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TILTING MECHANISM FOR VENETIAN BLINDS

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FIG. 1

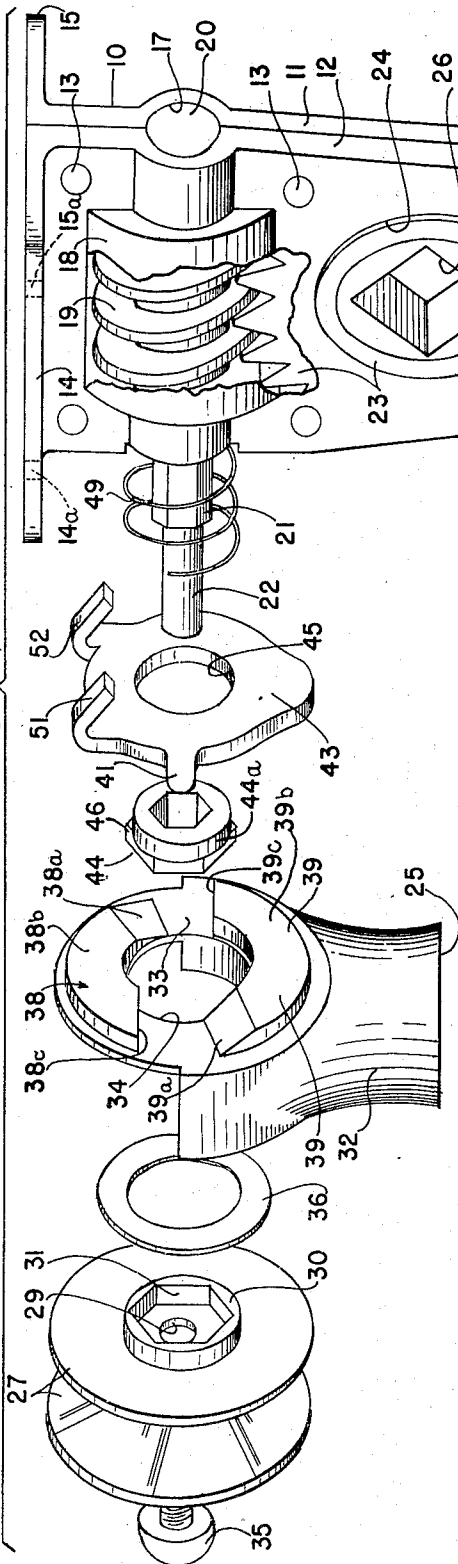


FIG. 4

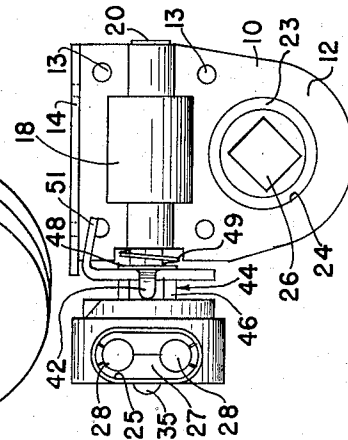


FIG. 3

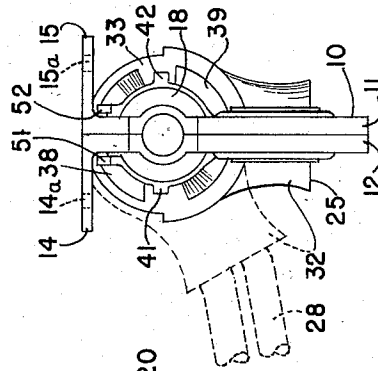
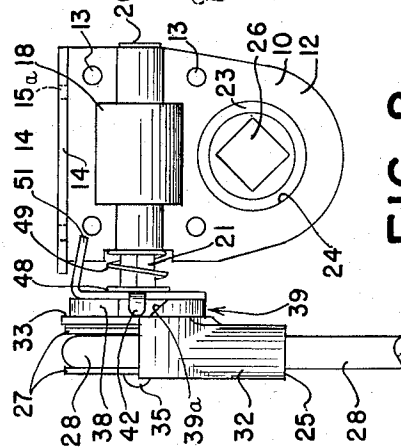


FIG. 2



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TILTING MECHANISM FOR VENETIAN
BLINDS

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13 Claims. (Cl. 160—176)

This invention relates to Venetian blinds and more particularly to an improved mechanism for tilting the slats of Venetian blinds in order to control the amount of light passing therethrough. The improved tilting mechanism is adapted for application at the top of a blind of well-known construction in which the slats are supported by ladder tapes secured to the tilt bar or head rail. The tilting mechanism is operably connected to the tilt bar and operation of the improved mechanism, having a novel construction to be described hereinafter, by means of depending cords accessible to the operator, causes tilting of the tilt bar and consequent tilting of all the slats therebelow.

