LOCKING DEVICE FOR A WINDING ARRANGEMENT

Inventor: Hans Meyer, Holzheim near Neuss, Germany

Assignee: GFA-Antriebstechnik Gesellschaft mit Beschränkter Haftung, Düsseldorf, Germany

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ABSTRACT

A roller blind or the like is wound on a winding shaft by means of a drive shaft, a worm on the latter and a worm gear fixed to the winding shaft, whereby the unwound portion of the blind will exert a moment of the winding shaft opposite to the moment imparted thereto by the drive shaft. This moment is counteracted by the self-locking worm drive between the drive shaft and the winding shaft. A locking device comprising an auxiliary self-locking worm drive is provided which becomes active after destruction of the worm drive between the drive shaft and the winding shaft to prevent in such a case accidental lowering of the roll blind.

8 Claims, 3 Drawing Figures
LOCKING DEVICE FOR A WINDING ARRANGEMENT

BACKGROUND OF THE INVENTION

The present invention relates to a locking device for a winding arrangement for a roll blind or the like in which a worm wheel fixed to the winding shaft is driven by means of a self-locking worm on a drive shaft.

The winding shaft of a winding arrangement, for instance for roll blinds, roll doors or roll gates are continuously subjected to the moment imparted thereto by the load which has to be moved in vertical plane. A cost saving arrangement is derived if as drive for such winding arrangement a self-locking worm drive is used which acts not only to lift the load, but at the same time acts as a continuous brake. For safety reasons and to avoid any accidents, it is additionally required to provide a locking device which will positively prevent accidental downward movement of the load to be lifted if the braking action produced by the worm drive is not maintained, for instance due to destruction of the worm drive, after excessive wear of the teeth of the worm. While this danger may arise only after the winding arrangement has been used for years, this danger has to be positively prevented in that usually the winding arrangement is not serviced or closely checked during years of use.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a locking device for a winding arrangement of the aforementioned kind which will become active when, after excessive wear of the worm drive the latter will not act properly any longer as a brake.

It is further object of the present invention to provide for a locking device for a winding arrangement of the aforementioned kind which may be manufactured at reasonable cost, which will not be subjected to any substantial wear during operation of the winding arrangement for considerable time so as to properly act as brake any time when such a braking action will, due to the destruction of the worm drive, not be obtained from the latter.

To obtain the desired results, an auxiliary worm wheel is coaxially fixed to the main wheel on the winding shaft of the winding arrangement and the auxiliary worm wheel is in meshing engagement with an auxiliary self-locking worm on an auxiliary shaft which is axially shiftable within predetermined limits and which is driven from the drive shaft by means of a gear drive or the like which is interrupted when an increased turning moment is transmitted thereto.

The auxiliary worm is driven, during normal operation of the winding arrangement, without participating in the power transmission from the drive shaft to the winding shaft. Since the auxiliary shaft is axially movable within certain limits, the latter will be axially moved during wear of the teeth of the worm on the drive shaft so that such wear of the teeth of the drive shaft will be compensated by axially shifting of the auxiliary shaft. The auxiliary worm will act as a brake when, for instance, the teeth of the worm on the drive shaft will be destructed by excessive wear. In this case, the turning moment of the drive shaft will be transmitted by the gear transmission between the drive shaft and the auxiliary shaft onto the latter so that the auxiliary shaft will then either axial move until one end engages an appropriate stop so that the gears of the transmission between the drive shaft and the auxiliary shaft will become disengaged from each other, or one of the gears of the transmission may be fixed to the respective shaft by means which break upon transmission of an increased moment so that transmission of a force by this transmission means will likewise be interrupted. In either case, the auxiliary worm and worm gear will now act as a brake so that accidental lowering of a partially wound up roll blind or the like positively prevented while the drive from the drive shaft to the winding shaft is interrupted so that the operator will know that the main worm or the main worm gear is excessively worn and has to be replaced.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation together with additional objects and advantages, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a partially sectioned, partial end view of the winding arrangement with the locking device according to the present invention;

