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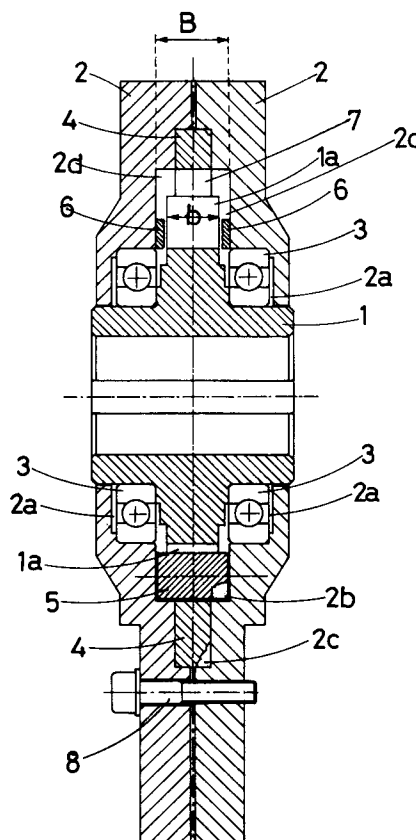
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I-60035 Jesi (Ancona) (IT)(54) **Cushioned locking device for rolling shutters or blinds.**

(57) The instant invention concerns a cushioned locking device for rolling shutters or blinds, comprising a toothed wheel (1), which houses cylindrical rollers (5) within its perimetral areas and which rotates precisely within a flat friction ring (4), enclosed, together with the wheel, within a pair of covers (2) opposite each other, which are clamped against the faces of the friction ring.

Should there be a failure, this friction ring is made to rotate by the wheel, by means of one of the aforementioned rollers, which stays embedded between the wheel and the friction ring, only during the failure phase.

**FIG. 2****EP 0 671 543 A1**

The instant patent application concerns a cushioned locking device for rolling shutters or blinds, which intervenes automatically should the rolling shutter accidentally descend.

The device in question comes into the category of so-called "cushioned parachutes", the working of which is fundamentally based on a self-blocking system which provides, that before the rolling shutter comes to a halt following free descent, there be a braking stroke during which part of the kinetic energy acquired by the winding shaft of the rolling shutter as a result of its uncontrolled descent, is dissipated by friction.

This braking action, which precedes the definitive blocking of the shaft, and therefore, of the shutter, reduces the violence of the impact on stopping, thereby avoiding that the whole structure be subjected to highly dangerous mechanical stress levels.

In the German patent DE 3140792, a "cushioned parachute" is described, which comprises a toothed wheel, keyed on the winding shaft of the shutter and enclosed within a pair of round-shaped side covers opposite each other, clamped one against the other by an annular series of bolts, which also cross a ring, being free to rotate and positioned in between the covers and precisely enclosing said toothed wheel.

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.

Within the spaces that separate the teeth of the aforementioned toothed wheel, there are positioned cylindrical rollers; which, should the shutter accidentally descend, are expelled by centrifugal force from their housings and remain embedded within a space provided along the internal circumference of the aforementioned ring, thus made to rotate by the toothed wheel, by means of the cylindrical rollers embedded therein.

The ring, in its turn, makes the pair of aforementioned side covers rotate, due to the fact that as already mentioned, the clamping bolts of the covers cross this very ring.

When the covers start to rotate, this immediately brings about a braking action on the part of 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, to which the toothed wheel is hinged, should a failure arise, by means of the rollers which remained embedded

between the wheel and the ring.

The blocking of the ring takes place by means of a rabbit 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 intervention of said pin against one of the two end corners of said seat.

The aim of the instant invention is to make construction and assembly of known "cushioned parachutes" simpler and more economical.

This aim was achieved by eliminating the fixed support plate and entrusting the role of bearing structure to the side covers themselves.

In the locking device according to the invention, therefore, the friction ring is clamped between the side covers, which adhere to the two opposite faces of the ring, and on which a braking action is generated each time that the ring is accidentally made to rotate by the toothed wheel.

Another difference in the device according to the invention concerns the fact that the cylindrical rollers housed within the peripheral spaces of the toothed wheel, are used not only as a means for coupling and drawing the friction ring in case of failure, but also as a means of location and arrest when the toothed ring comes to a halt at the end of its braking stroke.