In tilting mechanisms of this character, the operating cord, having depending loose ends, extends over a pulley wheel which may be rotated one way or the other by pulling down on one or the other ends of the cord so as to effect tilting of the slats through the other elements of the mechanism. When the tilt bar and slats are in horizontal position, it is desirable that the cord lengths on either side of the pulley be equal so as to permit operation of the tilting mechanism and consequent tilting of the slats throughout their full range. However, a long recognized difficulty inherent in such tilting mechanisms is the tendency of the operating cord to slip relative to the pulley during operation so that, after a period of operation, the lengths of cord become uneven, one long and one short. This inequality of length not only prevents full tilting movement, when the knob on the short end catches on the pulley, but also causes the short end to be in such an elevated position that it is out of the ordinary reach of the operator.

Attempts have been made to overcome this undesirable tendency by providing a positive non-slipping drive connection between the operating cord and the pulley. Still other attempts have accepted the inherent tendency of cord to slip somewhat about the pulley and sought to provide a mechanism for readjustment of the cord ends to equal length without requiring the entire disassembly of the tilting mechanism. Generally, the results of these attempts have been relatively unsuccessful, not only from the standpoint of the results achieved but also with respect to the expensiveness and complexity of the mechanical structures devised.

In one such attempt, a structure has been provided in which the pulley was adapted to be operably disconnected from the remainder of the tilting mechanism by pulling the cord ends outwardly or away from the blind. In such outward position, the cords were then adjusted to equal length, the pulley being free to rotate during adjustment without effecting operation of the remainder of the tilting mechanism. However,

in making such an adjustment of the cords in the mechanism of the foregoing character, it was necessary to keep the cord lengths under relatively high tension to maintain the pulley in disconnected condition; and, because of this fact and because the pull of the operator was necessarily outwardly away from the blind, the blind mountings were put under extraordinary stress in a direction which tended to loosen and weaken them to the breaking point. Also, because of the unnatural direction at which the operator was required to pull the cords, the various parts of the mechanism were placed under an undesirable strain which sometimes caused their deformation and failure to return to normal position upon release of the cords by the operator. This failure to resume operable position thus resulted in complete failure of the tilting mechanism and necessitated disassembly and reformation of the parts.

However, by means of the structure embodying the present invention, the disconnection of the pulley from operable engagement with the tilting mechanism is accomplished by the operator simply by holding the cords taut and moving their ends upwardly in either direction in a slight arc and in a plane substantially parallel to the plane of the entire blind. By such movement the cords tend to move about the tilting mechanism as a center and cause a relative pivotal movement of one of the parts which effects disengagement of the pulley from operable engagement with the tilting mechanism. Such relative disengaging pivotal movement of the parts is accomplished without any strain being placed upon the blind mountings or upon the various parts of the tilting mechanism itself. The pulley is therefore adapted to be readily disconnected from driving engagement by a simple swinging movement of the cord ends and the cord lengths are capable of being equalized when under a very slight tension sufficient only to keep the cord lengths taut during adjustment.

It is, therefore, one of the objects of my invention to provide an improved slat tilting mechanism for a Venetian blind comprising parts which may be operably disconnected from the remainder thereof for cord adjustment by movement of the operating cords in a circumferential direction about the tilting mechanism and in a plane substantially parallel to the plane of the blind.

Another object of my invention is the provision of an improved slat tilting mechanism by which the pulley thereof may be operably disconnected from the tilting mechanism for cord adjustment by movement of the operating cords in such a direction and manner that the blind mountings and the various parts of the tilting mechanism are not placed under any extraordinary strain and stress during cord adjustment.

A further object is the provision of an im-

proved slat tilting mechanism of a simple and inexpensive construction and having a pulley wheel which may be operably disconnected from the tilting mechanism by a simple and effortless swinging movement of the cord ends in a plane substantially parallel to the plane of the blind.

Still another object is the provision of a slat tilting mechanism comprising a positive but simple driving connection between the cord operated pulley and the tilting mechanism, which connection may be operably broken without effort by the operator and without stress or strain on the various parts of the mechanism for adjustment of the operating cords and which connection may be readily and positively restored by the operator.

