April 22, 1941. J. NISENSON 2,239,621

VENETIAN BLIND TILTER

Filed June 29, 1940

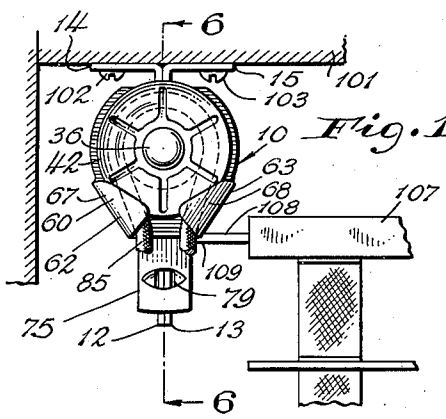


Fig. 1.

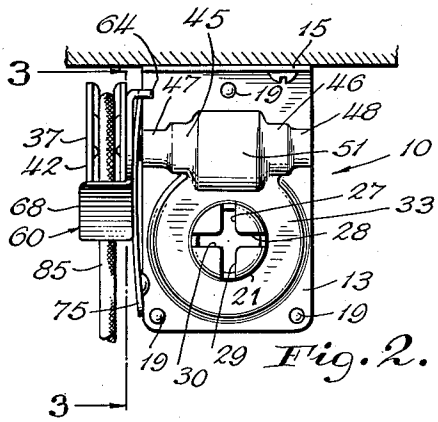


Fig. 2.

Fig. 3.

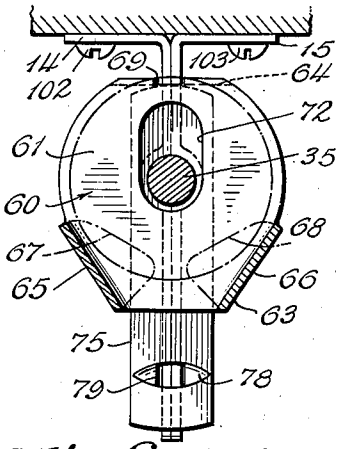


Fig. 4.

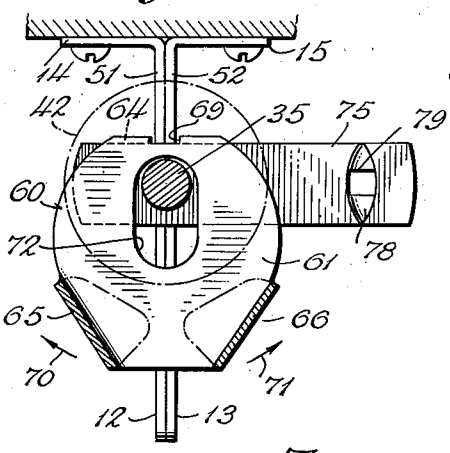


Fig. 5.

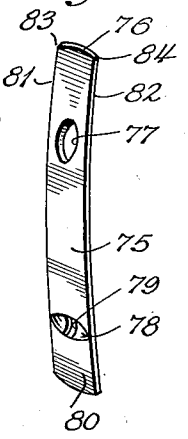


Fig. 6.

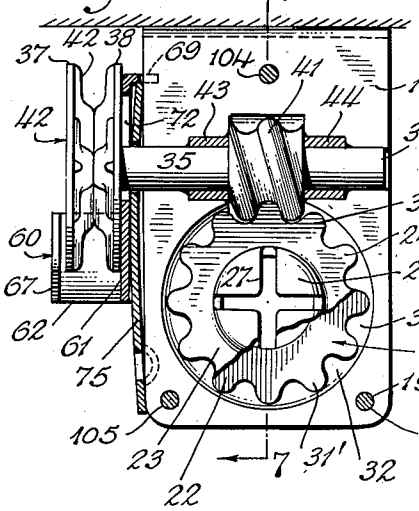


Fig. 7.

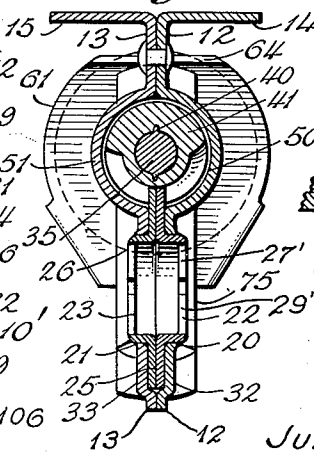
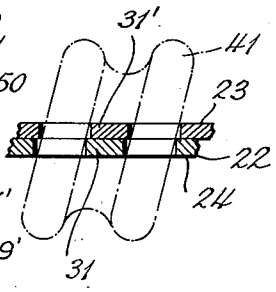


Fig. 8.



