PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Venetian Blind

We, J. AVERY & COMPANY (EST. 1834) LIMITED of Sunblind House, 82—90 Queensland Road, London, N.7, a Company incorporated under the Laws of the United Kingdom of Great Britain and Northern Ireland, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to venetian blinds.

In a venetian blind it is usual to have two completely independent drive mechanisms; one to raise and lower the slats of the blind and the other to tilt the blind. With the usual cord operated mechanisms this involves two independent sets of cords for each blind. These cords are insightly, particularly when the blind is in a raised position, and furthermore there is a possibility that the two sets of cords may become entangled in each other. Alternatively, if the two sets of operating cords are arranged at opposite ends of the blind, there are two unsightly regions of cord and it is not possible to control the raising/lowering and tilting of the blind from one location.

A venetian blind in which the raising/lowering and tilting of the slats are carried out by a single cord has previously been proposed. In this proposal, a single operating cord drives a substantial longitudinal shaft, which extends along the whole length of the head member, through either a worm gear or a bevel gear. The longitudinal shaft then drives tape lifting devices and tilt mechanisms at various locations immediately above the corresponding lifting cords and ladder web. An arrangement of this kind is cumbersome in operation, partly because the longitudinal shaft must have sufficient tortional rigidity to avoid twisting of the shaft under the load of the blind. The correspondingly heavy shaft requires correspondingly substantial bearings which add to the cumbersome nature of the device as a whole.

According to the invention there is provided a venetian blind including a drive mechanism to raise and lower the slats and bottom rail of the blind incorporating a series of lifting tapes or cords arranged to lift the slats and bottom rail at locations spaced out along the length of the blind, a lifting tapes or cords extending along the head member to a common winding location in the vicinity of the input to the drive mechanism, the blind also including a slat-tilt mechanism connected to the said drive mechanism and incorporating a slipping torque-limiting drive arrangement. By this means, with suitable drive ratios, small movements of the drive mechanism tilt the slats throughout their whole range of possible movement without substantially affecting the raised/lowered position of the blind and large movements of the drive mechanism to raise and lower the blind are possible without interference from the tilt mechanism, due to the slipping drive arrangement.

In a venetian blind of this nature, it is possible to use a cord drive arrangement in the said drive mechanism and use this cord drive to raise and lower the blind and also to tilt the slats. Preferably such a cord drive is constituted by an endless cord coupled to a driving pulley; this permits the cord drive to be particularly neat because there are no cord ends to be come entangled and a comparatively short cord can be used as the amount of free cord does not increase or decrease with raising and lowering of the blind.

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Preferably the drive mechanism includes a rotatable tape winding drum which is driven through a gear mechanism and around which lifting tapes or cords are wound or unwound to raise or lower the blind.

Preferably slat tilt mechanism includes a rotatable shaft which extends along the upper edge of the blind and has mounted thereon a series of tilt drums over which are passed tilting tapes or cords of the slat-tilt mechanism. Operation of the drive mechanism thus rotates the tilt drums which in turn tends to move the tilt tapes or cords to adjust the angle of the slats. When the end of available tilting movement of the slats is reached, the tilt drums continue to rotate whilst the tilting tapes or cords slip thereon.

The rotatable shaft which extends along the upper edge of the blind is required to drive the slat tilt mechanism but not the lifting mechansm and this a very light shaft with a low torque capacity is quite suitable.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a venetian blind, some parts being broken away for clarity and convenience,

Figure 2 is a view of the raising and lowering mechanism of Figure 1 or Figure 4 showing a detail on an enlarged scale;

Figure 3 is a vertical section through part of the arrangement of Figure 1, on section line III—III of Figure 4 and,

Figure 4 is section on the line IV—IV of Figure 3.

The venetian blind incorporates a head member 11 of channel section sheet steel or other metal. The majority of the working components of the blind are enclosed within the head member to give a neat appearance. The gear box 12 (best seen in Figures 3 and 4) has an input shaft 13 on which is mounted an input driving pulley 14. This pulley is in turn driven by an endless cord 15. There is a torque limiting drive from the pulley 14 to the shaft 13. This drive is constituted by a dog clutch (not shown) with tapered dogs. When a low torque is being transmitted, a series of belville washers 10 holds the tapered dogs in engagement with each other and thus maintains a drive between the pulley 14 and shaft 13. On the other hand, one a predetermined torque is exceeded, the tapered dogs move out of engagement against the force of the bellville washers 10 and thus permit slipping between the pulley 14 and shaft 13.

