

SPECIFICATION

Louvered venetian blind with vertical louvers

The present invention relates to a louvered venetian blind with vertical louvers.

One type of blind has several carriers which can be moved along a rail and through which passes a drive shaft provided with at least one helical groove. Some of the carriers act as louver carriers each carrying a vertically extending louver, the louvers being arranged in at least one louver pack. Further carriers serve as support carriers which are transported by the drive shaft and support parts of the drive shaft at predetermined spacings on the rail, at locations in the rail free from louver carriers.

The support carriers are intended to prevent sagging of the drive shaft in those zones in which there are no louver carriers or pull carriers (if the latter are used for the axial movement of the louver carriers). The support carriers can each individually be retained with the aid of stops provided on the rail.

In a known type of venetian blind, the louvers can be turned without axial movement on turning by an angle of more than 150° by rotating the drive shaft. If it is desired with such a type of venetian blind to use a system with support carriers transported by the drive shaft, great disadvantages which are not acceptable in practice would result since, during the turning time, a transport of the support carriers driven by the drive shaft, and hence running-up against the first louver carrier or the pull carrier, cannot always be excluded. Thus, an axial drive action which is exerted on the first louver carrier or the pull carrier and which starts at least from the first of the support carriers, cannot be avoided. Although the support carriers are each only connected frictionally to the drive shaft, the axial movement is still of such magnitude that an undesired movement of the particular pull carrier or louver carrier contacted can take place. However, it is preferred to avoid reliably any axial transport during the turning of the louvers.

According to the present invention we provide a louvered venetian blind comprising a rail, a drive shaft in the rail provided with at least one helical groove, several carriers which can be moved axially along the rail and through which passes the drive shaft, a number of the carriers being louver carriers for vertical louvers, whilst further carriers serve as support carriers which are moved by the drive shaft and support parts of the drive shaft at predetermined spacings on the rail, at locations in the rail free of louver carriers, the axial movement of the louver carriers being effected by a pull carrier which can be moved by means of the drive shaft, a freewheel mechanism of which interrupts the axial transport, effected by the drive shaft, during the turning of the louvers, a slip clutch arranged in each case between a support carrier and the drive shaft, and a braking device interacting with the rail to secure the pull carrier against axial movement, during the turning of the

louvers, the braking device being activated by the approach of a support carrier.

Such a design of a louvered venetian blind, results in the advantage that the standstill of the pull carrier during the turning of the louvers is not only dependent on the interruption of the transmission of the force coming from the drive shaft, but that there is additional securing of the pull carrier against an axial motion which can be caused in some cases by a support carrier running up. The invention has here recognised the fact that the approach of a support carrier to the pull carrier can be used in a favourable manner for actuating such a braking device.

Advantageously the braking device comprises a wedge surface on the pull carrier and overlaps a support carrier approaching a pull carrier when the latter is at a standstill during the turning of the louvers and which jams this support carrier by forcing it in vertical direction against a profile part of the rail and thus stops this support carrier and, if appropriate, further support carriers running up.

With the aid of the wedge surface, it is possible to utilise a horizontal force component, caused by the axial motion of the support carrier, to produce a vertical force component so that a braking force can be generated between the support carrier on the one hand and a profile part of the rail on the other hand. It is also possible, with the aid of the wedge surface, not only to brake the support carrier relative to the rail, but also for the pull carrier to be secured against a motion in the axial direction by the support carrier stopped in this manner, since the wedge surface of the pull carrier is jammed by the support carrier. The pull carrier is thus secured against an axial motion even if its freewheel mechanism should not interrupt the transfer of the driving force exerted by the drive shaft to an adequate extent.

In an advantageous embodiment of the invention, the wedge surface is a constituent of a wedge piece which extends towards the approaching support carrier and is pivotably mounted on one side of the pull carrier. It is also possible to provide one wedge surface or one wedge piece on each of the two sides of the pull carrier.

It is further proposed that the wedge piece is provided, on its side directed towards the louver carriers, with a stop which when contacted with a contacting surface causes the wedge surface to be held in the proper operational position.