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VENETIAN BLIND TILTER

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Application June 29, 1940, Serial No. 343,251

11 Claims. (Cl. 156—17)

This invention relates generally to Venetian blinds and more particularly to a tilting mechanism for tilting the slats of the blind.

Among the objects of the present invention is the provision of a unitary tilting mechanism which may be utilized to actuate a tilt bar from either the left or right side thereof, without making any changes during the fabrication of the tilter or at the point of installation.

Another object of this invention is the provision of a tilting mechanism which is readily actuated either by cord or bead chain, and in which novel means are utilized for the retaining and guilding of said cord or bead chain in operative connection with the main driving pulley thereof.

Another object of this invention lies in the provision of a tilting mechanism, cord or bead chain guard structure, which is manually operable by lever means and which may be securely locked in the closed position thereof.

A still further object of the invention is the provision of a tilting mechanism requiring a minimum of parts, which are either stampings or automatic screw machine products and which require a minimum of labor and expense to assemble and install.

Another object of the invention lies in the provision of the novel combination of the worm shaft with a plurality of stamped gears.

A further object herein lies in the provision of structure which is simple, light weight, strong, and efficient, smooth and fool-proof in operation.

These objects and further features and advantages will more fully appear in the progress of this disclosure and be pointed out in the appended claims.

In the accompanying drawing, forming a material part hereof, similar reference characters designate corresponding parts throughout the several views in which:

Figure 1 is a fragmentary front elevational view (as might be seen from the inside of a room, in a window in which a Venetian blind using the present tilter has been installed), certain of the parts being broken away or not shown for the purposes of clarity. In this figure the guard is in a closed position thereof.

Figure 2 is a side elevational view of Figure 1 as might be seen from the right side thereof with the tilt bar and associated parts removed for purposes of clarity.

Figure 3 is an enlarged vertical sectional view as seen from the plane 3—3 on Figure 2.

Figure 4 is a view taken similarly to Figure 3 showing the guard in the open or lowered position thereof.

Figure 5 is a view in perspective of the actuating lever drawn to the same scale as Figures 3 and 4.

Figure 6 is an enlarged vertical sectional view as seen from the plane 6—6 on Figure 1, certain parts being omitted for purposes of clarity.

Figure 7 is a vertical sectional view as seen from the plane 7—7 on Figure 6.

Figure 8 is an enlarged schematic view showing the shifting of the gears with relation to each other and the worm.

In accordance with the invention, as illustrated in Figures 1 to 8 inclusive, the tilter generally represented by numeral 10, includes a tilting mechanism 10', which is substantially enclosed in a housing 11, composed of casing plates 12 and 13. The casing plates 12 and 13 are identical in construction so that they are freely interchangeable, and have mounting plate portions 14 and 15, respectively. The mounting plate portions 14 and 15 are preferably integral with their respective casing plates and form an angle of 90° therewith. The mounting plate portions 14 and 15 are each provided with a single orifice which is eccentrically disposed so that when the casing plates 12 and 13 are placed in contact with each other with the mounting plate portions 14 and 15 extending outwardly therefrom, the orifices in the mounting plate portions are disaligned so that when the mounting plate portions are secured to the head bar 101, by the screws 102 and 103 penetrating said orifices, any tendency of the head bar to split is reduced.

The casing plates 12 and 13 are provided with a plurality of aligned orifices of which the orifices 104, 105 and 106 in the casing plate 12 are seen in Figure 6. Rivets 19 serve to maintain the plates 12 and 13 in operative connection, the said orifices penetrating the said aligned orifices and being headed over on the outsides of the casing plates 12 and 13.

