Jan. 17, 1933. W. H. RUBY ET AL 1,894,833

LIFTING AND LOCKING DEVICE FOR VENETIAN BLINDS

Filed May 16, 1932 2 Sheets-Sheet 1

Fig. 1.

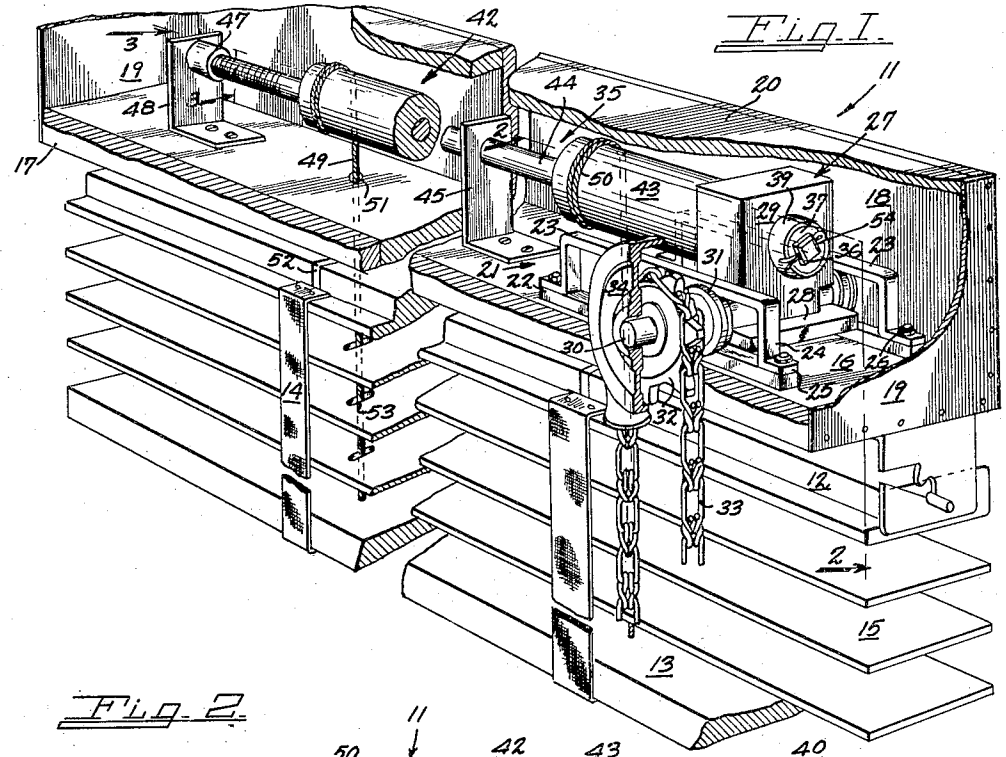
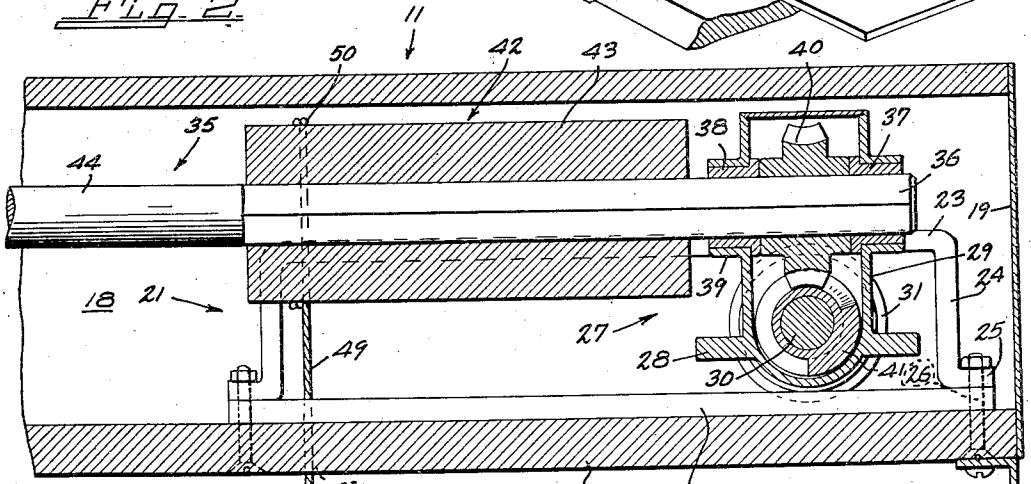


Fig. 2.