These and other technical/functional characteristics of the cushioned locking device according to the invention will appear more obvious as the description proceeds, with reference to the attached drawings, reproduced for illustrative and not limitative purposes, wherein:

- Fig. 1 shows a plan view of the locking device according to the invention, without one side cover, so as to underline the toothed wheel and the friction ring, both of which are positioned inside the other cover;
- Fig. 2 is a section of the device in question, complete with both side covers, along the section II-II plane, illustrated in Fig. 1;
- Figures 3, 4 and 5 show how the cylindrical rollers come in and out of their seats when the toothed wheel rotates slowly during the controlled descent of the shutter;
- Figures 6 and 7 show the means by which the toothed wheel couples automatically with the friction ring and makes it rotate, should the shutter start to descend freely;
- Fig. 8 is identical to figures 6 and 7, but it refers to the case in which the toothed wheel should rotate in the anti-clockwise direction due to the swinging of the shutter after impact on stopping.

With reference to the aforementioned figures, the cushioned locking device according to the invention comprises a toothed wheel (1) on a hori-

zontal axis, to be keyed onto the winding shaft of the shutter.

This wheel (1) is enclosed within a opposite pair of identical covers (2), which have a central internal seat (2a) for the support bearings (3) of the wheel (1) and a peripheral seat (2b) for the housing and sliding of the teeth (1a) of the wheel (1).

On the internal face of said covers (2) there is provided, on the outside of the seat (2b), a third circular seat (2c) to house and clamp a flat friction ring (4), the internal diameter of which is the same as that of the aforementioned circular seat (2b), apart from a short circumference arch, which will be specified more clearly later on.

Moreover, it should be said that the thickness of said friction ring (4) is more than double the depth of each of the two circular seats (2c), so as to ensure that the friction ring (4) is clamped within its housing seat, when the covers (2) are forcibly brought closer one against the other, by means of the clamping bolts.

More precisely, said circular seat (2b) has a slightly larger diameter than the external diameter of the wheel (1), the teeth of which therefore, lightly graze the wall of the seat (2b) without actually gliding over it.

The spaces (1b) which separate the teeth (1a) of the wheel (1) are "U" shaped and each house a cylindrical roll (5), which, in a symmetrical manner juts out on both sides, it being longer in length than the teeth (1a) are thick (b); the ends of said rolls (5), however do not glide over the bottom of the circular seats (2b), in as much as the length of each roll (5) is slightly less than the width (B) of the sliding seat of the teeth (1a).

On the internal face of the seats (2b) there are positioned, opposite to each other, two cuneiform cams (6), which raise and eject the rolls (5) from their housing (1b), each time that they cross the maximum elevation point of their circular path, while rotating with the wheel (1).

The ejection of the rolls (5) from their housing is made possible by the fact that the friction ring (4) has a loop (7) along its internal circumference, which extends to a circumferential arch positioned astride of the aforementioned cams (6).

This loop (7) is connected at one end with the internal circumference of the friction ring (4), while at its end, there is a rounded ridge (7a), positioned below the cams (6), according to the direction in which the wheel (1) rotates during the descent of the shutter.

Of course, in order to allow the ejection of the rolls (5) from their housings, the circular seats (2b) of the covers (2) also have loops (2d), in conformity with the loop (7) of the friction ring (4), compared to which, however, said loops (2d) are greater in length, so that the rounded ridges (2e) at one of

their ends are out of phase in comparison with the cams (6), by an angle (α) greater than the displacement angle (β) of the ridge (7a) of the loop (7).

The description now proceeds with how the device in question works, making particular reference to figures 3 to 7, where it is imagined that the descent stroke of the shutter corresponds to a rotation of the wheel (1) in the clockwise direction.

As already mentioned, the intervention of the rolls (5) with the cams (6), both during the descent and ascent phases of the shutter, brings about the ejection of these rolls (5), which, after having surpassed the cams (6), drop back into their own housings (1b) by gravity.

Should the shutter descend freely, the angular speed assumed by the wheel (1) is such that the roll (5) momentarily expelled from its housing (1b), does not have the time to drop and fall back into its own housing, so that it remains embedded between a tooth (1a) of the wheel (1) and the ridge (7a) of the loop (7), as illustrated in figure 6.