This is advantageous when the louvered venetian blind is closed. The free end of the wedge surface of the wedge piece is then with certainty always at such a height that the support carrier can run over or underneath the wedge surface, dependably whether the wedge piece is mounted with the wedge surface and nose on the lower- or upperside, both arrangements being equally effective.

Advantageously, the stop can here be formed by a resilient nose which is joined to the wedge piece only at either the upper or lower zone of the latter and extends approximately vertically.

Preferably, the support carrier is designed in such a way as to keep as small as possible the axial drive action which is exerted when the support carrier runs into an obstacle, such as a pull carrier. The smaller this drive action, the lower can be the jamming which is to be effected by the wedge surface and the more readily can the jamming also be released when the movement of louver and pull carriers in the axial direction starts anew.

To achieve this the slip clutch provided in the support carrier may comprise a disc which engages with a part of its cross-section in the drive shaft and which is arranged between, and in direct frictional contact with, the two walls of the carrier casing, which extend transversely to the drive shaft, the thickness of the disc in the axial direction being somewhat larger than the clear spacing between the walls of the carrier casing.

It depends on the magnitude of the particular desired axial drive force and on the magnitude of the required safety margin, by how much the thickness of the disc is made greater in this direction. Clearly the magnitude of the friction force to be transferred can also be determined by a corresponding choice of the disc diameter.

As a result of this construction, the friction clutch has the additional advantage of a constructional length which is only very short in the axial direction of the support carrier. For this reason, the support carrier itself can also be made very short. Whilst the support carriers must take over the support of the drive shaft in the zone free from louver carriers, while the louvered venetian blind is partially or completely open, the support carriers run in front of the pull carrier which is first in the direction of closing, when the louvered venetian blind is closed, until the first louver carrier is in a position at a distance of about half a louver width from the rail end stop. This distance must be preserved as a maximum distance in order to make possible a closed position of the first louver itself. However, it must be present as a minimum distance so that no unclosed opening or a gap between the first louver and, for example, the side post of a window frame is caused. In the zone of half this louver width, there must thus be room, in the closed position of the louvered venetian blind, for the pull carrier and all the support carriers present so that it is necessary to design the support carriers as small as is at all possible.

It is, however, also possible to size the friction force to be transmitted via the end face of the disc with such accuracy that precisely the driving force required for the axial transport of the support carrier — of course with a safety margin of a certain size — can be transmitted and that the axial drive action, exerted on running-up onto a first pull carrier, is small if it occurs at all.

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

Figure 1 is a diagrammatic side view of one

embodiment of louvered venetian blind according to the invention; and

Figure 2 is, in a perspective view partly broken away, and to an enlarged scale, showing the louvered venetian blind of Figure 1 in the zone of a pull carrier with adjacent louver carrier and support carrier.

Initially, the general construction of a louvered venetian blind is to be described by reference to Figure 1. On an upper rail 10, two louver packs are suspended, each of which has a pull carrier 11 and a number of louver carriers 12, one louver 13 being suspended on each carrier 12. A drive shaft 15, of which each part associated with a louver pack is provided with three helical grooves 16 or 17, passes through all the carriers 11, 12 and 14. The three helical grooves 16 are of opposite hand from the three helical grooves 17, so that, on rotating the drive shaft 15, correspondingly different axial directions of movement are given. Instead of using two shafts, the drive shaft 15 here also simultaneously fulfils the function of a turning shaft.

The drive shaft 15 can here be rotated by means of a chain 18. Support carriers 14 are provided to support the particular part, free from louvers 13, of the drive shaft 15 on the rail 10 and thus to 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 driving 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 straps 19 which are secured at one end to the pull carrier 11 or to the louver carriers 12, and can slide through the adjacent carrier until an abutment on the other end engages a stop on said adjacent carrier, thus providing a lost motion correction.

The louver carriers 12 run on the rail 10 with the aid of rollers 35, but glide pieces or the like can also be used in place thereof.