FIG. 2 is a cross section taken along the line II—II of FIG. 1; and

FIG. 3 is a cross section taken along the line III—III of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing, and more specifically to FIGS. 1 and 2 of the same, it will be seen that the winding arrangement with the locking device according to the present invention comprises a housing 1 in which a winding shaft 2, only partially shown in FIG. 2, is turnably mounted which serves to wind a roll blind or the like, not shown in the drawing, thereon during turning of the winding shaft in one direction. Coaxially fixed to the winding shaft 2 by means of a key 3 is a wheel body 4 which is provided on part of its outer periphery with the teeth of an auxiliary worm wheel 4a integrally cast with the wheel body 4. The wheel body 4 carries further fixed thereto in the region of its outer periphery and laterally of the auxiliary worm 4a a gear ring 5 in which the teeth of a main worm wheel are exactly machined. An auxiliary worm wheel 6 meshes with the teeth of the auxiliary worm wheel 4a, and the auxiliary worm 6 is integrally formed on an auxiliary shaft having ends of reduced diameter 6a which are turnably mounted in roller bearings 7 and 8 in the housing 1 and axially movably between fixed stops 9 and 10. Meshing with the teeth of the main worm wheel 5 is a main worm wheel 11 integrally formed on a main shaft. One end 11a of the main shaft is turnably mounted in the bearing 12, and the other end 11b forms a drive shaft connected to a prime mover, not shown in the drawing and is mounted in the bearing 13 in the housing. The bearings 12 and 13 are constructed to take up the axial pressure the drive shaft is subjected to during operation of the winding arrangement. In order to prevent any braking action of the auxiliary worm during normal operation of the winding arrangement, a gear 14 is co-
axially fixed to the main drive shaft and this gear meshes with an additional gear 15 coaxially fixed to the auxiliary shaft. The gear ratio of the gears 14 and 15 and that of the auxiliary worm 6 to the auxiliary worm wheel 4a is chosen in such a manner that the auxiliary worm will freely rotate with the main worm wheel 5 without participating in the power transmission between the drive shaft and the winding shaft.

When after operation of the winding arrangement for a long time period the teeth of the main or drive worm 11 wear, the resulting angle of movement of the main or drive worm wheel 5 will be compensated by the axially movable mounting of the auxiliary worm 6. The gear 15 will also move during such wear slightly in axial direction. If, however, the wear of the drive worm 11 becomes excessive so that a power transmission onto the worm wheel 5 will not take place any longer, than the turning moment of the drive shaft 11b will be transmitted to the auxiliary worm 6 which in this case will be axially moved until one of the shaft ends 6a will engage the corresponding stop 9 and 10. In this case, the gear 15 will become disengaged from the gear 14 so that the drive from the drive 11b to the winding shaft 2 will be interrupted while self-locking auxiliary worm 6 will cooperate with the auxiliary worm wheel 4a to act as a brake.

The auxiliary worm 6 will therefore act only when the drive between the main worm 11 and the main worm wheel 5 is destroyed due to excessive wear, and the auxiliary worm 6, will turn during normal operating conditions without participating in the power transmission between the drive shaft and the winding shaft. The teeth of the auxiliary worm wheel 4a and those of the auxiliary worm 6 need therefore not be very exactly machined.

The arrangement may also be made in such a manner that for instance the gear 15 is connected to the portion 6a of the auxiliary shaft by means of a set screw, not shown in the drawing, constructed to break when an increased turning moment is transmitted between the gears 15 and 14. Instead of meshing gears 14 and 15, the turning of the main shaft may also be transmitted to the auxiliary shaft by a chain drive.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of locking devices for winding arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in a locking device for a winding arrangement for a roll blind or the like, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be protected by Letters Patent is:

1. A locking device for a winding mechanism comprising, in combination, support means; a winding shaft turnably mounted on said support means for winding a roller blind or the like thereon; a main worm wheel connected to said winding shaft for rotation therewith; a drive shaft turnably mounted on said support means; a self-locking main worm gear on said drive shaft and meshing with said main worm wheels; an auxiliary worm wheel connected to said winding shaft for rotation therewith; an auxiliary shaft turnably and axially shiftable within predetermined limits mounted on said support means; a self-locking auxiliary worm gear fixed to said auxiliary shaft and meshing with said auxiliary worm wheel; and transmission means between said drive shaft and said auxiliary shaft for driving the latter at a fixed ratio so that said auxiliary shaft and said worm gear thereon rotates freely without participating in the power transmission from the drive shaft to said winding shaft, said transmission means being constructed to interrupt the drive from the drive shaft to said auxiliary shaft, when, due to excessive wear of said main worm wheel and said main worm meshing therewith, an increased moment is transmitted to said transmission means.

2. A locking device as defined in claim 1, wherein said transmission means comprises a pair of gears fixed to said drive shaft and said auxiliary shaft, said gears normally meshing with each other and being axially displaced from each other to be out of engagement upon axial movement of said auxiliary shaft when an increased moment is transmitted to the latter.

3. A locking device as defined in claim 2, wherein said main worm and said main worm extend substantially parallel to each other and wherein said pair gears comprises a pair of spur gears.

4. A locking device as defined in claim 2, wherein one of said gears is fixed to the respective shaft by means which break upon transmission of an increased moment to said transmission means.

5. A locking device as defined in claim 1, wherein said support comprises a housing enclosing said worm wheels, said worms and said transmission means.

6. A locking device as defined in claim 1, and including antifriction bearing means in said housing for turnably supporting said drive shaft and said auxiliary shaft, the main shaft and the bearing means for the main shaft being constructed to prevent axial shifting of said main shaft.

7. A locking device as defined in claim 1, and including a pair of stops on said support means respectively facing opposite ends of said auxiliary shaft for limiting axial movement of the latter.

8. A locking device as defined in claim 1, wherein said auxiliary worm wheel comprises a cast wheel body having integrally cast gear teeth on its periphery and wherein said main worm wheel comprises a gear ring fixed to said wheel body with precision machined gear teeth.

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