutters or sectional doors that can be reloaded rapidly and easily, without dismounting the rolling shaft of the shutter or sectional door. Another purpose of the invention is to devise a shock-absorbed stop device for rolling shutters or sectional doors wherein the braking action has a progressively increasing intensity.

[0014] These and other purposes, which will become evident in the following description, have been obtained by the device of the invention, the primary and secondary characteristics of which are respectively described in the attached first claim and in the following claims that depend or sub-depend on the first claim.

[0015] The new shock-absorbed stop device for rolling shutters or sectional doors comprises a box frame or bearing case, substantially configured as a tall narrow case with basically square shape.

[0016] The bearing case houses a retention ratchet gear of known type, which comprises a catch that oscillates around a horizontal axis and cooperates with a wheel provided with a peripheral series of regularly spaced claws.

[0017] Said clawed wheel is provided with a hub in order to support and center the wheel inside a circular housing, especially provided on the walls of said case, it being evident that said clawed wheel is adapted to be keyed in the horizontal rolling shaft of the shutter.

[0018] The support pin of said oscillating catch is in turn supported by a cursor formed of a side-by-side pair of identical vertical plates, between which an empty space is provided to receive said catch.

[0019] Said vertical plates are provided with a hole, the center of which coincides with the center of the hub of said clawed wheel and are connected by means of peripheral bolts, with the interposition of spacing collars.

[0020] The two identical vertical plates are provided on the border with an arc with toothed section that engages with corresponding pinions keyed in the same pin with horizontal axis, free to idle with respect to the two end housings obtained on the opposite walls of said bearing case, provided in turn with a narrow window used to access said pin, which has a polygonal central section adapted to be coupled with an ordinary wrench.

[0021] Said cursor is associated with an arched appendage consisting in a sort of fin, which is provided with a curvilinear slot, formed of an arc of circumference having its center coinciding with the center of the hub of said clawed wheel. Said curvilinear slot is crossed by the stem of a screw, preferably an Allen screw, the head of which is housed inside a circular hole obtained on one of the walls of said case, whereas its nut is exactly housed inside a polygonal hole obtained on the other wall, opposite the first wall, of said case.

[0022] Practically, said Allen screw is joined to the case and its stem is free to slide along said curvilinear slot when said appendage starts rotating, together with the cursor that supports it, around the hub of said clawed wheel.

[0023] Evidently, such a condition occurs only when the shutter accidentally enters a free descent, with consequent engagement of the ratchet gear, meaning that the catch is engaged between the claws of the clawed tooth that drives it into rotation around the rolling axis of the shutter.

[0024] The Italian patent No. 262160 discloses the operation mode of said ratchet gear of known type, and particularly illustrates the reason for which it tends to get jammed when the rotation speed of the clawed wheel exceeds a predefined value during the descent of the shutter.

[0025] When said ratchet gear gets jammed, the supporting cursor is driven into rotation, together with its arched appendage, with consequent sliding of the stem of the Allen screw inside the slot until the cursor is stopped against a projection obtained on the bearing case.

[0026] Obviously, the stop of the cursor corresponds to the stop of the appendage and indirectly to the stop of the clawed wheel, which is stopped by the catch that is joined with the cursor.

[0027] A large part of the kinetic energy acquired by the shutter in free descent is dissipated by friction during the sliding of the stem of said Allen screw inside the slot.

[0028] More precisely, the surfaces on which a high resistance is developed by friction are the two opposite sides of said fin-shaped appendage, which are clamped between a pair of jaws that are tightened by means of the Allen screw. According to the preferred embodiment of the invention said pair of jaws is obtained by means of a simple, inexpensive pair of washers inserted along the stem of the Allen screw.

[0029] In order to generate a progressively increasing resistance, the two opposite sides of said appendage are not parallel, and diverge slightly. In other words, it may be said that the thickness of said appendage is not constant, but slightly increasing when progressively moving along the curvilinear slot in the same direction as the stem of the Allen screw when a relative motion is accidentally generated between the revolving cursor and the fixed Allen screw.

[0030] In order to reload the emergency brake of the invention, it is simply necessary to intervene on said Allen screw in order to set to zero the tightening pressure of said jaws. Such an operation is made easier by the presence of said hole on one of the walls of the bearing case that provides access to the head of the Allen screw in order to unscrew it with an ordinary Allen wrench.

[0031] After loosening the jaws, the cursor can be easily driven into inverse rotation around the hub of the clawed wheel. This operation simply requires driving into rotation the pair of pinions that engage with the toothed section obtained on said cursor.

[0032] After bringing the cursor back to its initial idle position, it is simply necessary to tighten the jaws again with a dynamometric Allen wrench in order to tighten the Allen screw with a predefined value.