The casing plates 12 and 13 are each provided with aligned relatively large orifices 20 and 21 respectively within which are rotatably mounted the gears 22 and 23. Since the gears 22 and 23 are identical in construction, a detailed description of one will suffice for both. The gear 23 is preferably stamped from a sheet of metal and includes the outer surface 24 and the inner surface 25. The central portion of the gear 23 is deformed to provide an outwardly extending boss 26, the boss in turn being provided with a plurality of radially disposed slots 27, 28, 29 and 30,

The peripheral edge of the gear 23 is serrated to provide the gear teeth 31. The height of the boss 26 above the outer surface 24 of the gear 23 need not be very great, and preferably only sufficient to provide adequate perpendicular wall portions in the hollow boss so that a proper bearing surface is provided between the outer surface of said perpendicular wall portions of the boss and the edges of the orifice 21 in the casing plate. In order to avoid unnecessary repetition, where necessary corresponding parts of the gear 22 are given primed reference characters. When the device 10 is assembled, the gears 22 and 23 are disposed with relation to each other so that the inner surfaces thereof are in contact and the slots 27 to 30 inclusive of the gear 23 are in substantial alignment with the corresponding slots of the gear 22, as will be more fully described hereinbelow. In order to completely enclose the toothed portions of the gears 22 and 23, the inner surfaces of the casing plates 12 and 13 are provided with incompletely circular depressions which are preferably made by deforming the plates 12 and 13, forming the projections 32 and 33. This permits the gear teeth 31 and 31' to be lubricated and not only retains the lubrication, but prevents the contamination thereof. Rotation of the gears 22 and 23 is communicated to the tilt bar 107 by means of a key 108, which may be attached in any suitable manner to the end of the tilt bar 107. The key 108 has the operative end 109 thereof of predetermined dimensions which, however, may vary within rather wide limits. For best operation, it is desirable that the thickness of the operative end 109 be slightly less than the thickness of the slots 27 to 30 inclusive, and that the width thereof be slightly less than the combined length of oppositely disposed pairs of slots 27—29 or 28—30. It is desirable that a certain amount of play in the connection between the key 108 and the gears 22 and 23 exit. Too much play will cause undesirable back-lash, while insufficient play will require that the tilter 10 be too carefully aligned with relation to the tilt bar 107 in the installation thereof.

A worm shaft 35 is circular in cross section substantially throughout the length thereof, except the forward end, which comprises a head 36 and a non-circular shank portion disposed immediately rearwardly of the said head, said shank portion not being specifically illustrated in the drawing. A pair of concave disks 37 and 38 are provided with non-circular orifices of a size and shape corresponding to the said shank portion. With the convex surfaces of the disks 37 and 38 facing each other, these disks are placed over the rear end 39, of the worm shaft 35, and are seated upon said shank portion so that they become keyed to and rotate therewith. The middle portion of the shaft 35 is provided with opposed outwardly extending longitudinally directed keys 40 (Figure 7) which are adapted to engage the bore of a worm 41. It may thus be seen that the concave disks 37 and 38 form a pulley 42, which is affixed to the shaft 35, and that the worm is also affixed to the shaft 35 and thereby rotates with said pulley. The plates 12 and 13 are provided with outwardly extending semi-cylindrical worm pockets 50 and 51.

The worm shaft 35 is rotatably supported by a pair of sleeve bearings 43 and 44, which are mounted by being engaged by and between the casing plates 12 and 13. The casing plate 13 includes a pair of outwardly extending semi-cylindrical portions which form the bearing pockets 45 and 46, as best seen in Figure 2. The casing plate 12 is provided with a similar pair of bearing pockets (not shown) corresponding to the bearing pockets 45 and 46, so that when the plates 12 and 13 are secured together, the sleeve bearings 43 and 44 are properly anchored in place.

As seen in Figure 6, the bearings 43 and 44 are prevented from moving outwardly longitudinally of the worm shaft 35, by the outer portions of the bearing pockets, while the inner ends of the said bearings lie very close to the outer ends of the worm 41.

Since the worm 41 is integrated with the shaft 35 by being a force or drive fit thereon, it may thus be seen that the bearings 43 and 44 act to continually position the worm 35 in operative engagement with the gears 22 and 23, and also prevent undue movement of the pulley 42 toward or away from the front edges of the housing 11. The bearings 43 and 44 are preferably composed of brass or other material which will form a good bearing surface for cooperation with the particular metal of which the shaft 35 is composed, as for example, steel. Since the bearing pockets terminate at a point inwardly of the outer vertical edges of the casing plates 12 and 13, the forward and rear portions of said casing plates may have only a very slight clearance between the inner surfaces thereof and the shaft 35. The semi-cylindrical portions 47 and 48 (on plate 13) and corresponding portions on plate 12 function so that dust and dirt are prevented from entering therein, and suitable lubricating material, preferably of a high viscosity, may be coated upon the worm shaft at the time the tilting device is constructed.