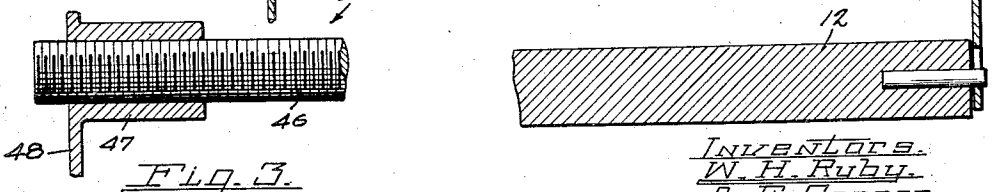


Fig. 3.

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LIFTING AND LOCKING DEVICE FOR VENETIAN BLINDS

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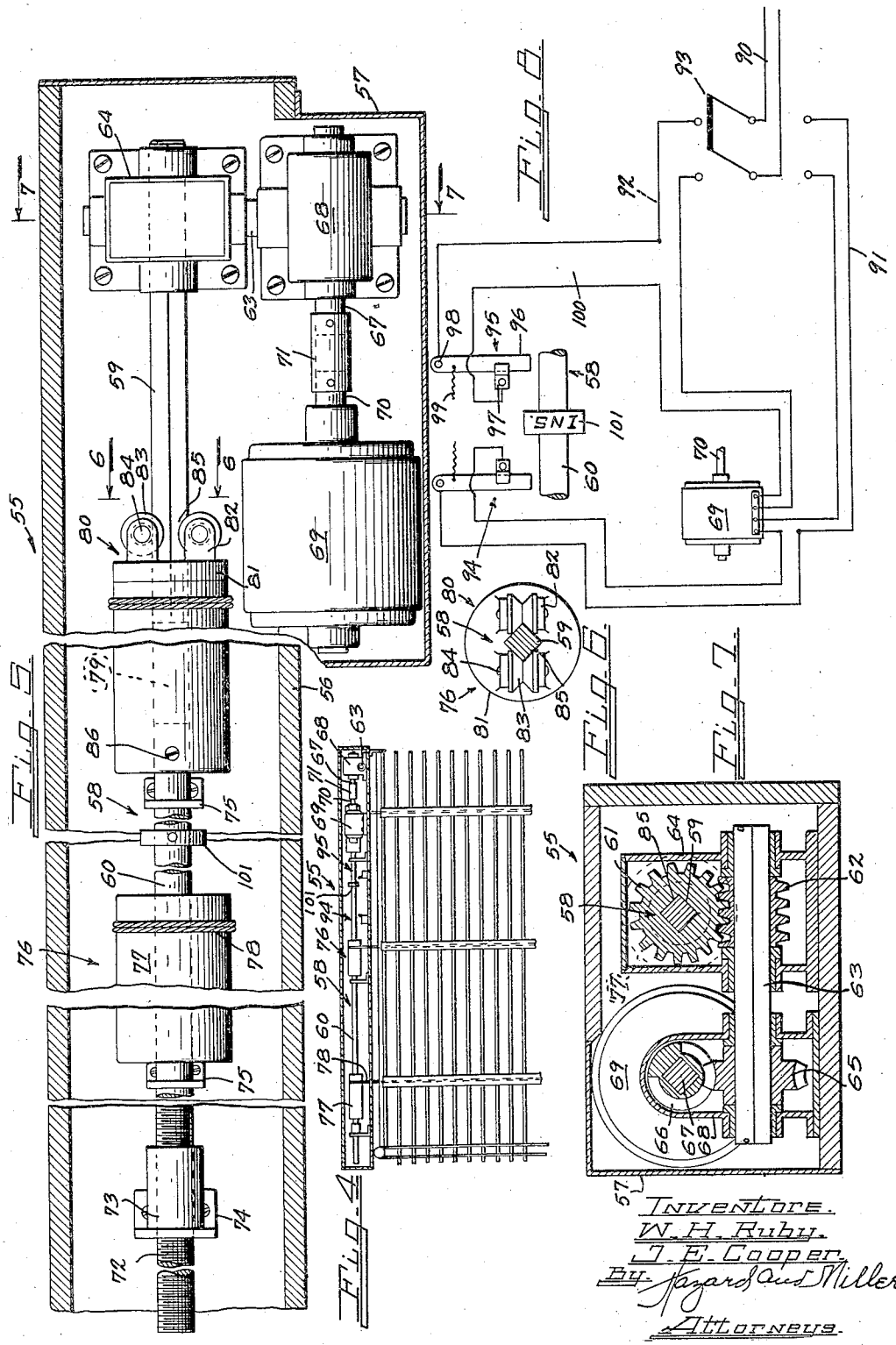