[0033] For explanatory reasons, the description of the stop device of the invention continues with reference to the attached drawings, which only have an illustrative, not limiting value, wherein:

- Fig. 1 is an axonometric view of the device of the invention;
- Fig. 2 is basically the same as Fig. 1, except in that the front lid of the support case has been removed. In this figure, the various parts are shown in the position taken during the normal operation of the shutter, when the emergency brake has not been actuated yet to stop the accidental travel of the shutter in free fall;
- Fig. 3 is substantially identical to Fig. 2, except in that an element has been eliminated in order to show the parts behind it. In this figure the tooth is shown in the position taken when the ratchet gear enters the gripping step;
- Fig. 4 is substantially identical to Fig. 2 except in that the various parts are shown in the position taken after the actuation of the emergency brake to stop the accidental travel of the shutter in free fall;
- Fig. 5 is substantially identical to Fig. 4, except in that a part has been removed in order to show the parts behind it;
- Figs. 6A to 6C are views and sections of said fin-shaped arched appendix;

- Figs. 7A and 7B are a diagrammatic view of the first operation required to reload the device of the invention;
- Figs. 8A and 8B are a diagrammatic view of the second operation required to re-fit the device of the invention;
- Fig. 9 is a diagrammatic view of the third operation required to re-fit the device of the invention.

[0034] Referring to the aforementioned figures, the new shock-absorbed stop device (A) for rolling shutters or sectional doors of the invention comprises a box frame or bearing case (1), substantially having the configuration of a tall narrow case with basically square shape.

[0035] As shown in Fig. 3, the bearing case (1) houses a ratchet gear comprising a catch (2) that oscillates around a horizontal axis (X) and cooperates with a wheel (3) provided with a peripheral series of regularly spaced claws.

[0036] Said clawed wheel (3) is provided with a hub (3a) for support and centering inside a circular housing (1 a), especially provided on the walls (1 b' and 1 b") of said case (1), it being evident that said clawed wheel (3) is adapted to be keyed in the horizontal rolling shaft of the shutter, not shown in the figure.

[0037] Said catch (2) is of oscillating type and oscillates around a central support pin (2a).

[0038] The head (2b) of said catch (2) is heavier than its tail (2c), which is shaped in such manner to rhythmically come in contact with the claws of said clawed wheel (3), receiving a sufficient thrust to overturn the catch (2) upwards momentarily, in spite of the unbalanced weidht of its head (2b).

[0039] The support pin (2a) of said oscillating catch (2) is supported by a cursor (B), which is preferably formed of a parallel pair of identical vertical plates (4) with rounded shape, among which an empty space (5) remains, wherein said catch (2) together with the clawed tooth (3) remains enclosed.

[0040] Said vertical plates (4) are provided with a hole (4a), with center coinciding with the center of the hub (3a) of said clawed wheel (3) and are connected by means of peripheral bolts (6) with the interposition of spacing collars (6a).

[0041] These two identical plates are provided (4) on the border (4b) with an arch (7) with toothed profile, which engages with corresponding pinions (8) keyed in the same pin (9) with horizontal axis (X') in parallel direction to (X).

[0042] Said arch (7) coincides with an arc of circumference having its center on the axis of rotation of the clawed wheel (3).

[0043] The pin (9) is free to rotate idle with respect to its ending seats, obtained on the internal side of the opposite walls (1 b' and 1 b") of said bearing case (1), which is in turn provided with a narrow opening (10) covered by a removable lid (10a) Said pin (9) is provided with a central section (9a) with polygonal section, adapted to be conjugated with a common wrench (C), as shown in Figs. 8A and 8B.

[0044] By means of fixing screws (11) said cursor (B) is associated with an arched appendage (12), consisting in a sort of fin, which is provided with a curvilinear slot (13) - the longitudinal axis of which coincides with an arc of circumference having its center (O) coinciding with the center of the hub of said clawed wheel (3).

[0045] Said curvilinear slot (13) is crossed by the stem of an Allen screw (14) with horizontal axis (X") parallel to (X).

[0046] The head (14a) of said Allen screw (14) is housed inside a circular hole (1 c) obtained in one (1 b") of the walls (1 b' and 1 b") of said case (1), whereas its nut (14b) is exactly housed inside a polygonal hole (1 d) obtained on the other wall (1 b') of the case (1).

[0047] Although said Allen screw (1 is joined with the bearing case (1), its stem is free to slide without friction inside said slot (13) when said appendage (12) enters into rotation, together with the cursor (B) supporting it, around the axis of rotation of said clawed wheel (3).

[0048] By means of the Allen screw (14) a pair of jaws (15) is tightened, with the appendage (12) between them, the opposite sides of which (12a) adhere to said jaws (15) that according to the preferred embodiment of the invention consist in two washers (15) inserted into the Allen screw (14).

[0049] Said two opposite sides (12a) of said appendage (12) are not parallel, and diverge slightly; in view of the above, the thickness of said appendage (12) is not constant, but slightly increasing, passing from thickness (S1) to thickness (S2>S1) when gradually moving along the curvilinear slot (13) in the same traveling direction - indicated by the arrow (F) in Fig. 6B - of the stem of said Allen screw (14) when the cursor (B) starts rotating around the hub (3a) of the clawed wheel (3).

[0050] The comparison of Figs. 3 and 5 shows that, after the cursor (B) starts rotating, being driven by the catch momentarily and accidentally engaged between the claws of the wheel (3), the stem of the Allen screw (14) moves along the curvilinear slot (13) in the direction indicated by the arrow (F), encountering an increasing friction resistance caused by the aforesaid divergence of the opposite sides (12a).

