

SPECIFICATION

Louvered venetian blind with vertical louvers

The present invention relates to a louvered venetian blind with vertical louvers. One type of such blind has several louver carriers each holding a louver and which can be moved along a rail, a pull carrier which pushes or pulls the louver carriers of a louver pack in the axial direction of a drive shaft which passes through the louver carriers and the pull carrier and has at least one helical groove.

When the louvers are turned, the pull carrier should not be moved in the axial direction. It is, however, still very difficult to ensure that, during turning of the louvers, the pull carrier does not produce any movement on the louver carriers associated with it.

According to the present invention, we provide a louvered venetian blind comprising a rail, a single drive shaft rotatable in the rail, several louver carriers each carrying a louver and capable of being moved along the rail, a pull carrier which pulls or pushes the louver carriers of a louver pack in the axial direction of the drive shaft, the drive shaft passing through the louver carriers and the pull carrier and having at least one helical groove and a low friction freewheel mechanism between the pull carrier and the drive shaft, and a drive system between the drive shaft and the louvers causing said louvers to turn upon rotation of the shaft, which mechanism by itself allows a movement of the pull carrier to start only when the turning of the louvers in one or the other direction is completely finished.

With such an arrangement the pull carrier cannot be moved in the axial direction by the drive shaft during turning of the louvers. The transmission of forces between the drive shaft and the pull carrier is reduced, due to the low-friction design of the freewheel mechanism, to such an extent that the latter remains stationary during turning in every case. An axial movement of the louver carriers during this period is thus also impossible.

In one embodiment of the invention are the freewheel mechanism comprising a worm, which is located on the drive shaft and engages with a part of its cross-section in the groove or grooves of the shaft, and a wormwheel which interacts with the worm and is provided with at least one stop which limits the rotation of the worm after a predetermined number of revolutions in either direction, the gearing ratio between the worm and the wormwheel being selected in such a way that the number of revolutions of the shaft required for the rotation of the worm from stop to stop is equal to or greater than the number of revolutions of the shaft required for a complete turning step of the louvers.

As a result of this, a safety range of predetermined size can be provided between the end of a turning step and the start of an axial movement. Although it has not always been possible in the past, due to any inaccuracies

caused by assembly or operation, to prevent that axial movement already started during a last small part of the turning step, even this difficulty is now completely overcome by the selection of the gearing ratio as suggested above.

In a certain type of louvered venetian blinds, each louver carrier has a turning drive which comprises a worm located on the turning shaft and a wormwheel which is arranged coaxially to the turning axis of the louver and interacts with the worm. For this type of venetian blind, it is particularly advantageous for each of the worms arranged in the pull carrier to have the same pitch as those of the louver carriers and for the number of teeth of the wormwheel arranged in the pull carrier to be greater than the number of teeth of a wormwheel arranged in a louver carrier.

This is thus a particularly simple measure, by means of which the abovementioned safety range can be provided.

The axial movement of the pull carrier and hence the louver carriers thus always starts only when the worm arranged in the pull carrier rests on the associated wormwheel stop in one or the other direction of rotation. If, however, the drive shaft then continues its rotation and attempts to effect a further axial transport of the pull carrier, it is conceivable that this happens even if the pull carrier has already reached its end position in this direction and bears against an end stop or another obstacle. In this situation, the pull carrier could be damaged if there is further rotation of the drive shaft.

This danger can be eliminated if additionally an overload clutch is inserted into the path of forces between the drive shaft and the worm thread. The overload clutch can be designed for a transmission of forces by positive connection and by frictional connection in such a way that, on declutching by means of the frictional connection, the positive connection is broken.

This design ensures that no disadvantages at all can occur if the drive shaft effecting the axial transport is rotated further even if the pull carrier is already in an end position. This represents a very substantial advantage. The positive connection between the drive shaft and the pull carrier, in particular in the zone of the freewheel mechanism, is reliably protected against any overload.

Furthermore, it is conceivable that, in the case of a louvered venetian blind which closes in the middle, the pull carriers moving towards one another do not accurately reach the envisaged end positions. If that pull carrier which has first reached its end position were to stop any further rotation of the drive shaft, it is quite possible that the second pull carrier would not have yet reached its end position. The reason is that the drive shafts with the helical grooves cannot be produced with a sufficiently great precision. Even with the best possible pre-adjustment of the pull carriers during assembly, it is still possible, due to production inaccuracies of this type, that the second pull carrier in a particular case is not transported up to

its end position. In known louvered venetian blinds, this had to be accepted. The use of an overload clutch eliminates this disadvantage. Since the overload clutch excludes any damage to

5 a pull carrier which is prevented from further axial motion, when the drive shaft is still rotated further in the same direction, the second pull carrier can also still be transported by the drive shaft up to its end position in every case.

