(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 045 956 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
03.09.2008 Bulletin 2008/36

(21) Application number: **99900445.0**

(22) Date of filing: **11.01.1999**

(51) Int Cl.:
E06B 9/90 *(2006.01)*

(86) International application number:
PCT/DK1999/000015

(87) International publication number:
WO 1999/037876 (29.07.1999 Gazette 1999/30)

(54) **A LOCKING DEVICE FOR ROLLER BLINDS**

VERSCHLUSSVORRICHTUNG FÜR ROLLOS

DISPOSITIF DE VERROUILLAGE POUR STORES

(84) Designated Contracting States:
DE DK FR GB NL

(30) Priority: **09.01.1998 DK 1998**

(43) Date of publication of application:
25.10.2000 Bulletin 2000/43

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EP 1 045 956 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention relates to a locking mechanism for roller blinds comprising a non-rotating shaft with a first set of radial depressions having inclined surfaces and an intermittently rotating drum with a second set of radial depressions mounted in a spring driven roller blind tube and provided with balls adapted for providing an interlocking of the shaft and the drum by jamming between said first and second set of depressions.

[0002] This type of locking of a roller blind replaced a construction using ratchets and ratchet wheels which permitted the pulling of the roller blind during tightening of the spring fitted inside the tube and locking. The ratchets were mounted on journals on the drum, and by sufficiently rapid rotation they were flung outwards and held at a distance from the ratchet wheel. During slow rotation gravity caused re-engagement. The construction using ratchets caused expensive manufacture of ratchets and ratchet wheels and the wear and friction on the bearings of the ratchets were replaced by balls which established locking between the stationary shaft and the drum by falling into the radial depressions in the stationary shaft. Due to the small diameter of a roller blind tube and the need for a suitable mass for the balls, so that they can overcome possible dust and still provide a reliable movement, fairly large balls have been used and only two first radial depressions which cooperate with three second radial depressions. This provides for sufficient possibilities of locking in practice.

[0003] However, in particular this advantageous construction gives problems, if the stationary shaft cannot be securely placed in a position so that one of the two first depressions is upwards turned (and consequently the other is facing downwards). When such a depression faces upwards, three lockings are ensured per revolution, whereas if the two first depressions are facing sideways (i.e. at right angles to the first position described above), then coincidences will determine if a ball rolls into the space between the shaft and drum and creates a locking thereby. This has the effect that the known, otherwise useful construction does not have the freedom of orientation which is required by modern building techniques. It is required that a roller blind tube can be mounted in their mountings, irrespective of whether they are mounted on a wall or in the ceiling, and hence 4 depressions in the shaft are required in practice.

[0004] Modern locking devices are disposed such that the balls obtain a free run towards the centre of the shaft. This means that the moment the component of gravity is larger than the component of the centripetal acceleration the ball will roll towards the centre of the shaft and thereby lock the drum. Thereby the rotational velocity which must be overcome is only dependent on the distance of the ball from the centre of rotation and by the rotational velocity for a fixed placement of the locking depressions in the shaft. This means that the spring must be tightened to such a degree that the necessary rotational velocity will be obtained at the latest after 1/3 revolution, in order that the mechanism is released and the roller blind moved upwards. This requires a large tightening of the spring and causes the roller blind to move upwards at high velocity.

[0005] A construction that displays the above features may be found in US 4,345,636 which describes a stationary shaft having two first radial depressions cooperating with a drum having four second radial depressions via two balls.

[0006] An example of a set of balls and depressions for use in a roller blind will be found in EP 0419 017 A2, in which the depressions have been given a special shape to provide a different velocity development, albeit in connection with a ratchet controlled by the jamming of the balls.