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1,894,833

UNITED STATES PATENT OFFICE

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LIFTING AND LOCKING DEVICE FOR VENETIAN BLINDS

Application filed May 16, 1932. Serial No. 611,539.

Our invention relates to an operating construction by which Venetian blinds may be lifted, lowered, and automatically locked in any position within the limits of its movement, the locking being done by the driving mechanism for winding and unwinding the cable for lifting the blind.

In the present invention a main object and feature of our invention relates to a drive mechanism for a spool on which a cable or band may be wound, such cable being connected to the bottom bar of the Venetian blind for raising and lowering the blind and automatically holding the blind at any desired point of elevation. We accomplish this result by having a so-called non-reversible gear drive, that is, the manually or power controlled shaft for rotating the spool cannot be driven in a reverse direction due to the weight of the blind exerting a tension on the cables wound on the spool. Of course, manifestly, the manually or power controlled mechanism may be reversed for lifting or lowering the blind. In this connection we employ a simplified manual or power control, this being by means of a worm wheel connected to a shaft on which the winding spool is mounted, this worm wheel being driven by a worm. In a simple or manually controlled form of our invention the worm is driven by means of a sprocket chain taking over a sprocket wheel on the worm. In a power control for large blinds we employ an electric motor with, preferably, a double reduction worm and worm wheel drive. As the worm wheel cannot rotate the worm this gives a positive lock holding the blind in any desired position.

Another object and feature of our invention relates to a longitudinally movable spool or drum on which the cable or band is wound, such cable or band being used for suspending the bottom part of the Venetian blind and, hence, raising and lowering the blind. In raising the blind the spool moves longitudinally of its axis in one direction so that the cable will be wound in one layer on the spool and, hence, there will be no overlap. Also, in lowering the blind the spool will move in the opposite direction so that it will lead vertically downwardly through the perforations or slots in the slats of the blind. We accomplish this result of the longitudinal movement of the spool by forming the spool shaft with the thread at one end mounted in a stationary nut so that on rotation of the spool shaft by means of the manual or power drive the spool is moved longitudinally, the thread on the end of the spool shaft being of a proper pitch to wind the cable in one layer.

Another object and feature of our invention relates to the manner of moving the spool longitudinally of its axis. In one form of our invention we mount the driving gear on a track and secure the spool rigidly to the drive shaft of the worm wheel, and the gear housing is mounted in a carriage on this track. Therefore, the gear housing, spool, and all, are moved longitudinally of the track on operation of the driving worm, This is a construction preferably used in manual control.

In another form of our invention, gear casing and gears are mounted in a stationary manner in a hood or cover above the blind. The drive shaft connected to the worm is thus stationary, and the spool is mounted to telescope on this drive shaft so that as the spool shaft is threaded longitudinally through the nut which carries the spools, the spool shaft and spools are driven in rotation by the drive shaft and telescoped thereon. This construction is more suitable for a power drive for large blinds.

Our invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view partly broken away of a manual control type of our invention.

Fig. 2 is a vertical section on the line 2—2 of Fig. 1 in the direction of the arrows.

Fig. 3 is a section on the line 3—3 of Fig. 1, showing the mounting of the threaded shaft on the stationary nut.

Fig. 4 is an elevation showing a power motor controlled Venetian blind, with the hood or housing at the top for the spool broken away.

Fig. 5 is a plan of part of the drive of the

construction of Fig. 4 illustrating the mounting of the spool.