By the way, it is to be noted that each space (1b) of the wheel (1) has an arched notch (1c), positioned on the rear side taking as a reference the clockwise rotation direction, which the wheel (1) assumes during the descent stroke of the shutter.

This notch (1c) is shaped like a circumferential quarter-arch and has the same diameter as the rolls (5), which find therein precise housing during the phase in which the cams (6) are surpassed, as illustrated in fig. 4.

Thus, in case of failure, the roll (5) remains embedded between said notch (1c) and the ridge (7a) of the loop (7), which is almost the same shape as the notch (1c).

Under these conditions, the friction ring (4), on the opposite faces of which a braking action is exercised by the covers, is made to rotate by the wheel (1) by means of the embedded roll (5).

By the way, it should be noted that it is possible to adjust the intensity of this braking action by calibrating how tightly the bolts (8), which clamp the covers (2), are screwed.

The wheel (1), and also the shutter in free descent, come to a halt when the protruding ends of the roll (5), embedded between the wheel (1) and the friction ring (4), come into contact with the ridges (2e) of the loops (2d) grooved inside the covers (2), as illustrated in fig. 7.

After the intervention of the locking device, it is possible to take up the initial position of the friction ring (4) quite easily, by making this ring rotate in the anti-clockwise direction, after having of course, loosened the bolts (8) which clamp the covers (2) to the faces of the ring (4).

This clearing operation can be easily and rapidly carried out by gripping the pivot (9), radially

screwed on the external circumference of the friction ring (4) and protruding from the covers (2), which have on their internal faces, a slot (2f) which creates a central gap, within which said pivot (9) is housed and can freely rotate.

Attention is brought to the fact that the slot (2f) is of such a size, that when the pivot (9) rotates in the anti-clockwise direction, until it comes into contact with the end of the slot (2f), the friction ring (4) automatically returns to its initial position, as is illustrated in fig.1.

In fig. 8 it is underlined how the embedded roll (5) does not have any possibility of dropping back into its own housing (1b), unless the wheel (1) should swing in the anti-clockwise direction, equal to an angle of about 7° , as a result of the dimension and shape of the aforementioned notch (1b).

This notch (1c), in fact, has the task of avoiding that the embedded roll (5), should the system swing after the wheel (1) stops, can easily drop forwards into its housing (1b), thereby freeing itself and favouring another uncontrollable descent stroke by the shutter, which would be re-blocked at this point only if a roll (5) were to remain embedded between the wheel (1) and the cover (2).

This second block, however would be much more violent than the first, in as much as the impact of the roll (5) with the ridges (2e) of the covers (2) would not be preceded by a braking and cushioning stroke, since the friction ring (4) would already have completed its working stroke previously.