[0007] It is the purpose of the invention to avoid these disadvantages, and this is obtained in that the second set of radial depressions is provided with protusions in the direction of rolling-up as a partial support for the balls and in order to create a release direction for the balls which is not directed towards the centre of rotation. Thereby "pockets" are so to speak created in the drum for the balls which support the balls partly, so that a part of the force with which gravity influences the ball which is at any one instant the top one, is taken up by the drum. Hereby the force which forces the ball against the locking surface on the shaft is reduced. In this manner a reduction of the rotational speed which is required to keep the balls in the drum is obtained. Thereby the spring does not need to be tightened as in the prior art, and the roller blind may move much slower before the ball is locked. Thereby a given spring mechanism obtains a larger capacity and may be used for larger roller blinds than in known constructions.

[0008] The invention is particular in that surfaces have been provided at the second set of radial depressions such that the jamming of a ball occurs with a force which is directed at an angle with respect to the tangent to the shaft at the ball in question. Another way of expressing this is that the inclined surfaces are oriented differently from the usual where the force is essentially directed tangentially. The increased radial force is no disadvantage, and the advantage of the inclined surfaces is furthermore that the balls may "roll" from the second set of radial depressions whithout being dependent on a purely radial movement. Hereby it becomes possible under certain circumstances to provide only two first radial depressions.

[0009] Furthermore the bottoms of the second set of radial depressions are shaped as a part of a spherical surface with a radius essentially equal to the radius of the balls. Such spherical surfaces are disposed in the bottom on either side of the protrusions, so that the balls are not only jammed between edges on the first and second set of depressions, but are also supported by a part of a spherical surface. The protrusions in the second set of radial depressions are reinforced by the spherical

transfer to the bottom, and the strenght increases. Thereby a greater security is obtained against deformation and wear.

[0010] A further embodiment is particular in that also the first set of radial depressions are provided with bottoms which are parts of spherical surfaces with a radius essentially equal to the radius of the balls. This enables a less solid construction of the walls between the axial depressions (first set of radial depressions) in the shaft, whereby more depressions may be fitted for a given axial diameter.

[0011] The invention will be described in greater detail in the following with reference to the drawing, in which

Fig. 1 shows a known construction in cross section through the balls and depressions,

Fig. 2 shows an embodiment of the invention, and

Fig. 3 shows an embodiment with a reinforcement of the protrusions.

[0012] In Fig. 1 is shown a blocking mechanism according to the prior art where a drum 1 with a bearing which is not shown is fitted rotatably around a stationary shaft 2. The shaft is provided with a profile 3 at the end which may lock against rotation to the support bracket. The drum is provided with 3 radial depressions 4, 5, 6 which are capable of containing balls 7 such that they do not engage the depressions 8, 9 in the shaft 2. During rotation this condition is maintained as long as the balls are flung outwards with sufficient force, and it is this condition which is shown in the figure. The surface which during rotation presses against the ball is directed towards the centre of the movement. The borderline case obtains when a depression 4, 5, 6 with a ball is directly above the shaft, while the sides of the depression contributes to holding the balls in other angular positions. When a ball falls down to touch a depression 8, 9 it jams between the slanted surfaces, and blocking occurs.

[0013] In Fig. 2 is seen an embodiment of the invention in which the depressions 4, 5, 6 are differently shaped, in that there are provided protrusions 4', 5', 6' which partly support the ball which is at any time the topmost ball, even during slow rotation. The shaft is provided with the depressions 8, 9, 10, 11. In the figure there is schematically shown a ball in the depression 4 and another ball which performs blocking at the depression 5, 5'.

[0014] In Fig. 3 is seen the shape of one of the depressions in the second set of radial depressions in perspective detail. Using the same reference numerals as in Fig. 2, the edge or protrusion 4' is seen between the depression with the greatest radial distance to the centre 4 and the depression 4" which is to cooperate with a ball 7 and one of the first set of depressions 8, 9 on the stationary shaft 2. The bottom of the depressions in the drum 1 is given a spherical shape, i.e. the depressions have a spherical surface as the transfer to a plane perpendicular to the axis of the drum. Compared to the situation where the depressions are constituted as cylindrical surfaces which intersect in the protrusion 4', a reinforcement is obtained of the edge which is created, because it thicker near the bottom while retaining a shape which corresponds to the ball 7, namely a circular arc 4c which is seen from the edge in Fig. 3. This reinforcement of the edge has shown itself to have a beneficial influence on the durability of the edge or protrusion. A part of the reason is that there is a surface contact sphere-against-sphere against the ball 7 instead of just a circle, as in the case ball against cylinder.