A still further object of my invention is the provision of a slat tilting mechanism comprising a simple and efficient means for permitting equalizing adjustment of the operating cords and being capable of a long operable life.

Other and further objects of my invention will become apparent hereinafter as this description progresses, reference being had to the accompanying drawing, in which:

Figure 1 is a perspective view of the various component parts of the improved tilting mechanism comprising my invention in relative disassembled or exploded relation;

Fig. 2 is a side elevational view of the improved tilting mechanism illustrating the pulley and other parts in operable driving connection for slat adjustment;

Fig. 3 is a rear elevational view of the tilting mechanism, as viewed from the right in Fig. 2, and showing in broken lines the angular position assumed by the cord guide member during cord adjustment; and

Fig. 4 is a side elevational view of the tilting mechanism showing the parts in their operably disconnected position during cord adjustment.

The improved slat tilting mechanism comprising my invention and shown in Figs. 1 to 4, inclusive, of the drawings, is adapted to be applied to a Venetian blind of the usual construction in the manner shown in the Balthasar Patent No. 2,224,712 of December 10, 1940. Such a blind (not shown) generally comprises a main supporting or head bar secured to the sides of the window frame, a tilt bar, and a plurality of horizontally disposed slats supported by a plurality of ladder tapes which are secured at their upper ends to the tilt bar. By tilting or turning movement of the head rail, tilting movement of all the slats therebelow is effected. This tilting movement of the tilt bar is accomplished by means of the improved tilting mechanism comprising my invention which will now be described.

Referring to the drawing, the tilting mechanism comprises a housing or bracket member 10 composed of two complementary semi-oval sections 11 and 12 which are adapted to be secured together, upon insertion of certain mechanism therewithin, by means of rivets 13. The sections 11 and 12 are each provided at their upper ends with laterally directed flanges 14 and 15 having holes 14a and 15a through which screws (not shown) may be inserted for securing the entire tilting unit to the main supporting bar of a blind. The housing 10 is further provided with a transversely extending cylindrical cavity 17 which is further enlarged at its inner central portion 18 to accommodate a worm gear 19. The worm gear 19 may be integrally formed with a rotatable shaft 20 which is supported within the

cavity 17 of the housing 10 but projects outwardly therefrom at its left end. That portion of shaft 20 which extends within the housing 10 is circular while the portion thereof which projects outwardly therefrom to the left, as shown in Fig. 1, comprises an hexagonal portion 21 and a reduced circular portion 22.

A worm wheel 23 is journaled in an opening 24 in the lower part of the housing 10 and extends radially and upwardly within the housing into meshing engagement with the worm gear 19. The worm wheel 23 is provided at its central portion with a square aperture 26 which is adapted to receive a boss (not shown) of square cross section operably connecting the worm wheel 23 to the tilt bar. By the foregoing construction, rotative movement of the shaft 20 causes tilting movement of the head rail and consequent tilting of the slats, through the worm gear 19, worm wheel 23, and the tilt bar (not shown).

On the reduced circular end portion 22 of the rotatable shaft 20 is a pulley 27 supported thereon for free and independent rotative movement relative thereto. The pulley 27 may be of the usual construction and is operable by a single cord 28 which extends over the top of the pulley and depends on either side thereof. Downward movement of one or the other of the loose ends of the cord 28 by the operator either during slat adjustment or cord equalization adjustment will effect rotative movement of the pulley 27. Axial movement of the pulley off the shaft portion 22 is prevented by means of a headed bolt 35 which is threadedly received within a threaded bore in the end of the circular portion 22 of shaft 20. On the inner vertical face of the pulley 27 and in concentric relation to a round aperture 29 therein through which the shaft portion 22 extends, there is fixedly secured a driving clutch member in the form of a collar or short cylinder 30 which has a circular outer contour and an hexagonal inner contour as at 31.

A guide member 32 is supported by the pulley 27 for free and independent relative rotative or rockable movement by means of an upstanding circular wall 33 at its right side, this wall 33 being provided with a central aperture 34 into which is received the driving clutch collar 30 of the pulley 27. An annular washer 36, composed of a suitable lubricating metal, is carried by the collar 30 and is, therefore, interposed between the inner face of the vertical wall 33 of the guide member 32 and the pulley 27 to insure easy and free relative rotative movement therebetween. The lower end of the guide member 32 is provided with a restricted opening 25 through which the operating cord 28 extends downwardly from the pulley to a point accessible to the operator.