[0051] In any case, the rotation of the cursor (B) stops when its peripheral tooth (16) interferes at the end of the sliding travel against a projecting part (17) internally obtained in the case (1), as shown in Fig. 5.

[0052] To reload the device (A) of the invention it is first of all necessary to intervene on the Allen screw (14) in order to set the tightening pressure of said jaws (15) at zero. Such an operation is made it easier by the presence of said hole (1 c) that houses the head (14a) of the Allen screw (14) wherein an Allen wrench (CB) is inserted, as shown in Figs. 7A and 7B.

[0053] After loosening the jaws (15), the cursor (B) is easily driven into inverse rotation around the hub (3a) of the clawed wheel (3). Such an operation only requires

driving into rotation the pair of pinions (8) that engage with the toothed sections (7) obtained on said cursor (B).

[0054] Such an operation can be easily made by inserting an ordinary wrench (C) into said window (10) until it engages with the faceted central section (9a) of the pin (9), as shown in Figs. 8A and 8B.

[0055] After bringing the cursor (B) back to the initial idle position (as shown in Fig. 2), it is simply necessary to tighten the jaws (15) again by tightening the Allen screw (14) with a dynamometric wrench (CD) in order to exactly calibrate tightening.

[0056] Reference number (18) is used to indicate a microswitch housed inside the case (1) and adapted to be excited by means of interference with said appendage (12) when the cursor (B) starts rotating.

[0057] If excited, the microswitch (18) stops the power to the electrical motor that is used to automate the rolling shutter or sectional door.

[0058] Finally, the importance of having a braking action with progressively increasing intensity must be pointed out.

[0059] As a matter of fact, if the braking action started with high intensity value, a dangerous repercussion would be created on the rolling shaft of the shutter that, in some cases, might even invert the direction of rotation of the shaft, thus impairing the "parachute" efficacy.

[0060] This is the case when the "parachute" intervenes when the roller is partially unwound, thus generating the accumulation of a modest amount of kinetic energy.

Claims

1. A shock-absorbed stop device for rolling shutters or sectional doors, comprising a bearing case (1) wherein a clawed wheel (3) is housed and rotates with respect to a horizontal axis, adapted to be joined to the rolling shaft of the shutter and cooperating with means (2) driven into rotation by said wheel (3) only when its rotational speed exceeds a predefined safety value, wherein said means (2) are supported by a cursor (B) that rotates with respect to the axis of rotation of the wheel (3) and is housed inside the case (1) and is subject to the braking action of an opposite pair of jaws (15), that tighten the cursor (B), device (A) **characterized in that** said jaws (15) are associated with a fixing screw (14) contained inside the case (1), the head of which (14a) can be anyhow accessed from outside the case (1) by means of a hole (1 c) obtained on one (1b") of the two lateral walls (1b' and 1b") of the case (1), which is also provided with a window (10) through which access is provided to a parallel pair of pinions (8) keyed in a pin (9) fixed inside the case (1) and engaging with a toothed section (7), provided along the border of said cursor (B) and coinciding with arc of circumference having the center on the axis of rotation of the clawed wheel (3).

2. The device of claim 1, **characterized in that** said means (2) consist in a catch (2) that cooperates with said clawed wheel (3) according to the operating principle of a so-called "ratchet gear" and oscillates around a central support pin (2a) supported by said cursor (B).

3. The device of one of the preceding claims, **characterized in that** said cursor (B) is formed of a parallel pair of identical vertical plates (4) with rounded shape, between which an empty space (5) remains, wherein said catch (2) remains enclosed together with said clawed tooth (3).

4. The device of claim 3, **characterized in that** said vertical plates (4) are provided with a hole (4a) with center coinciding with the center of the hub (3a) of said clawed wheel (3) and connected by means of peripheral bolts (6) after interposition of spacing collars (6a); said two identical vertical plates (4) are provided with toothed section (7) in correspondence of the border (4b).

5. The device of one of the preceding claims, **characterized in that** said cursor (B) is associated, by means of fixing screws (11), with an arched appendage (12) consisting in a sort of fin, which is provided with curvilinear slot (13) - the longitudinal axis of which coincides with arc of circumference with center (O) coinciding with the center of the hub (3a) of said clawed wheel (3) - crossed by the stem of said screw (14), the nut of which (4b) is exactly housed inside a polygonal hole (1 d) obtained on the wall (1 b') of said case (1) opposite to said wall (1 b") where said hold (1 c) is obtained.

6. The device of claims 1 and 5, **characterized in that** said pair of jaws (15) tightens said appendage (12), the opposite sides of which (12a) adhere to said jaws (15) by friction.

7. The device of claim 6, **characterized in that** said two opposite sides (12a) of said appendage (12) diverge slightly so that the thickness of said appendage (12) increases slightly from thickness (S1) to thickness (S2>S1), when progressively moving along the curvilinear slot (13) in the same direction as the stem of the screw (14) when the cursor (B) starts rotating.

8. The device of claim 5, **characterized in that** said jaws (15) consist in two washers (15) inserted along the stem of the screw (14).

9. The device of claim 1, **characterized in that** said cursor (B) is provided with a peripheral tooth (16)

that is stopped after cursor (B) starts rotating, thus stopping the travel of cursor (B) against a projecting part (17) internally obtained in the case (1).