Claims

1. A locking mechanism for roller blinds comprising

1) a non-rotating shaft (2) with four first radial depressions (8) having inclined surfaces;
2) an intermittently rotating drum (1) mounted in a spring driven roller blind tube and with a second set of radial depressions (4, 5, 6);
3) balls (7) adapted for providing an interlocking of the shaft and the drum by jamming between said first and second set of depressions;

said second set of radial depressions (4, 5, 6) being provided with protrusions (4', 5', 6') in the direction of rolling-up as a partial support for the balls (7) and in order to create a release direction for the balls which is not directed towards the centre of rotation, said second set of radial depressions (4, 5, 6) being provided with surfaces such that the jamming of a ball (7) occurs with a force which is directed at an angle with respect to the tangent to the shaft at the ball in question,
characterised in that the bottoms of the second set of radial depressions (4, 5, 6) are shaped as a part of a spherical surface with a radius essentially equal to the radius of the balls (7).

2. A locking mechanism according to claim 1,
characterised in that also the radial depressions (8) in the first set are provided with bottoms which are parts of spherical surfaces with a radius essentially equal to the radius of the balls (7).

Patentansprüche

1. Eine Verschlussvorrichtung für Rollos umfassend:

1) eine nichtrotierende Welle (2) mit vier ersten Radialvertiefungen (8) mit schrägen Oberflächen;
2) einen intermittierend drehenden Trommel (1) in einer federgetriebenen Rollorohre ange-

bracht und mit einem zweiten Satz von radialer Vertiefungen (4, 5, 6);
3) Kugeln (7) dazu berechnet, eine Verriegelung zwischen der Welle und dem Trommel hervorzubringen durch einkeilen zwischen dem ersten und dem zeiten Satz von Vertiefungen;

indem der genannte zweite Satz von radialen Vertiefungen (4, 5, 6) mit Vorsprüngen (4', 5', 6') in der Richtung des Aufrollens als teilweise Unterstützung für den Kugeln (7) und um eine nicht gegen das Umdrehungszentrum gerichtete Freigaberichtung zu schaffen, versorgt ist,
wobei der genannte zweite Satz von radialen Vertiefungen (4, 5, 6) mit Oberflächen derart versorgt ist, dass das Einkeilen einer Kugel (7) mit einer Kraft geschiet, die gewinkelt zu der Tangente der Welle bei der betroffenen Kugel gerichtet ist,
dadurch gekennzeichnet, dass die Böden des zweiten Satzes von radialen Vertiefungen (4, 5, 6) als ein Teil einer Kugelfläche gebildet sind, mit einem Halbmesser im wesentlichen gleich dem Halbmesser der Kugeln (7).

2. Eine Verschlussvorrichtung gemäss Anspruch 1, **dadurch gekennzeichnet, dass** auch die radiale Vertiefungen (8) in dem ersten Satz mit Böden versorgt sind, die Teile einer Kugelfläche sind, mit einem Halbmesser im wesentlichen gleich dem Halbmesser der Kugeln (7).