Secured to the outer face of the wall 33 of the guide member 32 are two circumferentially spaced arcuate cam members 38 and 39 disposed about the opening 34 of the guide member 32. The cam members 38 and 39 are provided with diametrically opposite inclined cam surfaces 38a and 39a respectively, at one of their ends, which terminate in flat outer raised surfaces 38b and 39b, respectively, and with diametrically opposite vertical faces 38c and 39c at their other ends. The camways 38 and 39 are adapted to cooperate with a pair of axially extending tongues 41 and 42 integrally formed in diametrically opposite relation at the outer extremities of a plate member 43. The tongues 41 and 42 in normal slat tilting position are adapted to engage the outer

face portions of the wall 33 of the guide member 32 between the arcuate cam members 38 and 39, as shown in Figs. 2 and 3 of the drawing. In moving from normal position to cord adjusting position, the tongues are adapted to ride up the inclined cam faces 38a and 39a of the cam members and engage the raised outer flat surfaces 38b and 39b, as will be more fully described hereinafter.

The plate member 43 is supported on the hexagonal portion 21 of the shaft 20 by means of a driven clutch member 44 secured within a central opening 45 of the plate member 43. The driven clutch member 44 is provided with an hexagonal head 46 which is of larger size than the diameter of the opening 45 of the plate member but of the proper size and shape for reception within the hexagonal opening 31 of the driven clutch member 30. The driven clutch member 44 is provided with an axially extending annular portion 44a which is adapted to be inserted through the opening 45 of the plate member 43 and secured therein by swaging the outer edges thereof to form a retaining collar 48. By this construction, although the plate member 43 is confined against axial movement relative to the driven clutch member 44, it nevertheless is unaffected by rotative movement of that clutch member which turns freely within its opening 45.

The driven clutch member 44 is carried on the hexagonal portion 21 of the shaft 20 for rotative movement therewith and transmits rotative movement from the pulley 27 and the driving clutch member 30 to the shaft 20. The clutch member 44 and the plate member 43, which are adapted to slide axially along the hexagonal shaft portion 21, are maintained in their normal position at the left end of the hexagonal shaft portion 21, as shown in Fig. 2, by means of a helical spring 49 encircling the shaft portion 21 and compressed between the housing 10 and the swaged collar 48 of the driven clutch member 44.

Although the plate member 43 is mounted on the driven clutch member 44 so that that clutch member may be free to rotate in its opening 45, any tendency of the plate member 43 to rotate with the driven clutch member 44 due to inadvertent binding between the parts is prevented by means of tongues 51 and 52 which extend in an axial direction from the plate member 43 into engagement with the opposite sides of the housing 10. These tongues 51 and 52 may be integrally formed with the plate member 43.

With the above-described parts in assembled condition as shown in Figs. 2 and 3, the slats of the Venetian blind may be either opened or closed simply by pulling down one or the other of the loose ends of the cord 28 so as to cause rotation of the pulley 27. Rotation of the pulley 27 causes rotation of the clutch member 30, which in turn causes rotation of the clutch member 44 and the shaft 20. As above described in detail, rotation of the shaft 20 effects rotation of the slats through the worm gear 19 and the worm wheel 23. During this rotative movement of the above-named parts, the cord guide member 32 and the plate member 43 remain stationary, as above described.

If, after a period of usage, the lengths of the cord 28 below the pulley become excessively uneven due to slippage through the pulley and it is desired to re-establish them to equal lengths, the operator may grip and hold taut the loose

ends of the cord 28 and with a swinging motion with the tilting unit as a center move them through an arc of 45° to 90° in a plane substantially parallel to the plane of the blind. This arcuate movement may be either to the right or left, hence in either direction, depending upon the arrangement and disposition of the cam surfaces. In either direction, the arcuate movement is still in substantially the same plane as the plane of the blind. During this movement the cords engage the lower edges of the cord guide member 32 and cause it to rotate or rock about the exterior annular surface of the driven clutch member 30 to a position illustrated in Fig. 4 and indicated by the broken lines in Fig. 3. As the guide member 32 turns about its pivot, the arcuate cam members 38 and 39 are carried with it and move circumferentially or clockwise as viewed in Fig. 2 so as to engage the tongues 41 and 42 and force them up the inclined cam surfaces 38a and 39a to the high points 38b and 39b of the cam members. This latter or declutched position is illustrated in Fig. 4 of the drawing.