10 Whilst hitherto the two louver packs of a louvered venetian blind, which closes in the middle, and hence the two parts of the drive shaft with helical grooves running in different directions, had to be of the same length, it is now even

15 possible to apply the same drive principle even if the two louver packs are of different sizes. The pull carrier which first reaches the extended end position can indeed not arrest the drive shaft against further rotation or cannot be damaged by

20 further rotation of the drive shaft with excessive force. It will thus be possible in every case to bring the second pull carrier up to its end position.

Moreover, the application and design of the overload clutch, proposed by the invention, can be

25 used particularly advantageously in connection with louver carriers in which the driving force, required for turning the louvers, is taken only by a simple frictional connection between the circumferential surface of the grooved shaft and

30 that part of a slip clutch which interacts with this shaft. This applies to a greater extent even if the frictional force of such a slip clutch is suddenly reduced in each case when a turning end position is reached, since the drive shaft can then be

35 rotated further without it being necessary to provide a substantially greater driving force because of the relatively large friction losses.

Advantageously, one part of the overload clutch is formed by a sleeve which is located on the drive

40 shaft and engages with a part of its cross-section in the drive shaft, the worm hub surrounds the sleeve and forms the other part of the clutch and the sleeve has a toothed ring with teeth which extend in the axial direction, the worm hub being

45 provided, on the end face which faces the toothed ring, with teeth complementary to the teeth of the toothed ring.

This gives a very space-saving arrangement of the overload clutch. When moreover the sides of the tothing extend in substantially the axial

50 direction, the overload clutch has a pure positive connection. Declutching of the clutch, when a predetermined drive power is exceeded, would then have to be effected by other suitable means.

55 By contrast, it is an advantage for the sides of the teeth to extend with an oblique inclination at an acute angle to the axial direction. If the worm hub is now pressed with a predetermined force, for example a spring force, against a toothed ring of

60 the sleeve, the teeth will, provided the power to be transmitted is above a certain magnitude, automatically force the worm hub away from the toothed ring of the sleeve so that the overload clutch can slip or idles.

65 Preferably the worm hub is pressed against the

toothed ring of the sleeve by means of a coil spring which acts in the axial direction and surrounds the sleeve, the coil spring in turn being surrounded by the worm hub and one end of the

70 coil spring bearing against an inner annular shoulder of the worm hub, whilst its other end is supported on a flanged ring, provided with a conical outer surface; the ring being formed with an axial slot and engaging with an annular groove of the sleeve.

75 This also further reduces the required constructional space. The slot provided in the support ring makes it possible to bend the support ring open when it is inserted into the annular

80 groove. The result of the conical design of the outer surfaces of the ring is that the spring which is pushed over this part can hold the flanged ring in its compressed position. In spite of its axial slot, the flange ring is thus secured in the annular

85 groove. The overload clutch thus has a particularly simple construction. In principle, in a louvered venetian blind design according to the invention, it is possible, in addition to the drive shaft which effects the axial transport and is provided with at

90 least one helical groove, to provide an additional turning shaft, via which the drive power required for the turning step is transmitted. The driving force effecting the turning can also be transmitted to the louver carriers in another way. It is,

95 however, particularly advantageous for only a single shaft to serve as the shaft for moving the pull carriers and as the turning shaft. This results in considerable space saving. The manufacturing expenditure is also considerably reduced. A further

100 advantage is that operation of the blind is made easier.

The overload clutch described here can also be used, with the same advantages, in every case for a louvered venetian blind, the pull carrier of which

105 is not provided with the freewheel mechanism of low friction, and it can also be employed independently of the fact whether the drive shaft is or is not combined with the turning shaft to give one shaft.

110 In order that the invention will be more fully understood, the following description is given, merely by way of example, reference being made to the accompanying drawings, in which:—

115 FIGURE 1 is a diagrammatic side view of one embodiment of louvered venetian blind according to the invention;

FIGURE 2 is an exploded view of one of the pull carriers of the blind of Figure 1; and

120 FIGURE 3 is a vertical section through a part of the pull carrier of Figure 2 in the zone of the drive shaft.

Referring to Figure 1, the vertical blind includes an upper rail 10, on which two louver packs are suspended, each of which has a pull carrier 11 and

125 a number of louver carriers 12, on each of which, one louver 13 is suspended. A drive shaft 15 passes through all the carriers 11 and 12 and each part associated with a louver pack is provided with three helical grooves 16 or 17. The three grooves 16 associated with one louver pack are wound in

one hand and the three grooves 17 associated with the other pack are of opposite hand so that, on rotating the drive shaft 15, the packs move in opposite directions, i.e. the louver packs either open towards the side or move in the direction of the middle, which corresponds to the closed position.