Claims

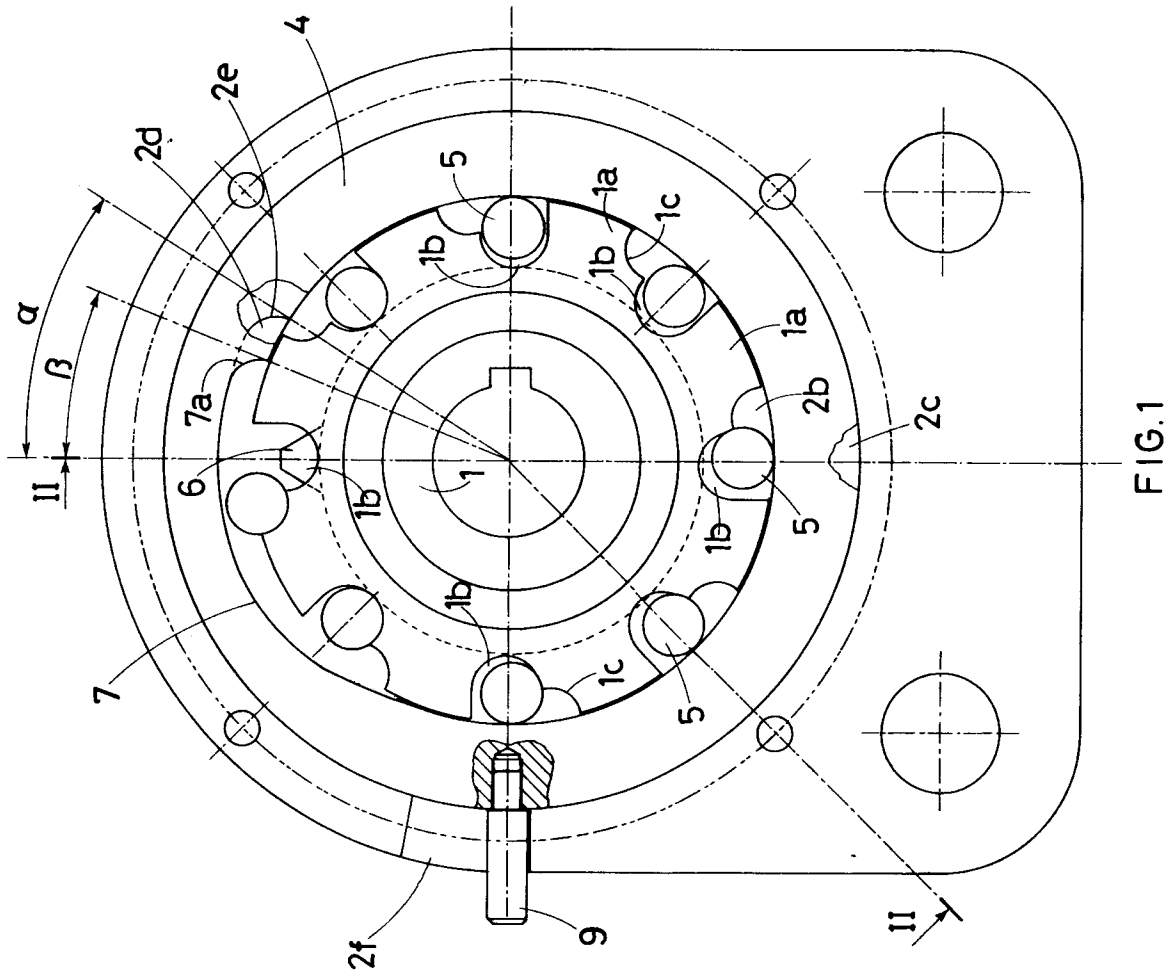
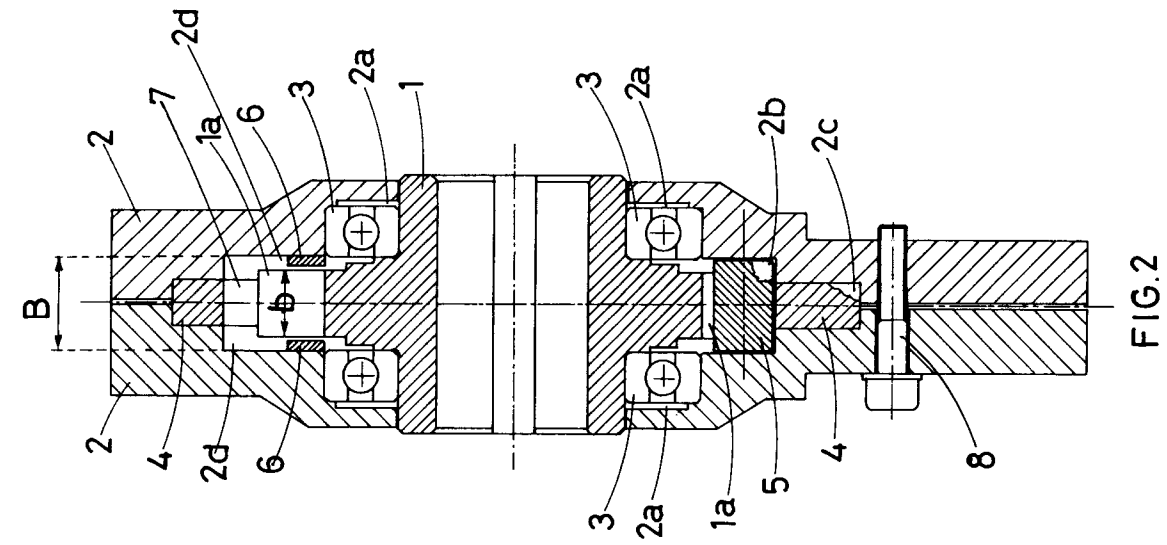
1. Cushioned locking device for rolling shutters or blinds, of the type comprising a toothed wheel (1), which houses in its peripheral spaces (1b), cylindrical rolls (5), and which rotates precisely within a flat friction ring (4), enclosed together with the wheel (1), within an opposite pair of covers (2), device characterised by the fact that the covers (2) are clamped by means of bolts (8), against the faces of the friction ring (4), which has on its internal circumference, a loop (7), having two conforming loops (2d) grooved on the circumference of the circular seats (2b) of the covers (2), within which there are housed and made to slide freely, the teeth (1a) of the wheel (1), which are not as thick (b) as the length of the rolls (5), which in their turn are slightly shorter in length than the width (B) of their housing, made up of the opposite pair of seats (2b); it being provided that :