A tape winding drum 16 is driven from the shaft 13 through spur gears 17 and 18, shaft 19 and spur gears 21, 22 and 23 spur gear 22 being free to rotate on shaft 13 on a bearing 24. The whole of the gear box 12, including the spur gears, shaft and side members 20, are formed of nylon or other suitable plastics material. The winding drum 16 and spur gear 23 are mounted for rotation together on a common shaft 25. The spur gears 17, 18, 21, 22 and 23 should in a typical case be such that the tape winding drum 16 rotates at a slower rate than the driving pulley 14, the drive ratio being 6:1. This drive ratio of 6:1 is suitable for heavy venetian blinds where it is desired to achieve a substantial mechanical advantage between the force required on the cord 15 and the force required to raise the blind. With smaller and lighter venetian blinds, a ratio of 4:1 or 1:1 may be suitable.

The tape winding drum 16 is mounted within a cage 26 which incorporates a series of apertured sheet members which divide the drum 16 into five sections each suitable for the winding of an individual tape. In the case shown in the drawing, the venetian blind is comparatively short and incorporates only two tapes 27 and 28. These tapes both pass under the gear box 12, being guided by cross members 31, 32 and 33 of the gear box, and the base of the head member 11 to positions where they pass down through the base of the head member 11 to the bottom stick 34 of the blind. The head member 11 incorporates two cross members 35 and 36, the main purpose of which will be described hereinafter. If the blind is sufficiently long to required more than two lifting tapes and ladder webs, there should be a correspondingly increased number of cross members such as 35 and 36 and of the other equipment associated with these cross members. The cross members each incorporate a spigot 37 which engages in an aperture in the base of the head member 11 and these spigots in turn each incorporate an aperture 38. The tapes 27 and 28 pass down through the apertures 38. The two cross members 35 and 36 are formed of nylon or a similar plastics material so that the edges of the apertures 38 provide smooth guiding surfaces for the tapes.

In operation of the raising and lowering mechanism, the cord 15 is operated to rotate the pulley 14. This in turn rotates the tap drum 16 as described above. Rotation of the tape drum 16 causes the tapes 27 and 28 to be wound or unwound therefrom and this in turn causes the tapes 27 and 28 to raise or lower the bottom stick 34, thus raising or lowering the slats of the blind.

When the blind slats are in a raised or partly raised condition, there is a tendency for the weight of the bottom rail 34 and slats 41 to rotate the winding drum 16 and other components of the gear box due to tension in the tapes 27 and 28. In order to overcome this tendency a friction brake is provided as shown in Figure 2. This brake comprises a nylon brake member 42 which passes over the pulley 14 in close proximity there-

to. The brake member 42 is formed of a plastics material such as nylon and thus is slightly flexible. It is mounted at one end by a screw 43 to the head member 11. At the other end, a screw 44 in the head member provides adjustment for the brake member 42 and enables it to engage with a desired pressure on the driving cord 15, where this cord passes over the pulley 14. In this way, the functional resistance to rotation of the pulley is adjustable by means of the screw 44. The adjustment should be such that no undue force is required to operate the cord 15 but sufficient to prevent the weight of the bottom stick 44 and slats 41 from lowering the blind from its raised position. Due to the fact that the friction brake is arranged on the input side of the reduction gearing, a very small frictional force is sufficient to prevent the blind from falling under its own weight from a raised position. This small frictional force assists the smooth operation of the blind as a whole.

Figure 2 also shows that the cord 15 passes down through a slot in the base of the head member inside a nylon or similar guide member 45 which prevents the cord 15 from rubbing against the edge of the slot in the base of the head member. The brake members 42 also tends to prevent the cord 15 from coming off the pulley 14.

The slat-tilt mechanism incorporates a rectangular longitudinal shaft 51 which is driven from the shaft 13 by means of spur gears 17 and 18, shaft 19 spur gears 21 and 52, shaft 53 and bevel gears 54 and 55. Each cross member such as 35 is generally in the form of a rectangular box 56 which is supported against the sides of the head member 11 by means of extensions 57 and 58. The spigot 37 engaging in an aperture in the base of the head member 11 also assists location of the cross member. The top of the rectangular box 56 is open and the sides thereof are slotted at 59 in order to receive a nylon or similar tilt drum 61 on an integral stub shaft 62. The stub shaft 62 engages with the base of the slots 59 which provide a bearing to rotatably support the tilt drum 61 in the cross member 35. The stub shaft 62 has a rectangular aperture through which the rectangular shaft 51 passes, thereby providing a driving connection so that the tilt drum 61 is rotated by rotation of the drive pulley 14.