Fig. 6 is a transverse section on the line 6—6 of Fig. 5 in the direction of the arrows, showing a telescoping bushing for the spool and the spool shaft on the drive shaft.

Fig. 7 is a vertical transverse section on the line 7—7 of Fig. 5 in the direction of the arrows.

Fig. 8 shows a wiring diagram of the electric motor control.

Referring first to the construction of Fig. 1. This illustrates a hood or housing structure 11 at the top, a tiltable top board 12, a bottom board 13 connected by the tapes 14 and slats 15 of the blind. The particular manner of tilting the top board 12 is not an immediate part of this invention.

The hood 11 is constructed with a base board 16, front and back boards 17 and 18, end plates 19 and top 20. Secured on the base board 16 there is a track construction 21. This has a bottom rail 22 and a top guiding or restraining rail 23. This top rail is supported by end posts 24, these being illustrated as having flanges 25 by which bolts 26 may bolt the top rail 23 and the bottom rail 22 of the track to the board 16.

A combination carriage and gear housing 27 is illustrated as being formed with a lower flange 28 and a box housing 29 extending upwardly thereabove. In the lower part of the box there is a worm shaft 30 which extends through both ends of the box, being journaled in such box, and has a wheel 31 at each end. This wheel runs on the track 22 and has a slight clearance underneath the upper track 23. This shaft extends outwardly through a longitudinal slot on the front board 17 and on the front there is a sprocket wheel 32 over which operates a sprocket drop chain 33. A cover 34 is secured to the front of the hood forming a cover for the sprocket chain as it passes over the sprocket gear.

In the upper part of the gear box there is a combination drive and spool shaft 35. This is illustrated as having a squared end 36 mounted in a pair of bushings 37 and 38, the bushings being journaled in flanges 39 of the box 29. On this squared shaft there is a worm wheel 40 which meshes with the worm 41 on the worm shaft 30. The spool 42 is formed of a plurality of spool sections 43 connected by spool shaft sections 44, these extending through guide plates 45 which are secured to the bottom 16 of the hood. The end of the spool shaft opposite the driving gear is screw threaded as indicated at 46. This screw threaded end extends through a nut 47 mounted on a nut supporting bracket 48, this bracket being bolted to the base 16. The cables 49 are secured to and wind on the spool sections as indicated at 50. This cable drops through a perforation 51 in the bottom board 16 through a slot 52 in the top board 12 and slots 53 in the slats 15, and the cables are connected to the bottom board 13 for raising and lowering the blind.

In the operation of the construction of Figs. 1, 2, and 3, as the operator actuates the drop chain 33 to rotate the sprocket wheel 32 and, hence, the worm shaft 30 and the worm 41, to wind up the cable, that is, for elevating the blind, the rotation of the combined spool and drive shaft causing this shaft to move bodily longitudinally due to the threaded connection 46 with the nut 47. As the shaft is connected to the gear housing blocks 27, there being a cotter pin 54, which holds the end of the shaft, the gear box with the carriage in which it is mounted must move longitudinally in the track 21. This action causes the cable to wind on the spool sections in a single layer. The opposite direction of rotation of the worm and spool shaft through the medium of the drop chain causes the spool shaft and the spool sections and the carriage having the gear housing to move in the opposite direction, thus causing the cable to drop vertically through the various perforations and slots in the boards and slats. On account of having the worm and worm wheel drive, the blind will remain at any desired position of elevation.

In the construction of Figs. 4, 5, and 6 the blind is provided with a hood structure 55. In this case the front part 56 has a section broken away with a built-out casing 57 to accommodate an electric motor and part of a gear train as hereinunder detailed. There is a spool shaft 58; this may be considered as having a driving section 59 and a driven section 60. The driving section has a worm wheel 61 thereon which is driven by a worm 62 on a transverse shaft 63, these being mounted in a gear box 64 and suitably journaled. At the outer end of the shaft 63 there is a worm wheel 65 which is driven by a worm 66 on a motor driven shaft 67. The shafts 63 and 67 are mounted in a second gear housing 68. These gear housings are secured in a fixed position to the bottom board of the hood 55. The electric motor 69 is also secured to the bottom board of the hood and has a driving shaft 70 which is connected by a universal joint coupling 71 to the shaft 67. Therefore, the motor, through the train of worms and worm gears, rotates the threaded end 59 of the spool shaft 58.