The drive shaft 15 can be rotated by means of a chain 18. Support carriers 14 are provided to support that part of the drive shaft 15 between the louver packs on the rail 10 and thus prevent sagging of the drive shaft 15.

The pull carrier 11 is in each case directly connected to the next louver carrier 12 of its louver pack. The force required for the axial movement is transmitted from the drive shaft 15 only to the pull carriers 11, whilst the louver carriers 12 only take the particular driving force, required for the turning step, from the drive shaft 15. The axial movement of the louver carriers 12 is effected by strips 19 which are connected to the pull carriers and pass through the louver carriers 12. The strips 19 have abutments, on the end remote from the carrier to which they are connected, which engage a stop on the louver carriers, so that a lost motion connection is provided between adjacent carriers. The louver carriers 12 run on the rail 10 with the aid of rollers 35.

Referring now to Figures 2 and 3, the pull carrier 11 illustrated has a casing 20 through which the drive shaft 15 passes. A sleeve 21 is mounted on shaft 15 and has three cam-like, inward-projecting parts of its cross-section which engage in the three grooves 16 to positively connect it to the drive shaft 15. At one of its ends, the sleeve 21 has a toothed ring 22 with teeth 23 extending inwardly in the axial direction. The sleeve has an annular groove 24 in the zone of its opposite end.

The sleeve 21 is surrounded by a worm 25 which, on its end face which faces the toothed ring 22, is provided with outwardly extending teeth 26, the form of which is complementary to that of the teeth 23, the teeth 23 and 26 each having sides which extend obliquely at a predetermined angle. The worm 25 has a worm hub 27 with an inner ring shoulder 28 which serves as a stop for one end of a coil spring 29 which surrounds the sleeve 21. A ring 30 has a conical outer surface and an annular flange 31 at one of its ends. A slot 32 runs in the axial direction through the ring 30 and through the flange 31.

In the assembled state, that end of the coil spring 29 which faces the ring 30 and the flange 31 surrounds the ring 30, compressing the latter in such a way that it engages with a part of its cross-section in the annular groove 24 and is thus held in the axial direction. The coil spring 29 is in turn secured in the axial direction by the flange 31, which is wholly within the bore in the worm 33, so that the latter can move axially to the right, as seen in Figure 3, whereby the teeth 23 and 27 can act as an overload clutch, as will be explained later.

The worm 25 has a worm thread 33 which engages in the teeth of a wormwheel 34, which has a stop 36 at half its axial length between two adjacent teeth only. The worm 25 and the wormwheel 34 form a freewheel mechanism of low friction.

In operation, when the drive shaft 15 rotates during a turning step and the pull carrier 11 is thus not to be driven in the axial direction, rotation of the worm 25 and hence of the gear wheel 34 is effected by the rotation of the drive shaft 15. After a turning step has been completed and after an additional rotary motion of the drive shaft 15, which motion serves for safety and is at least small, has ended, one or the other end of the worm thread 33, depending on the direction of rotation, engages the associated side of the stop 36. A further rotation of the worm 25 is thus arrested. The worm 25, thus prevented from further rotation, can now be driven by the drive shaft 15 in the axial direction so that in this way the pull carrier 11 is taken along in the corresponding direction.

When the pull carrier 11 reaches its end position and is prevented by an external obstacle, such as an end stop, from a further motion in the same axial direction, the overload clutch will respond when the drive shaft 15 rotates further in the same direction. Whilst, up to now, the coil spring 29, which is engaged against the support ring 31, has pressed the worm 25 in the direction of the toothed ring 22 with the aid of the inner annular shoulder 28, so that the teeth 23 and 26 were in full engagement, a large relative torque between the sleeve 21 and the worm 25 now has the effect of forcing the toothing apart. The size of torque, at which this takes place, depends on the inclination of the toothed sides, on the force of the coil spring 29 and, moreover, on the properties of the material. The positive connection between the teeth 23 and 26 is thus broken so that the sleeve 21 can continue to rotate with the drive shaft 15, whilst the worm 25 is prevented from rotating.

During such a further rotation, the other pull carrier 11 can continue its travel up to its end position, if this has not yet been reached. The noise produced by the overload clutch draws the attention of the person operating the louvered venetian blind to the fact that at least one of the two louver packs is already in the corresponding axial end position.