Revendications

1. Dispositif de verrouillage pour stores comprenant:

1) une tige (2) non-rotatif avec quattre premières cavités radiales (8) avec des surfaces inclinées;
2) un tambour (1) de rotation intermittante monté dans une tube pour stores actionné par un ressort et avec un deuxième groupe de cavités radiales (4, 5, 6);
3) des billes (7) pourvu pour établir une verrouillage entre la tige et le tambour par coinçage entre lesdits premier et deuxième groupe de cavités;

ledit deuxième groupe de cavités radiales (4, 5, 6) étant pourvu des saillies (4', 5', 6') dans la direction de levage comme support partielle des billes (7) et pour créer une direction de descoinçage des billes qui n'est pas orienté vers le centre de rotation,
ledit deuxième groupe de cavités radiales (4, 5, 6) étant pourvu des surfaces dans une façon telle que le coinçage d'une bille (7) prends lieu avec une force dans une direction divergent du direction tangentielle de la tige près de la bille en question,
caractérisé en ce que les fonds des cavités radiales (4, 5, 6) du deuxième groupe sont façonnés comme part d'une surface spherique avec un rayon essentiellement égale au rayon des billes (7).

2. Dispositif de verrouillage selon revendication 1, **caractérisé en ce qu'**aussi les cavités radiales (8) dans le premier groupe sont pourvu des fonds qui sont parts des surfaces spheriques avec un rayon essentiellement égale au rayon des billes (7).

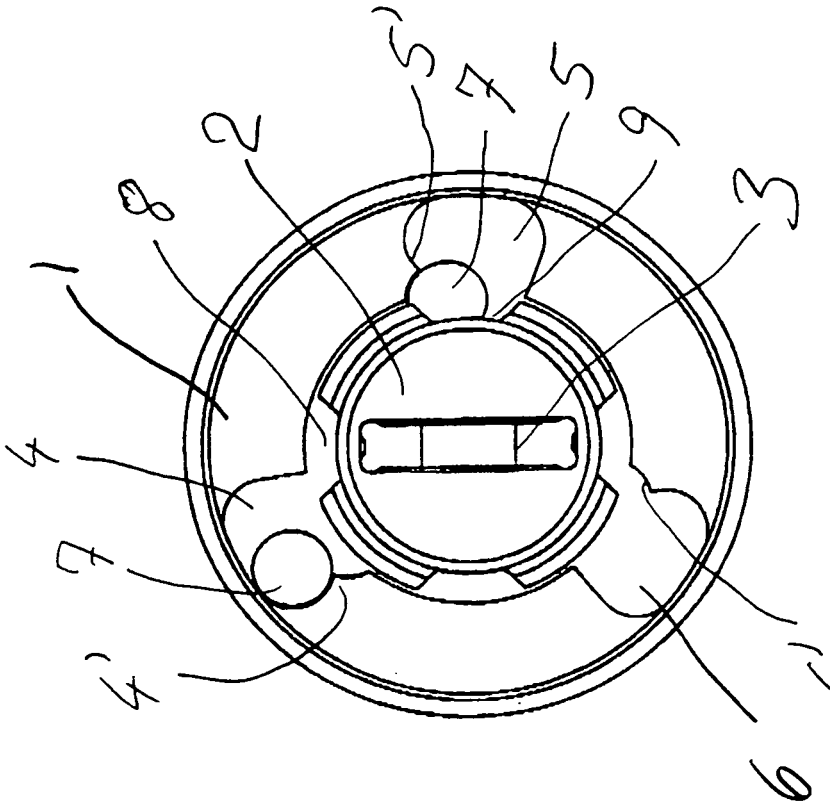

Fig. 2.