10. The device of claim 1, **characterized in that** said pin (9) is provided with a polygonal central section (9a) at the back of said window (10).

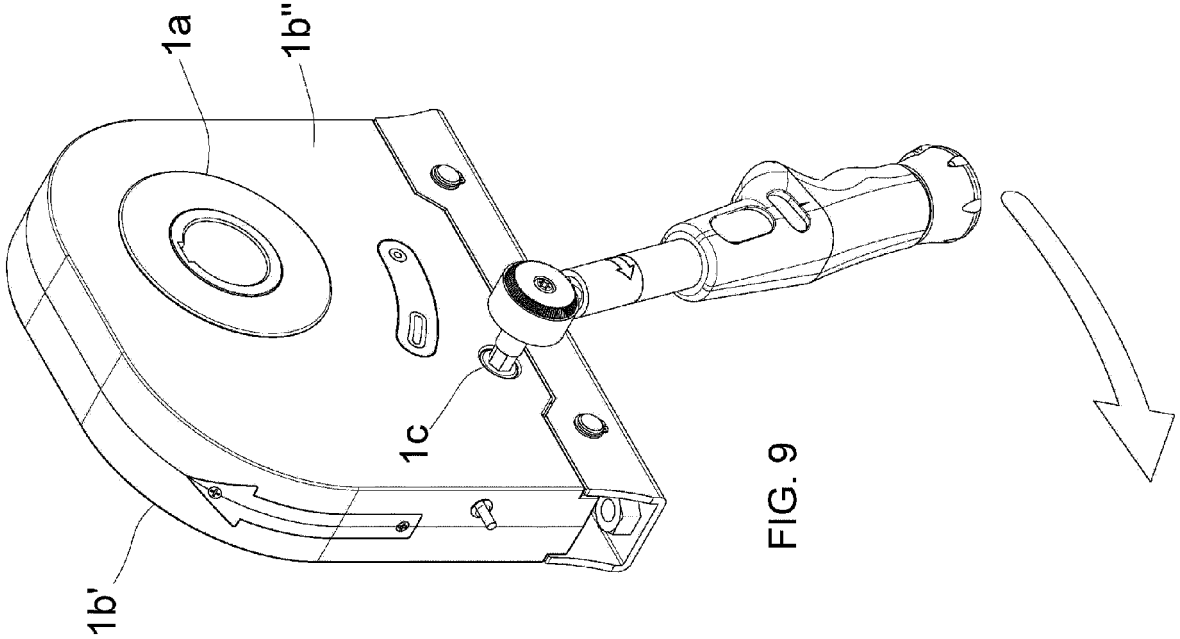

FIG. 9

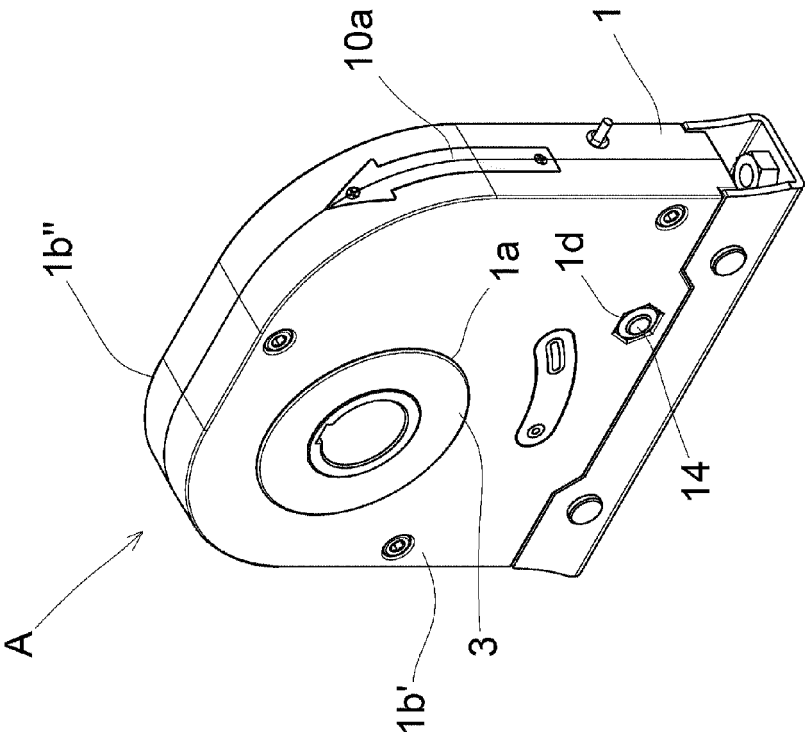