The driven end 60 of the spool shaft is threaded as indicated at 72 and this is threaded through a nut 73 mounted on a bracket 74. There are also a plurality of guide brackets 75 for this driven end of the spool shaft. On the spool shaft there is mounted a spool 76 which has a plurality of spool sections 77, to each of which there is attached the blind cable 78 for raising and lowering the blind.

There is a telescopic connection and drive between the driving portion 59 and the driven portion 60 of the spool shaft. This is con-

structed by forming the spool section nearest the gear housing 64 with a hollow center indicated at 79 and providing a bushing 80. This bushing comprises a collar 81 on the spool section. This collar has a plurality of pairs of upstanding ears 82 in which there are rotatably mounted V-shaped rollers 83, these being mounted on axes 84. These V-shaped rollers engage the square portion 85 of the drive portion 59 of the spool shaft. Therefore, when this portion is rotated the driven end of the spool shaft is also rotated. For convenience of attachment, a pin 86 is used to connect the spool having the drive bushing to the driven end of the spool shaft.

A means is provided for actuating and controlling the electric motor, and when this operates, the spool shaft is rotated through the medium of the squared driving section 85, the bushing 80, and the driven section 60 of this spool shaft. The cables are thus wound up or unwound from the spool sections. As the driven end of the spool shaft is rotated it is threaded through the nut 73 by the threaded section 72 and thus in winding up the cables on the spool sections they form a single layer; and in the reverse unwinding the section immediately being unwound is vertically above the opening in the bottom of the hood and the vertical slots in the slats.

In Fig. 8 we illustrate the wiring diagram for the electric motor for operation of the spools. This shows lead wires 90 and what may be termed lowering and lifting connections 91 and 92 to the motor 69, there being a double throw switch 93 to make the connection for rotating the motor in opposite directions. There are also a pair of limit stop switches 94 and 95, each of which is indicated as having a moving switch arm 96 and a fixed contact 97. The arm is pivoted at 98 and retracted by a retraction spring 99. The moving arms and the contact are in a series connection 100 with the connections 91 and 92. Mounted on the spool shaft there is an insulated collar 101, which collar in the longitudinal movement of the spool engages at the limit of motion with the arms 96 and moves these out of electrical contact with the fixed contact 97, thus opening a circuit when the blind is either fully lifted or fully lowered. These are safety stops should the person operating the blind overlook the switch 93 when the blind reaches its limit. It is manifest, however, that the switch 93 can be manually opened with the blind at any position intermediate between its extreme raised and lowered positions and thus give complete control of the position of the blind. Also, if the blind is to be fully raised or lowered, the operator, after closing the switch in the proper direction, does not have to wait until the blind has reached its limit of movement, as the circuit is automatically opened.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

We claim:

1. In a Venetian blind having cables for lifting the slats, a spool mounted above the slats with the cables connected thereto, means to rotate the spool and simultaneously therewith move the spool longitudinally of its axis to wind the cables in a single layer on the spool, the spool having a shaft with a worm wheel thereon, a worm shaft having a worm meshing with said wheel, and a drive for said worm shaft.

2. In a Venetian blind having slats with cables for lifting and lowering same, a rotatable spool positioned above the slats with the cables connected thereto, means to rotate the spool, said spool having a shaft screw threaded at one portion extending through a stationary nut for moving the spool longitudinally of its axis during its rotation to wind the cables in single layers on the spool, said spool being mounted in a hood above the slats and extending longitudinally thereof, the shaft of the spool having a drive end with a worm gear thereon, a transverse worm shaft in the hood with a worm meshing with the worm gear, and means to rotate said worm shaft.

3. In a Venetian blind having slats with a plurality of lifting and lowering cables, a spool shaft extending parallel to the slats and above same, said shaft having a plurality of spool sections thereon with guides engaging the shaft, one part of the shaft being threaded and extending through a threaded nut, said shaft having a drive end, and means to rotate said end whereby the cables are wound on each of the spool sections and each section shifted bodily longitudinally with the shaft, the drive end of the shaft having a worm wheel connected thereto, a transversely mounted worm shaft having a worm meshing therewith, a sprocket gear on the worm shaft, and a chain drive for said sprocket gear.