Turning now in particular to the cord or chain guide generally indicated by numeral 60, the same is preferably formed from sheet stock of suitable thickness and includes a body portion 61, having an orifice 72, symmetrical and oppositely disposed lateral cord guides 62 and 63, and a rearwardly extending flange 64. The orifice 72 is elongated and vertically disposed, having parallel vertical side edges and semi-circular ends. The cord guides 62 and 63 comprise pulley portions 65 and 66, and guard lips 67 and 68. The cord guide 60 is loosely disposed upon the worm shaft 35 between the forward edges of the plates 12 and 13 and the rear pulley disk 38.

The flange 64 has a small indentation 69 in the rear edge thereof, said indentation being substantially U shape in configuration. The indentation 69 engages the forward upper edges of the casing plates 12 and 13 so that the cord guide 60 is adapted for vertical reciprocation, the movement of which is principally rectilinear, though by reason of the fact that the orifice 72 is wider than the shaft 35, and the indentation 69 is wider than the combined thickness of the casing plates 12 and 13, a considerable amount of side motion may take place, the cord or chain guide 60 being shiftable in the directions of the arrows 70 and 71 in Figure 4. The cord guide 60 is limited in the upward movement thereof by the portion of the guide 60 which forms the lower edge of the orifice 72; while the downward movement of the cord guide 60 is limited by the flange striking the side of the control lever 75.

The control lever 75 is best seen in Figure 5 and includes the upper end 76, a circular orifice 77, a dome shape rearwardly extending projection 78, having a vertically disposed slot 79 therein, and the handle or lower end 80. The control lever is preferably formed from a piece of

strip stock and is slightly convex, as seen from the front thereof. The control lever **75** is loosely disposed upon the shaft **35** between the cord guide **60** and the front edges **51** and **52** of the casing plates **12** and **13**. When the control lever is in the vertical position thereof, the upper end **76** engages the under surface of the flange **64**, thereby supporting the cord guide in the upper or closed position thereof, as seen in Figures 1, 2, 3, 6 and 7. When in the closed position, by reason of the fact that the control lever is slightly bowed, the slot **79** in the domed projection **78**, engages the lower portions of the edges **51** and **52**, as best seen in Figures 3 and 6. This securely latches the cord guide and the control lever in place. In order to lower the cord guide, the handle or lower end **80** is manually grasped and pulled forward so as to disengage the slot **79** from the edges **51** and **52**. The lever **75** is then rotated through 90° either to the left or to the right, that is in the direction of the arrows, with the result that the cord guide **60** no longer supported beneath the flange **64** will drop to the lower or open position thereof, as seen in Figure 4. In order to elevate the cord guide **60** to the closed position thereof, it is only necessary to return the control lever **75** to its original vertical position. During such movement, one of the lateral sides **81** or **82**, and one of the corners **83** or **84** engage slidingly the under surface of the flange **64** and raise the same. The curvature of the end **76** is preferably concentric with relation to the center of the orifice **77**, so that the last portion of the movement of the control lever **75**, as it approaches its vertical position, has no further elevating effect upon the cord guide **60**, but merely allows the lower end **80** to be moved in such a manner that the end is forced slightly forward by the domed surface of the projection **78**. Only when the slot **79** and the edges **51** and **52** are in alignment, the lever **75** will snap into a latched vertical position.

Where the present tilting mechanism is utilized in the construction of completely assembled Venetian blinds which are subsequently shipped to another point for installation, and the tilter cord **85** is placed upon the pulley **42** prior to shipment, the cord guide **60** may be placed in a latched position so that the cord **85** may not become accidentally displaced.

In accordance with the present invention, the operation of the device is substantially as follows: Assuming the parts to have been assembled as previously described, the control lever **75** is moved to either of its horizontal positions and the cord guide **60** will drop to its lower or open position, the pulley coacting portions **65** and **66** will move away from the pulley **42** sufficiently to allow the cord **85** to be placed into engagement with the pulley. The guard lips **67** and **68** will not interfere with this operation. After the cord **85** is in place, with the two outwardly extending portions of said cord extending between the lower edges of the pulley coacting portions **65** and **66**, the lever **75** is moved to the vertical position thereof, thereby raising the guard **60** to its closed or upper position. It then becomes impossible to move the guard forwardly of the device and thereby to disengage it from the pulley sheaves.