FIG. 1

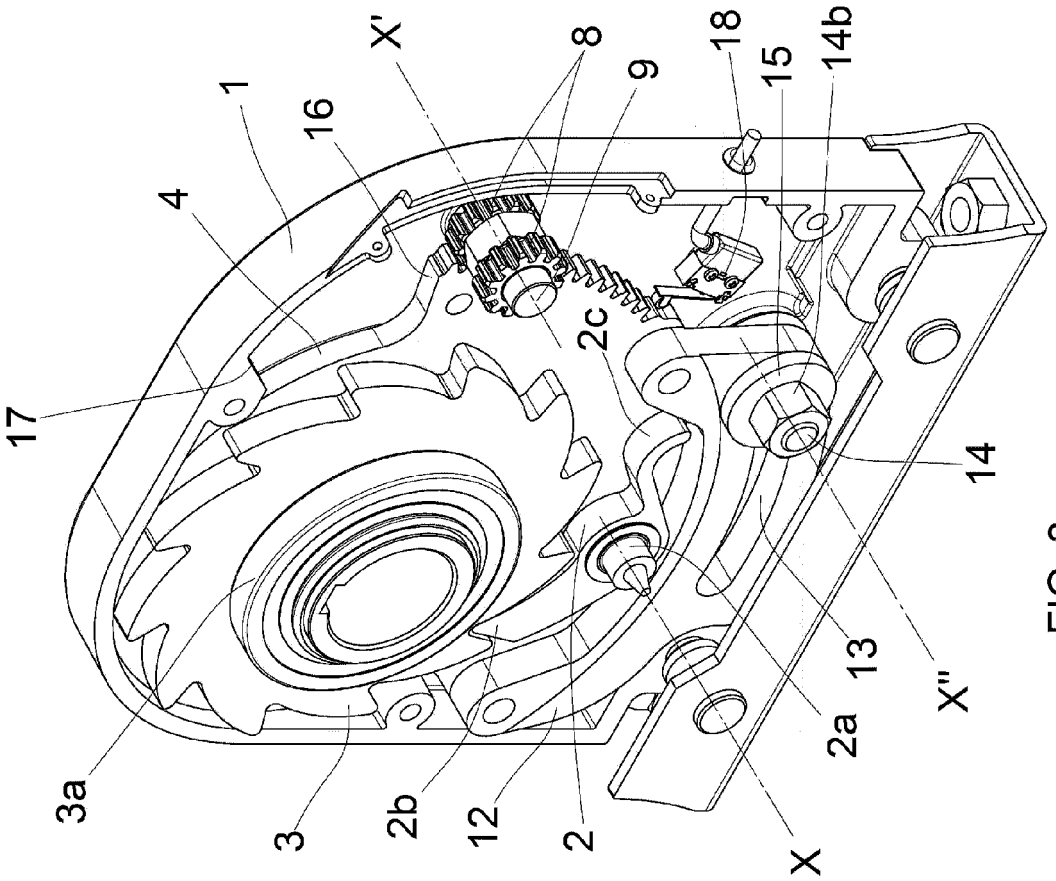
X'
8
9
18
15
14b
1
16
4
2c
17
14
13
X''
2a
3a
3
2b
12
2
X

FIG. 3

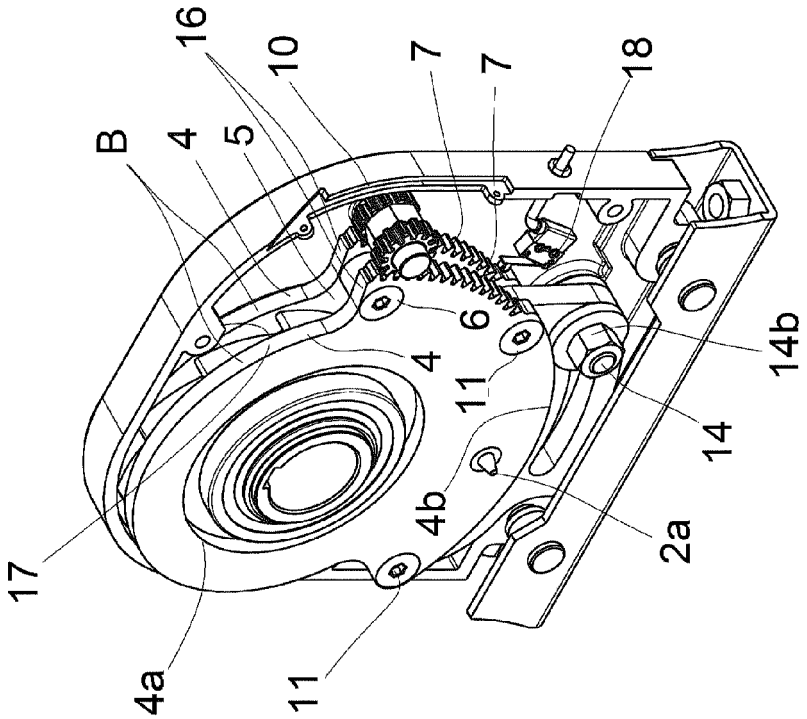
16
10
7
7
18
B
4
5
6
14b
4
11
14
4b
2a
17
4a
11