The cords of a typical ladder web 60 pass over the tilt drum 61 and through apertures 64 in the base of the head member 11. The surface of the tilt drum 61 incorporates ridges such as 61a which provide a moderate grip between the cords 63 and the drum 61. Thus, rotation of the tilt drum 61, in one direction or the other by means of the cord 15 and the interposed driving connection, thus causes cord 63 to be raised at one side and lowered at the other side in order to tilt the slats 41 in the usual way.

Although only one tilt drum 61 has been described in detail there is a corresponding tilt drum 65 near the other end of the head member 11 and this is also driven by the shaft 51. If no further cross members are provided there will also be further tilt drums. The shaft 51 is located axially by means of a collar 66.

The gear ratios within the gear box 12 are such that only small lengths of lifting tapes 27 and 28 are paid out from or wound onto the drum 16 during the complete range of tilting movement of the slats 41. Thus, in order to raise or lower the blind, a slipping torque-limiting drive is required between the gear box and the cords 63 of the ladder web. This slipping drive is provided by a tilt drum 61 and the cords 63 in that the drum 61 can continue to rotate whilst the cords 63 remain stationary.

Thus, in operation, large movements of the cord 15 are used to raise and lower the blind as a whole whilst slip takes place between the tilt drums 61 and 65 and their associated ladder web cords.

The length of the lifting tapes 27 and 28 is made such that when the blind is fully lowered, the lifting tapes become slack, leaving the slats 41 and bottom rail 34 suspended by the ladder webs 60. There is sufficient slack in the tapes 27 and 28 to permit some movement of the cord 15 without any raising or lowering motion taking place. This small range of movement of the cord 15 is used to tilt the slats 41 and the bottom rail 34 to the desired angular position. It should be noted that as soon as the tapes 27 and 28 come under tension and thus take the load of the bottom stick 34 off the ladder web 60, there is a very much reduced pressure between the tilt drums 61 and 65 and the cord 63 of the ladder web due to the reduced tension in the cord 63. This further reduces the friction between the tilt drums 61 and 65 and the cord 63 during the major part of a raising or lowering operation.

When the blind is to be raised from its lowermost position, either side of the cord 15 may be pulled. Either direction of rotation will result in winding of the lifting tapes around the tape drum, thus raising the blind. Depending on which side of the cord 15 is pulled the lifting tapes will be wound in one direction or the other. Due to this feature, it is not possible to overload the lifting mechanism by pulling too hard on the 'wrong' side of the cord and thus no positive stop is needed to prevent such an overload.

When it is desired to lower the blind from a fully raised position, a pull on the 'wrong' side of the cord 15 tends to build up excessive forces in the lifting mechanism, particularly excessive tension in the lifting cords.

However, the torque limiting drive between the pulley 14 and shaft 13 prevents an excessive force from being applied to the lifting mechanism. If the 'wrong' tape is pulled with the blind in its fully raised position, the tapered dog teeth of the torque limiting drive slip over each other, at the same time generating a substantial noise. This noise provides a warning to the operator that the wrong side of the cord 15 is being pulled. In this way, the torque limiting drive avoids the requirement for a positive stop in the uppermost position of the blind.

The use of a series of spur gears in the gear box has the advantage that simply by changing a small number of cogs. It is possible to vary the gear ratio to meet the requirements of a particular blind. A further advantage of spur gearing is that even with simple nylon gears formed by injection moulding, a gear box of high mechanical efficiency can be provided. This feature, in conjunction with the very light force required on the friction brake and the free rotation of the comparatively light longitudinal shaft 51 results in a blind which requires a very low operating effort. As a result of this, a suitable gear ratio can be chosen so that even a large blind can be raised by a force of less than 10 lbs., without requiring an excessive amount of pulling on the cord 15.

A further advantage of the arrangement whereby all the lifting tapes are wound on a single winding drum in the vicinity of the gear box is that the reduction in the cost of the blind due to the simplified longitudinal shaft and simplified arrangement in the vicinity of the upper end of the lifting tapes and ladder webs more than offsets the cost of the single tape winding drum and the drive thereto.

To summarize the operation of the blind by a user thereof, large movements of the cord 15 cause the blind as a whole to be raised or lowered whereas small movements of the cord 15, particularly with the blind fully lowered, cause the slats to be tilted. Thus there is provided a blind which is simple to operate and which incorporates only a single endless loop operating cord.

WHAT WE CLAIM IS:—

1. A venetian blind including a drive mechanism to raise and lower the slats and bottom rail of the blind and incorporating a series of lifting tapes or cords arranged to lift the slats and bottom rail at locations spaced out along the length of the blind, the lifting tapes or cords extending along the head member to a common winding location in the vicinity of the input to the drive mechanism, the blind also including a slat-tilt mechanism connected to the said drive mechanism and incorporating a slipping torque-limiting drive arrangement.