Referring now to Figure 2, the rail 10 is subdivided by a horizontal profile web 20 into an upper profile part 21 and a lower profile part 22. In the latter, there are stops 24 which are inserted at different heights and which interact with stops 23 which laterally project on the support carriers 14. One stop 24 and one laterally projecting stop 23 make it possible selectively to stop each individual support carrier 14 during the opening step at the particular desired point, since each stop 23 of a support carrier is located at a vertical position and lateral direction which are each typical for this carrier. In Figure 2 only two support carriers are shown; the stops 23 of which are located at different heights on the side facing the observer. Each support carrier 14 initially has three stops 23 on each side. The stops 23 which are not required are in each case removed on assembly; they are drawn in dashes in Figure 2. Correspondingly, the stops 24 on the

lower profile part 22 of the rail 10 are located on different sides or at different heights.

Each support carrier 14 has, between its two casing walls 25 extending transversely to the drive shaft 15, a disc 26 which engages with three cam-like parts of its cross-section in the three grooves 16 of the drive shaft 15. The two end faces of the disc 26 bear against the insides of the casing walls 25, a contact pressure of predetermined magnitude being obtained by the fact that the thickness of the disc 26 in the axial direction is somewhat larger than the clear spacing between the casing walls 25. The magnitude of the total friction, which can be attained between the disc 26 and the casing walls 25, is determined by the given thickness of this disc 26 and by its diameter and, furthermore, also by the resilience and the nature of the surface of the materials in contact with one another.

Thus, the disc 26 forms a slip clutch. On rotation of the drive shaft 15, initially an axial movement of the support carrier 14 will be effected as long as the support carrier 14 does not strike an obstacle. As soon as the latter is the case, the force emanating from the disc 26 in the circumferential direction will become so large that the friction relative to the casing walls 25 is overcome and a rotation of the disc 26 is possible. The drive shaft 15 is thus not blocked against further rotation even if a support carrier 14 runs up against an obstacle.

The two pull carriers 11 each have on either side a wedge piece 27 with a downward-pointing wedge surface. The wedge piece 27 is pivotable about a horizontal axis 28 which extends transversely to the drive shaft 15. On its side facing the next louver carrier 12, the wedge piece 27 has a nose 29 which is separated by a gap 30 from the wedge piece 27 and is joined to the latter only in the upper zone of the wedge piece 27. Due to this design, the nose 29 likewise is given a resilience, utilising the inherent resilience of the plastic used here. The pull carrier 11 has, on its side facing the louver carrier 12, two blocks 36 fitting within the U-shaped recess of the profile part 21 and extending around both sides of the adjacent louver carrier 11. The nose 29 of the wedge piece 27 rests against guide part 36. It is thus possible always to hold the wedge piece 27 in a resilient manner in that position in which the wedge surface of the wedge piece 27 is at the greatest possible height and in which it is ensured that the particular support carrier 14 adjacent to the pull carrier 11 does not run against the free apex of the wedge piece 27, but can be overlapped by the wedge surface.

Each pull-carrier 11 has a freewheel mechanism which is formed by a worm 31 and a gear wheel 32 with a stop, which is not shown here, between two adjacent teeth. As long as the worm 31 can also rotate the gear wheel 32, no axial movement takes place. Only when the thread of the worm 31 strikes the stop on the gear wheel 32 in one or the other direction of rotation, is the rotation of the worm 31 blocked and the rotation of the drive

shaft 15 then effects an axial movement of the pull carrier.

Although this is not required for the functioning of this blind in the embodiment shown here, the pull carrier 11 and the next louver carrier 12 are interconnected by way of the blocks 36 which have a T-shaped recess 37 in which a stub shaft (not shown in the drawing) of the louver carrier 12 is engaged.

The other louver carriers 12 have rollers fitting onto the stub shafts, with which they can run in the profile part 21.