4. In a Venetian blind as claimed in claim 3, the means to rotate the end of the spool shaft being mounted in a guide and shiftable longitudinally in such guide with a movement of the shaft.

5. In a Venetian blind having slats with a plurality of lifting and lowering cables, a spool shaft having a spool thereon with the cables connected to the spool, means to rotate the shaft and hence the spool, means to move the shaft lengthwise during rotation, the rotating means for the shaft being connected thereto and mounted in a guide to move longitudinally with the shaft on the spool.

6. In a Venetian blind as claimed in claim 5, the rotating means for the shaft having a housing structure with a gear wheel on the

spool shaft, a driving shaft having a gear thereon for driving said wheel and said shaft, with means to rotate said latter shaft, said housing being mounted in the guide means and shiftable longitudinally with the spool shaft and the spool.

7. In a Venetian blind having slats with a plurality of lifting and lowering cables, a spool shaft having a spool thereon with the cables connected thereto, said shaft and spool being above and parallel to the slats, a gear housing at one end of the spool shaft, a gear on the spool shaft, a driving shaft with a gear thereon mounted in the housing for driving the spool shaft, a drive means for the drive shaft, a guide having tracks, wheels connected with the housing and mounted on said tracks, and means interconnecting the spool shaft with a fixed structure to move said shaft and the spool with the gear housing and gears longitudinally on rotation of the shaft and the spool.

8. In a Venetian blind having slats with a plurality of lifting and lowering cables, a spool shaft extending parallel to the slats and above the same and having a spool thereon with the cables connected thereto, said shaft being formed in two telescopic parts, one part with the spool being movable longitudinally and the other part being stationary, means to rotate the stationary part of the spool shaft and therethrough the movable part, and means to move the shiftable part of the spool shaft and spool longitudinally while being rotated.

9. In a Venetian blind having slats with a plurality of lifting and lowering cables, a spool shaft in a driving and a driven part positioned above and extending parallel to the slats and having a spool thereon with the cables connected to the spool, the driven part of the shaft being screw threaded and engaging a stationary nut, the driving part of the shaft having a geared connection to a drive means for rotating the driving section whereby said spool may be rotated and moved in a longitudinal direction parallel to the slats.

10. In a Venetian blind as claimed in claim 9, the driving and the driven sections of the spool shaft being telescopic, and the driven section having a bushing slidably mounted on the driving section, said bushing transmitting rotary movement from the driving to the driven section.

11. In a Venetian blind having slats, a longitudinally movable spool shaft having a spool with cables for operating the slats connected thereto, an electric motor, a reduced gear drive from the motor to operate the spool shaft, an electric circuit having a main switch for reversing the direction of the motor and for opening the circuit, and secondary switches with means for opening the circuits of such switches at the limit of longitudinal movement of the spool shaft and the spools.

12. In a Venetian blind, a hood forming a housing for a longitudinal spool shaft having a spool thereon, and an electric motor, and also a reduction gear drive between the electric motor and the spool shaft, the spool having a cable connected thereto and depending from the hood, an electric circuit for energizing the motor having a main double acting switch for operating the motor for winding in or winding out the cables, means operatively connected to the spool shaft to move such shaft longitudinally, and a plurality of limit switches actuated by the movement of the spool shaft for opening the motor circuit when the cables are wound in or out to their limit.

13. In a Venetian blind as claimed in claim 12, the limit switches comprising each a fixed and a moving contact, and a collar secured to the spool shaft and adapted to engage either of the movable contacts.

14. In a Venetian blind having slats with a plurality of lifting and lowering cables, a spool shaft having a spool thereon with cables connected to the spool, said spool shaft having a drive end, means to move the shaft lengthwise during rotation, the drive end of the shaft having a connection with a gear housing, said gear housing and the gears therein being stationary, means to rotate the geared end of the shaft, the remainder of the shaft and the spool having a sliding motion in reference to the driving end of the shaft.

In testimony whereof we have signed our names to this specification.

WILLIAM H. RUBY.
JESSE E. COOPER.