2. A venetian blind as claimed in claim 1 in which a cord drive arrangement is used to operate the drive mechanism.

3. A venetian blind as claimed in claim 2 in which the cord drive arrangement is constituted by an endless cord coupled to a driving pulley.

4. A venetian blind as claimed in claim 3 including a friction brake operative on the cord where it passes over the pulley.

5. A venetian blind as claimed in claim 2 or claim 3 or claim 4, in which the drive mechanism includes a rotatable drum which is driven through a gear mechanism and around which lifting tapes or cords are wound or unwound to raise or lower the blind.

6. A venetian blind as claimed in claim 5 in which the gear mechanism incorporates spur reduction gearing.

7. A venetian blind as claimed in any of the preceding claims in which the drive mechanism drives a rotatable shaft which extends along the upper edge of the blind and has mounted thereon a series of tilt drums over which are passed tilting tapes or cords of the slat-tilt mechanism.

8. A venetian blind as claimed in claim 7 in which the drive mechanism to raise and lower the slats is such that there is lost motion in the drive mechanism when the blind is fully lowered so that the tilt angle of the slats is adjustable without any raising/lowering of the blind.

9. A venetian blind as claimed in claim 8 in which the lost motion is provided by causing lifting tapes or cords to become slack with the blind fully lowered, the slats and a bottom stick being supported on tilting tapes or cords.

10. A venetian blind as claimed in any of the preceding claims including a further torque limiting drive in the drive mechanism to prevent over-loading of the drive mechanism by an excessive operating force in a direction to raise the blind further when it is already in the fully raised position.

11. A venetian blind as claimed in claim 10 wherein the lifting tape or cord winding arrangement is such that from the lowermost position of the blind, operation of the drive mechanism and the winding arrangement in either direction causes the lifting tapes or cords to raise the blind.

12. A venetian blind substantially as described with reference to and as shown in the accompanying drawings.

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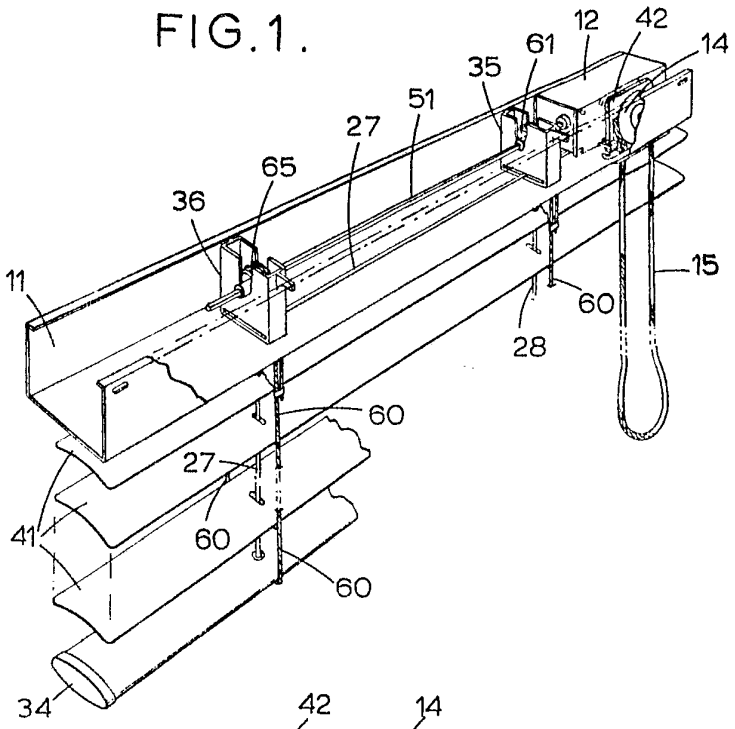
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

FIG.1.



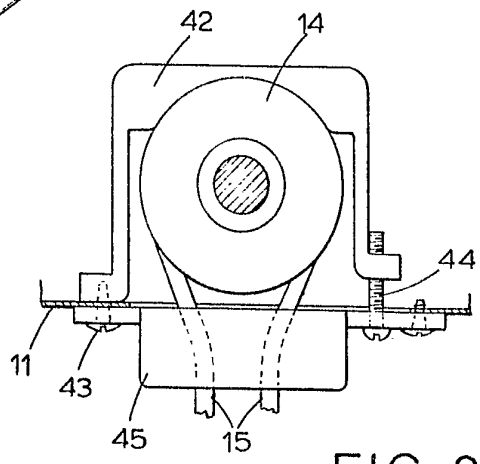


FIG.2.

DOCKET ALARM

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