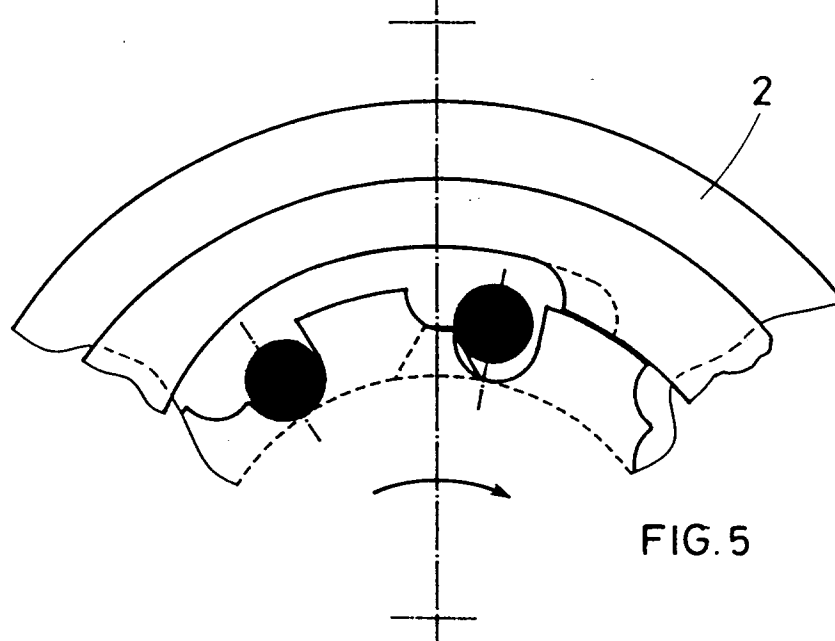
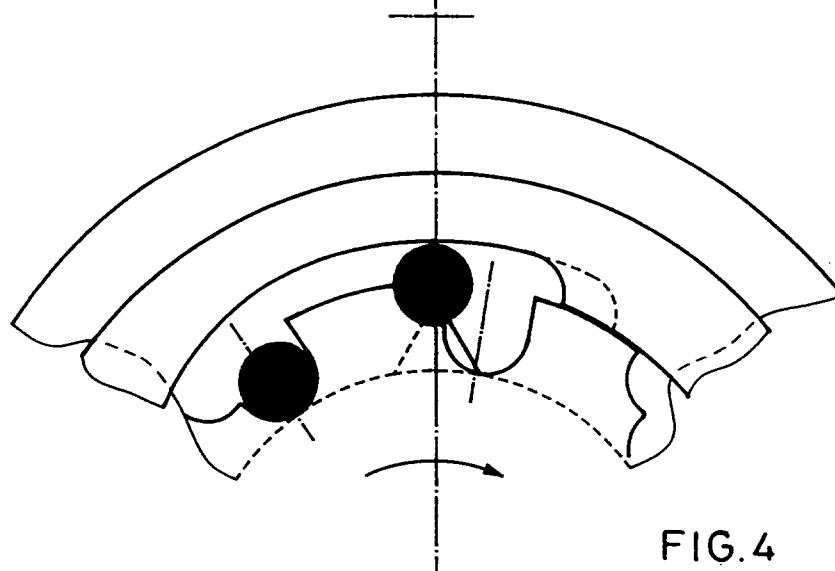
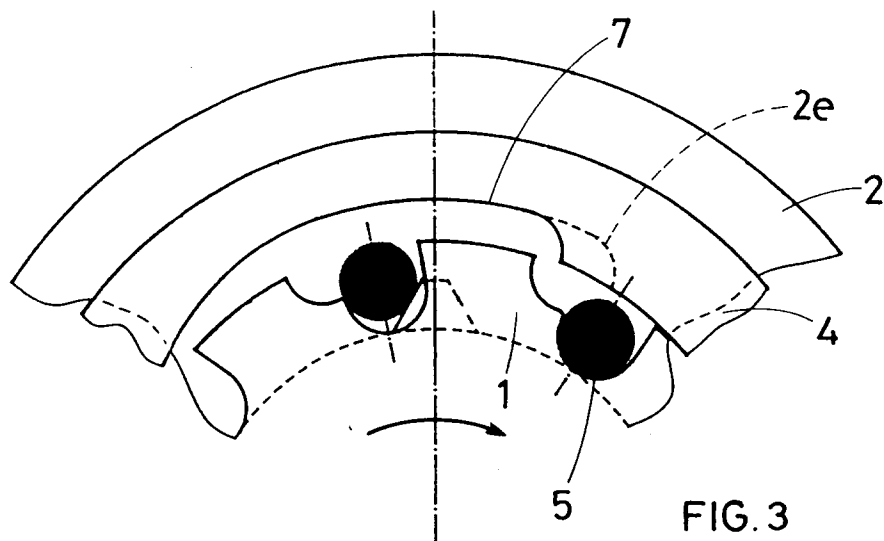
- on the inside face of the seats (2b) there be fitted, two cuneiform cams (6), opposite each other;