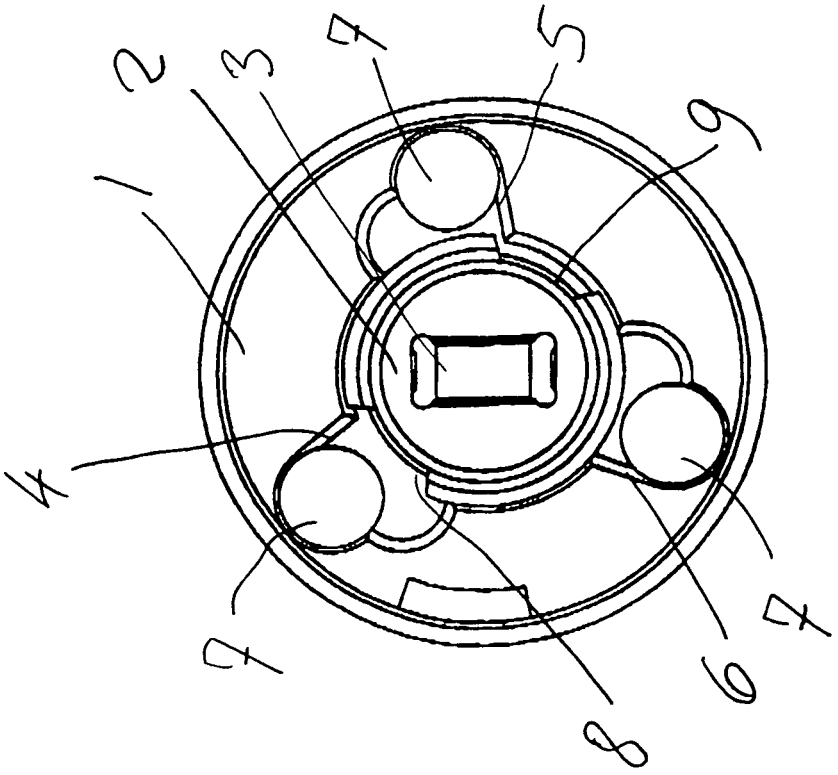

Fig. 1.
(prior art)

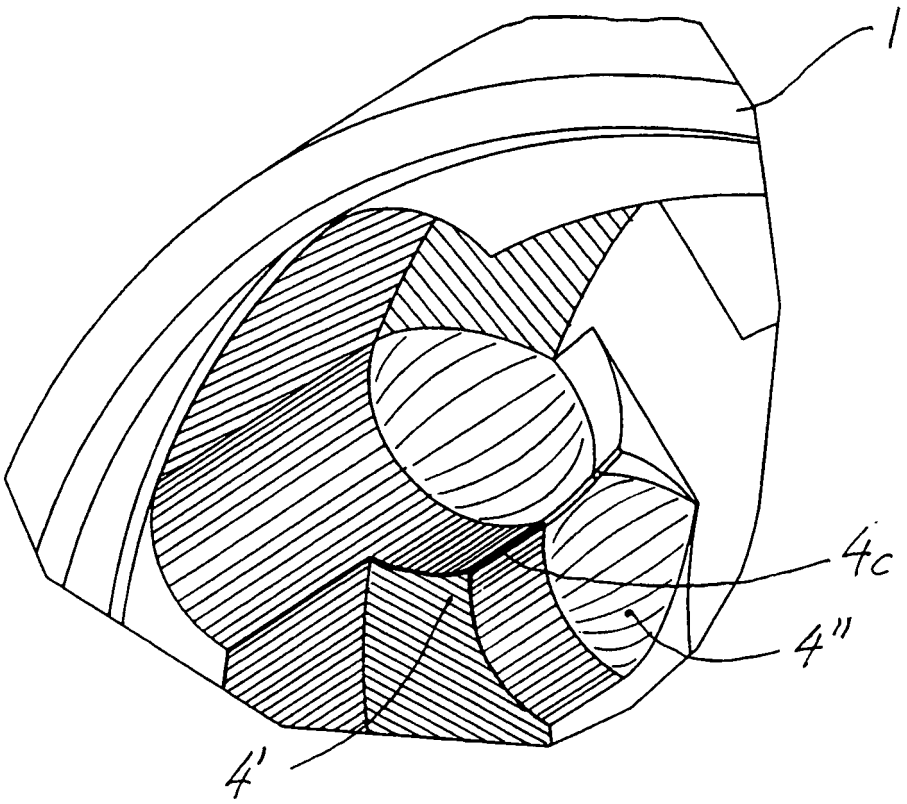

Fig. 3.