FIG. 2

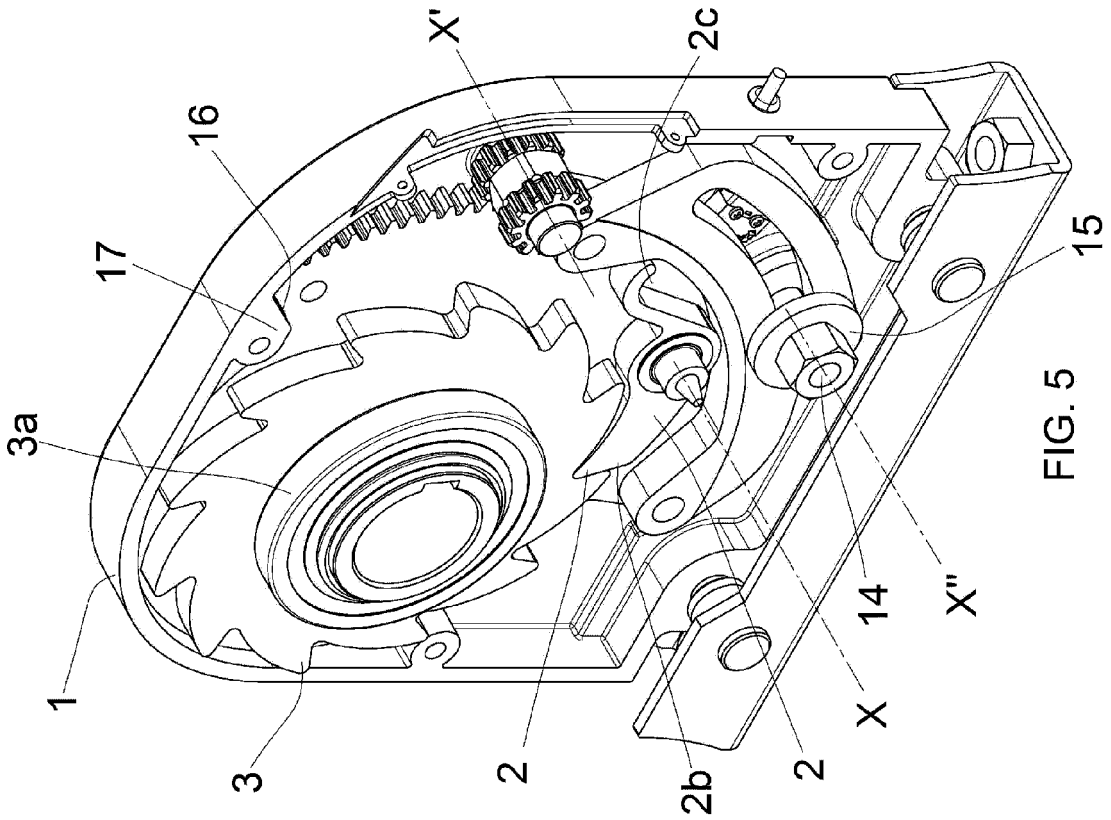

FIG. 5

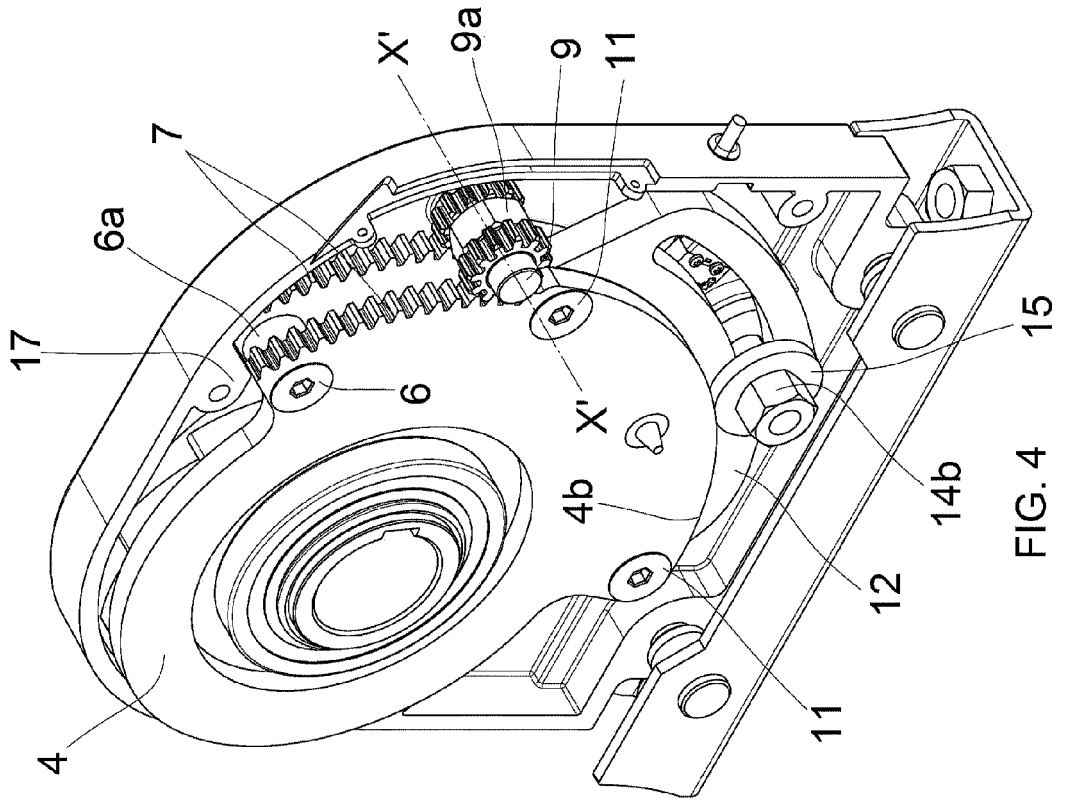

FIG. 4