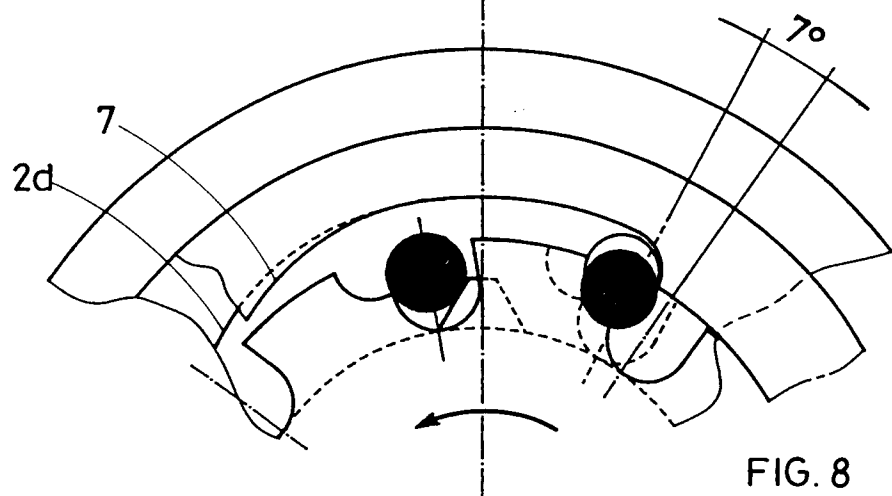
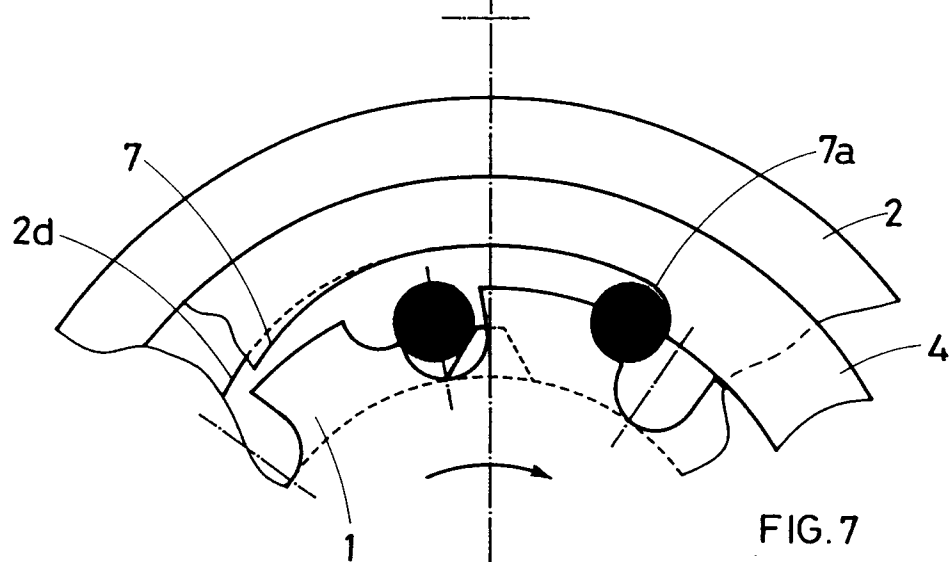
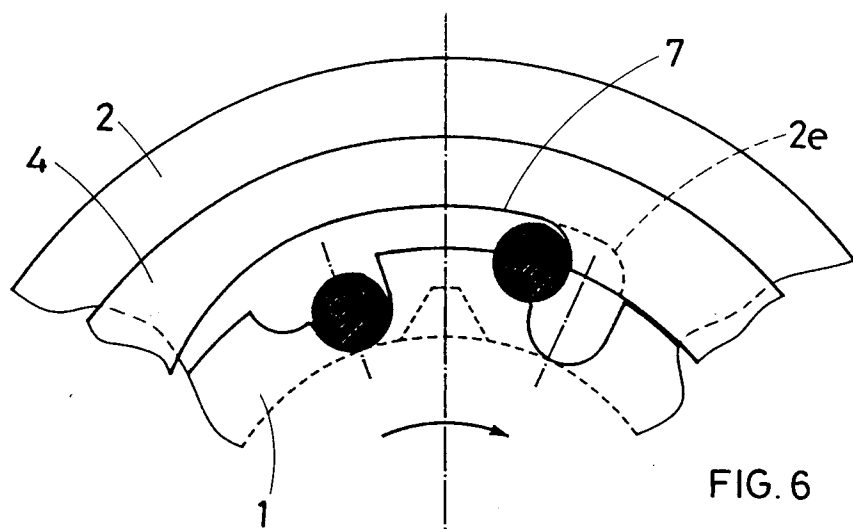
- the loops (2b) be longer in length than the loop (7), so that the rounded ridges (2e) at one of their ends are out of phase, compared to the cams (6), by an angle (α) greater than the displacement angle (β) of the ridge (7a) at the end of the loop (7).