If the louvered venetian blind is now of such a design that a turning drive formed by a worm and a wormwheel is likewise present in the louver carriers 12, the following applies in this case:

The wormwheel arranged coaxially to the turning axis of a louver 13 in a louver carrier 12 can then be provided with, for example, five or six teeth, whilst the wormwheel 34 in the pull carrier 11 is provided, for example, with eight or nine teeth. The worm provided in the turning drive of the louver carrier 12 here has a thread of the same pitch as that of the worm thread 33 of the worm 25 in the pull carrier 11. This choice of gearing ratio thus ensures that, between the end of a

turning step and the start of a moving step in the axial direction, there is at least a small intervening time.

CLAIMS

5 1. A louvered venetian blind comprising a rail, a
single drive shaft rotatable in the rail, several
louver carriers each carrying a louver and capable
of being moved along the rail, a pull carrier which
pulls or pushes the louver carriers of a louver pack
10 in the axial direction of the drive shaft, the drive
shaft passing through the louver carriers and the
pull carrier and having at least one helical groove,
and a low friction freewheel mechanism between
the pull carrier and the drive shaft and a drive
15 system between the drive shaft and the louvers,
causing said louvers to turn up rotation of the
shaft, which mechanism by itself allows a
movement of the pull carrier to start only when
the turning of the louvers in one or the other
20 direction is completely finished.

2. A louvered venetian blind according to
claim 1, wherein the freewheel mechanism
comprises a worm, which is located on the drive
shaft and engages with a part of its cross-section
25 in the groove or grooves of the shaft, and a
wormwheel which interacts with the worm and is
provided with at least one stop which limits the
rotation of the worm after a predetermined
number of revolutions in either of the two
30 directions of rotation, the gearing ratio between
the worm and the wormwheel being selected in
such a way that the number of revolutions of the
shaft required for the rotation of the worm from
stop to stop is equal to or greater than the number
35 of revolutions of the shaft required for a complete
turning step of the louvers.

3. A louvered venetian blind according to claim
2, wherein a turning drive is provided in each
louver carrier in the form of a worm located on the
drive shaft and a wormwheel which is arranged
40 coaxially to the turning axis of the louver and
interacts with the worm, the worms arranged in
the pull carrier and in the louver carriers having the

same pitch and the number of teeth of the
45 wormwheel arranged in the pull carrier is greater
than the number of teeth of a wormwheel
arranged in louver carriers.

4. A louvered venetian blind according to claim
1, 2 or 3, wherein an overload clutch is inserted
50 into the path of forces between the drive shaft and
the worm thread of the pull carrier, the overload
clutch being designed for a transmission of forces
by positive connection and by frictional
connection in such a way that, on declutching by
55 means of the frictional connection, the positive
connection is broken.

5. A louvered venetian blind according to Claim
4, wherein one part of the overload clutch is
formed by a sleeve which is located on the drive
shaft and engages with a part of its cross-section
60 in the drive shaft, the worm hub surrounding the
sleeve and forming the other part of the overload
clutch and the sleeve having a toothed ring with
teeth which extend in the axial direction, the worm
hub being provided, on the end face which faces
65 the toothed ring, with teeth complementary to the
teeth of the toothed ring.

6. A louvered venetian blind according to Claim
5, wherein the worm hub is pressed against the
70 toothed ring of the sleeve by means of a coil
spring which acts in the axial direction and
surrounds the sleeve, the coil spring in turn being
surrounded by the worm hub, one end of the coil
spring bearing against an inner annular shoulder of
75 the worm hub whilst its other end is supported on
a flanged ring, provided with a conical outer
surface, the ring being formed with an axial slot
and engaging an annular groove of the sleeve.

7. A louvered venetian blind according to any
80 one of the preceding claims, wherein a single shaft
serves as the drive shaft for moving the pull
carriers and as the turning shaft for turning the
louvers.

8. A louvered venetian blind, substantially as
85 hereinbefore described, with reference to and as
illustrated in the accompanying drawings.



turning step and the start of a moving step in the axial direction, there is at least a small intervening time.

CLAIMS

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single drive shaft rotatable in the rail, several
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of being moved along the rail, a pull carrier which
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10 in the axial direction of the drive shaft, the drive
shaft passing through the louver carriers and the
pull carrier and having at least one helical groove,
and a low friction freewheel mechanism between
the pull carrier and the drive shaft and a drive
15 system between the drive shaft and the louvers,
causing said louvers to turn up rotation of the
shaft, which mechanism by itself allows a
movement of the pull carrier to start only when
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20 direction is completely finished.

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wormwheel which interacts with the worm and is
provided with at least one stop which limits the
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number of revolutions in either of the two
30 directions of rotation, the gearing ratio between
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