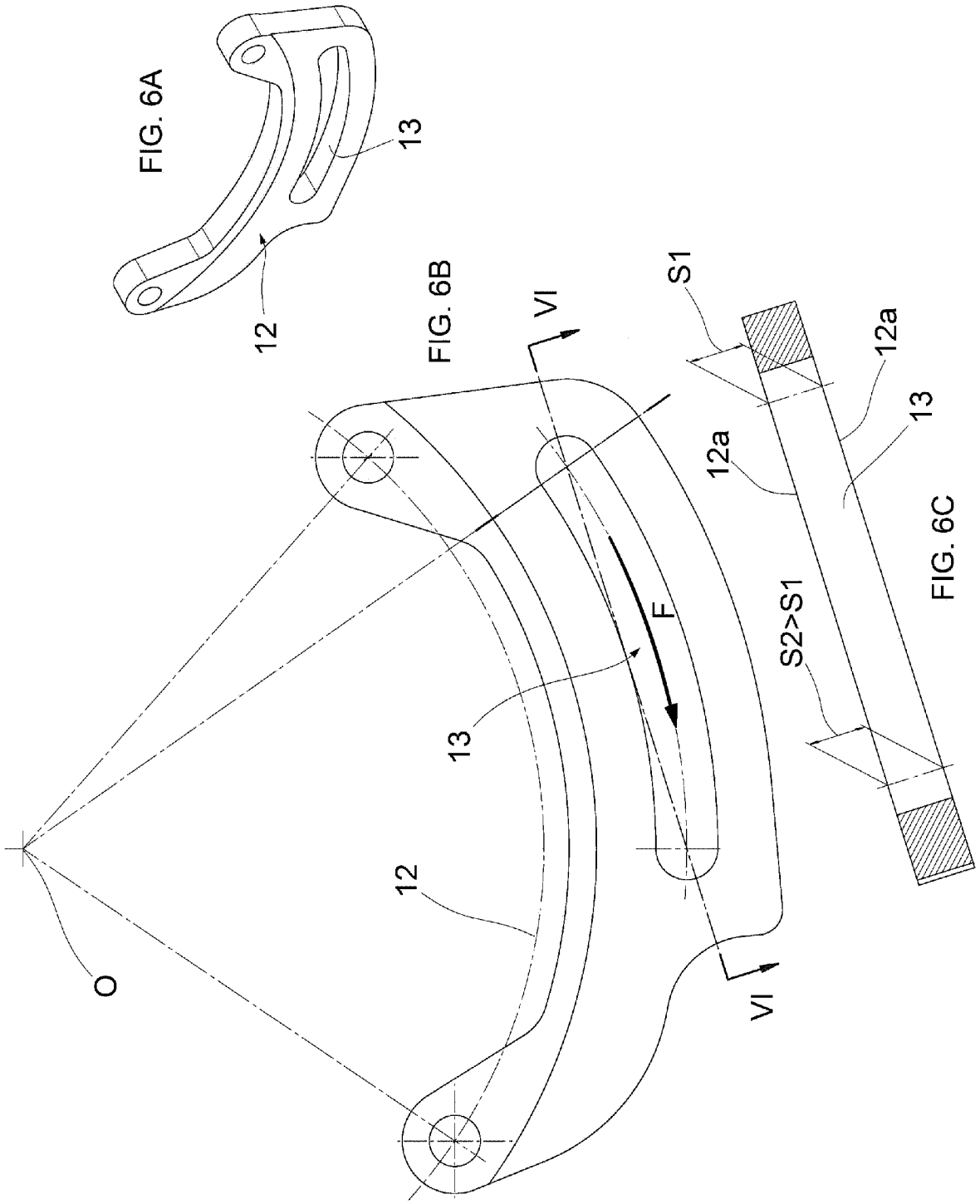
FIG. 6A
13
12
FIG. 6B
VI
S1
12a
13
12a
F
13
S2>S1
12
O
VI
FIG. 6C