When either one of the downwardly extending portions of the cord **85** is pulled, the pulley **42** and hence the worm **41** will be rotated. As the worm rotates, each of the gears **22** and **23** will be independently rotated by the action of the worm **41** upon the teeth **31** and **31'**, as illustrated in Figure 8. In prior art structures, where a turned worm was used in conjunction with a stamped gear, the teeth of which had adequate thickness, considerable binding and friction occurred. In order to avoid this condition, the expedient was frequently resorted to of reducing the size of the teeth, but this brought with it the disadvantage of too much backlash in the tilter. This condition has been remedied by the present structure in which a plurality of relatively thin gears are used and the gears may shift slightly with relation to each other so that each of the sets of gear teeth may take a separate purchase upon the worm. In this manner, the load of each gear is shared with the other or others and the friction existing at the points of contact between the gears and the worm is apportioned so that any one point of contact bears a portion of the whole load. While the amount of shift, that is rotational displacement between the gears with relation to each other, is only slight, since the gears are very close together and the pitch of the worm is not very great, nevertheless, this shift permits a better distribution of the torque load and results in improved operation and saving in cost, since the quality of operation of a cut or milled gear is approximated by relatively low cost of thin stamped gears working in combination.

By reason of the fact that the slots **27** to **30** inclusive are disposed at 90° relationship with each other, in assembling the gears as the device is manufactured, only a slight shift in one of the gears is necessary prior to riveting the casing plates together in order to properly align the slots in both of the gears. The X shape arrangement of the slots also requires only a 90° shift or less in the gears in order to properly engage the connector or key **108** therein.

It may thus be seen that I have provided a novel Venetian blind tilting device, which is extremely simple and positive in action and while presenting the advantages of a more expensive construction, permits fabrication on large scale at low cost. In accordance with the present construction the tilter is completely universal, in that the slots in the gears **22** and **23** may be penetrated from either side of the tilter, so that the tilter may be used on either end of the head bar. All of the parts are connected so that there cannot be any loss during shipment.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:

1. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain; a movable guide for said flexible element adapted in a first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; means associated with said frame element for shifting said guide from the second to the first position thereof.

2. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in a first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said

pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; lever means associated with said frame element for shifting said guide from the second to the first position thereof.

3. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain; a movable guide for said flexible element adapted in a first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; lever means pivotally mounted adjacent the forward portions of said frame element and adapted in a first position thereof to secure the said guide in its first position, said lever means in a second position thereof permitting the said guide to move to the second position thereof.

4. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in the first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a projection on said movable guide; a frame element such as a casing; means supported by said frame element for shifting said guide from the second to the first position thereof, said means coacting with said projection.

5. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in the first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a projection having an indentation on said movable guide; a frame element such as a casing; a frame element slidably engaging the indentation in said projection and thereby regulating the movement of said guide; means supported by said frame element for shifting said guide from the second to the first position thereof, said means coacting with said projection.

6. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in the first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a rearwardly extending integral flange; a frame element such as a casing; means supported by said frame element for shifting said guide from the second to the first position thereof, said means coacting with said flange.

7. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in the first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; means on said guide slidably engaging the said frame element during all positions of said guide.

8. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in a first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; lever means associated with said frame element adapted to support the guide in a lower position thereof by the guide resting upon a side portion of said lever means and adapted to support the said guide in the upper or closed position thereof by said guide resting upon the upper end of said lever.

9. In a Venetian blind tilting mechanism having a pulley adapted to be engaged by a flexible element such as a cord or chain: a movable guide for said flexible element adapted in a first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; means associated with said frame element for shifting said guide from the second to the first position thereof; latching means for detachably attaching the first mentioned means to the frame element when the first mentioned means is in a position for shifting the guide to the first position thereof.

10. In a Venetian blind tilting mechanism having a shaft with a pulley mounted thereon and adapted to be engaged by a flexible element such as a cord or a chain: a movable guide for said flexible element adapted in a first position thereof to maintain said flexible element in operative contact with said pulley, and in a second position thereof to lie spaced from said pulley whereby the flexible element may be removed entirely from the pulley or replaced; a frame element such as a casing; an orificed lever pivotally mounted upon said shaft; said guide including a body having an elongated orifice and thereby slidably and rotatably mounted upon said shaft; said lever being adapted to shift said guide to the first position thereof.

11. In a Venetian blind tilting mechanism: a shaft; a worm; a casing; a plurality of gears each independently engaging said worm; each of said gears being adapted for simultaneous connection with a tilt bar, said worm and said gears being supported in operative engagement by said casing.

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