In detail, this results in the following mode of action:

As long as the worm 31 can rotate the gear wheel 32, during the rotation of the drive shaft 15 in the two pull carriers 11, no axial movement of the pull carriers 11 takes place, whilst the rotary motion of the drive shaft 15 in the individual louver carriers 12 is utilised for turning the louvers 13. In one of the two possible directions of rotation of the drive shaft 15, the support carriers 14 can also be moved in that axial direction which corresponds to an approach to the particular pull carrier 11. The support carrier 14, which in each case is next to the pull carrier 11, then passes underneath the wedge piece 27 during this approach. The axial driving force on contact of the wedge piece 27 with the support carrier 14, is utilised to generate a vertical force component, by means of which the support carrier 14 is forced onto the profile web 20 of the rail 10. Thus, the wedge piece 27 and the part, overlapped by the latter, of the support carrier 14 are thus jammed between the upper horizontal web of the profile part 21 and the profile web 20. Thus, further axial motion of the support carrier 14 in the direction of the pull carrier 11 is prevented. The friction clutch, formed by the casing walls 25 and the disc 26 is now activated since the drive shaft 15 will also rotate the disc 26 so that it is not possible for any damage to be caused by further rotation.

Due to the action of the friction clutch provided in each support carrier 14, the remaining actual axial driving force component is relatively small. A correspondingly small jamming force is then also sufficient for stopping further axial motion of the support carrier 14 in the direction of the pull carrier 11. The required force necessary for releasing the jamming during later driving of the drive shaft 15 in the opposite direction is then also correspondingly small.

When the support carrier 14 adjacent to the pull carrier 11 is retained on the rail 10 with the aid of the wedge pieces 27, this holding action is sufficient even if one or more of the other support carriers 14 should run up onto the support carrier 14 braked in a fixed position. Moreover, the jamming is also of sufficient magnitude to secure additionally the pull carrier 11, on turning of the louvers, against axial transport since a corresponding holding force can be exerted via the wedge pieces 27 jammed on the rail 10.

As can furthermore be seen from the description, the wedge piece 27 and the support

carrier 14 overlapped by the latter as well as the rail 10 act here as a braking device, the wedge piece 27 initiating the action of this braking device by overlapping the support carrier 14.

5 CLAIMS

1. A louvered venetian blind comprising a rail, a drive shaft in the rail provided with at least one helical groove, several carriers which can be moved axially along the rail and through which passes the drive shaft, a number of the carriers being louver carriers for vertical louvers; whilst further carriers serve as support carriers which are moved by the drive shaft and support parts of the drive shaft at predetermined spacings on the rail, at locations in the rail free of louver carriers, the axial movement of the louver carriers being effected by a pull carrier which can be moved by means of the drive shaft, a freewheel mechanism of which interrupts the axial transport, effected by the drive shaft, during the turning of the louvers, a slip clutch arranged in each case between a support carrier and the drive shaft and a braking device interacting with the rail to secure the pull carrier against axial movement, during the turning of the louvers, the braking device being activated by the approach of a support carrier.

2. A louvered venetian blind according to claim 1, wherein the braking device comprises a wedge surface on the pull carrier and overlaps a support carrier approaching a pull carrier when the latter is at a standstill during the turning of the louvers and which jams this support carrier by forcing it in the vertical direction against a profile part of the rail and thus stops the support carrier.

3. A louvered venetian blind according to claim

2 wherein one wedge surface is provided on each of the two sides of the pull carrier.

4. A louvered venetian blind according to claim 2 or 3, wherein the or each wedge surface forms part of a wedge piece which extends towards the approaching support carrier and is pivotably mounted on one side of the pull carrier.

5. A louvered venetian blind according to claim 3 or 4, wherein the wedge piece is provided, on its side directed towards the louver carriers, with a stop which when in contact with a contacting surface causes the wedge surface to be held in the proper operational position.

6. A louvered venetian blind according to claim 5, wherein the stop is formed by a resilient nose which is joined to the wedge piece only in an outer zone of the latter and extends approximately vertically.

7. A louvered venetian blind according to claim 5 or 6, wherein the pull carrier is joined to the next following louver carrier to give a combination carrier.

8. A louvered venetian blind according to any one of the preceding claims, wherein the slip clutch provided in the support carriers comprises a disc which engages with a part of its cross-section in the groove or grooves of the drive shaft and which is arranged between, and in direct frictional contact with the two walls of the carrier casing, which extend transversely to the drive shaft, the thickness of the disc in the axial direction being somewhat larger than the clear spacing between the walls of the carrier casing.

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



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