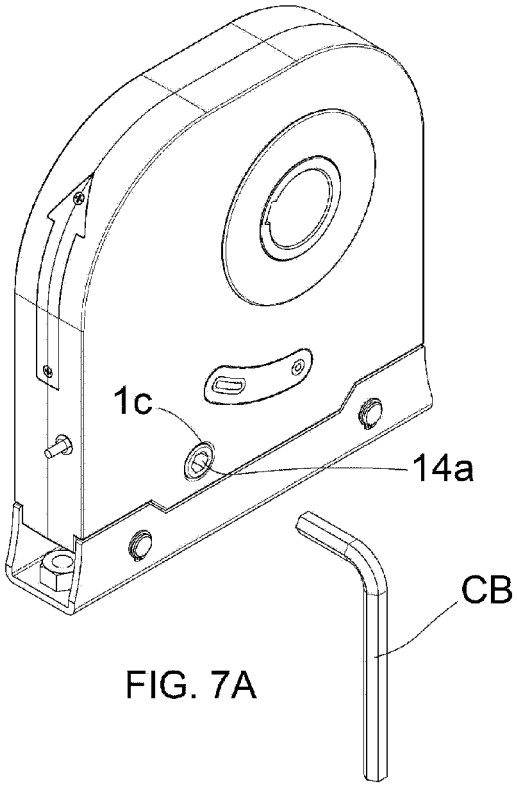

FIG. 7A

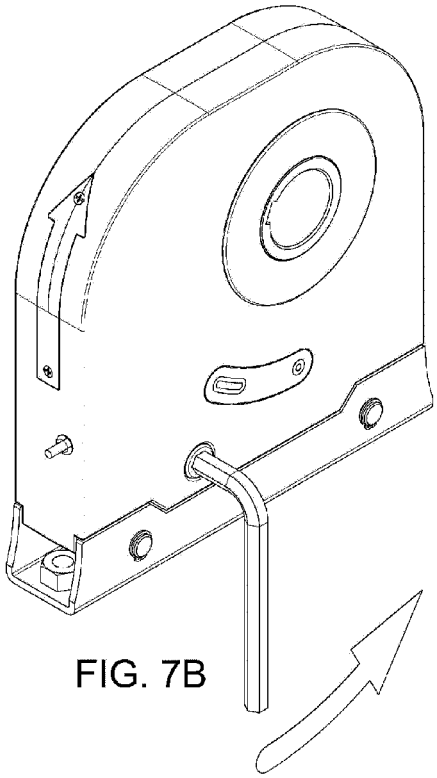

FIG. 7B

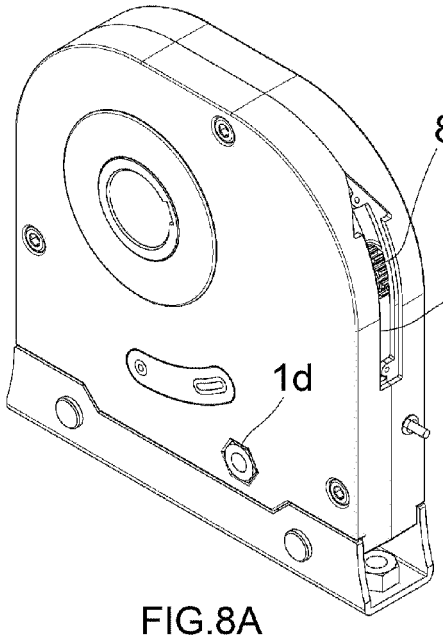

FIG.8A

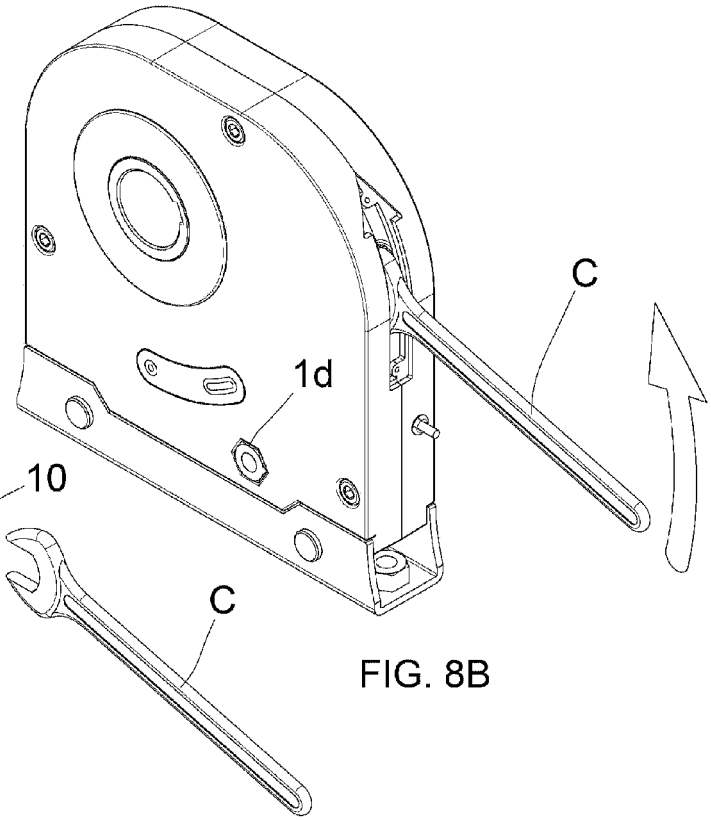

FIG. 8B

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 8740

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 42 07 697 A1 (RAHE WILFRIED [DE]) 16 September 1993 (1993-09-16) * column 2, lines 25-48; claims 3,5; figures 1-3 *	1-10	INV. E06B9/84
A	DE 40 02 074 C1 (GFA - ANTRIEBSTECHNIK GMBH) 8 May 1991 (1991-05-08) * abstract; figures 1-2 *	1-10	
A	DE 31 40 792 A1 (TIMMER JOSEF GMBH [DE]) 28 April 1983 (1983-04-28) * page 6, line 9 - page 8, line 16; figures 1-2 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 February 2014	Kofoed, Peter

CATEGORY OF CITED DOCUMENTS

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05-02-2014

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

REFERENCES CITED IN THE DESCRIPTION

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- IT 262160 **[0024]**