2. Cushioned locking device for rolling shutters or blinds, according to the previous claim, characterised by the fact that each space (1b) of the wheel (1), has an arched notch (1c), positioned on the rear side, taking as a reference the clockwise rotation direction which the wheel (1) assumes during the descent stroke of the shutter; it being provided that said notch (1c) have a quarter circumferential arch shape and the same diameter as the rolls (5).

3. Cushioned locking device for rolling shutter or blinds, according to the previous claims, characterised by the fact that on the outside circumference of the friction ring (4), there is a radially screwed pivot (9), which protrudes from the covers (2), which have on their inside face, a slot (2f), so as to create a central gap, within which said pivot (9) can be housed and can freely rotate.









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EUROPEAN SEARCH REPORT

Application Number
EP 95 83 0080

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	FR-A-2 278 905 (WUH NEUKIRCHEN) 13 February 1976 * page 4, line 20 - page 6, line 31; figures *	1,2	E06B9/84

A	DE-C-36 25 759 (HAAKE) 1 October 1987 * column 3, line 23 - column 4, line 21; figures *	1	

A	US-A-4 848 522 (WOLF RUDOLF) 18 July 1989 * column 3, line 34 - line 52; figures *	1	

A	DE-A-37 31 657 (HAAKE ANDRE) 6 April 1989 * column 3, line 5 - line 42; figures *	1	

A	DE-C-36 21 335 (W.U.H. NEUKIRCHEN) 20 August 1987 * column 2, line 49 - column 3, line 53; figures *	1	

			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E06B E05D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 June 1995	Examiner Fordham, A
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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	