As the tongues 41 and 42 are forced laterally to the high points 38b and 39b of the cams 38 and 39, the plate member 43 is forced to the right as viewed in Fig. 4 so as to compress the spring 49 and retract the driven clutch member 44 from engagement with the driving clutch member 30. With the clutch members 30 and 44 out of engagement, the pulley may be freely rotated as the cords are equalized by the operator without causing rotative movement of the other parts. To equalize the loose ends of the cord 28, the operator may grasp each cord and pull angularly downwardly on the shorter one until the loose ends are of the same length.

From the foregoing description of the structure and mode of operation of the improved slat tilting mechanism comprising my invention, it will be seen that the adjustment of the operating cord to equal lengths may be accomplished with minimum effort by the operator and without any abnormal stress or strain being placed upon the operating parts of the tilting device. By a slight simple movement of the cords over a relatively short arc which causes a simple pivotal movement of the guide members, the pulley is released from driving engagement and may be rotated in either direction for cord adjustment. The parts of the tilting device are capable of being positively connected and disconnected by the simple rocking or pivotal movement of one part. The very slight force applied by the operator to the cords is sufficient only to keep the cords taut and therefore places the parts under no abnormal strain, nor is this negligible force applied in a direction tending to pull the blind from its main supports. The tilting mechanism is, therefore, capable of operation over a long period of time without requiring adjustment or repair.

Although by the foregoing description and in the accompanying drawing there is set forth and illustrated one form of my invention, it is to be understood that changes and modifications may be made without departing from the scope of my invention as defined by the appended claims.

I claim:

1. A tilting mechanism for a Venetian blind comprising a pulley, an operating cord operably engaging said pulley, tilting means adapted to be operated upon rotation of said pulley, means for operably connecting said pulley and said tilting means, and means for operably disconnecting said pulley from said tilting means upon move-

ment of the cord about the tilting mechanism as a center in a plane substantially parallel with the plane of the blind.

2. A tilting mechanism for a Venetian blind comprising a pulley, an operating cord extending over said pulley, tilting means adapted to be operated upon rotation of said pulley, clutch means operably connecting said pulley and said tilting means, and means for rendering said clutch means inoperative upon movement of the cord about the tilting mechanism as a center in a plane substantially parallel with the plane of the blind.

3. A tilting mechanism for a Venetian blind comprising a rotatable shaft, a pulley supported by the shaft, an operating cord operably engaging said pulley, clutch means operably connecting said rotatable shaft with said pulley, and means for disengaging said clutch means upon an arcuate movement of said cord in a plane substantially parallel to the plane of the blind.

4. A tilting mechanism for a Venetian blind comprising a rotatable shaft, a pulley supported by the shaft, an operating cord operably engaging said pulley, means operably connecting said rotatable shaft with said pulley, and means for disengaging said connecting means upon an arcuate movement of said cord in a plane substantially parallel to the plane of the blind.

5. A tilting mechanism for a Venetian blind comprising a rotatable shaft, a pulley supported by the shaft, an operating cord extending over said pulley, clutch means operably connecting said rotatable shaft with said pulley, and cam means operable upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind for disengaging said clutch means.

6. A tilting mechanism for a Venetian blind comprising a rotatable shaft, a pulley supported by the shaft, an operating cord extending over said pulley, clutch means operably connecting said rotatable shaft with said pulley and adapted to be moved longitudinally of the shaft into and out of operable clutching engagement, and cam means operable upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind for moving said clutch means longitudinally of the shaft to render said clutch means inoperative.

7. A tilting mechanism for a Venetian blind comprising a pulley, a rotatable shaft supporting said pulley for free rotatable movement thereon, an operating cord extending over said pulley, a driving clutch member operably connected with said pulley, a driven clutch member carried by said rotatable shaft and adapted for rotatable movement with said shaft and for independent movement axially of said shaft, means for urging said driven clutch member into operative engagement with said driving clutch member, and cam means operable upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind for moving said driven clutch member axially along the rotatable shaft out of operable engagement with the driving clutch member.

8. A tilting mechanism for a Venetian blind comprising a pulley, a rotatable shaft supporting said pulley for free rotatable movement thereon, an operating cord extending over said pulley, a driving clutch member operably connected with said pulley, a driven clutch member carried by said rotatable shaft and adapted for rotatable movement with said shaft and for independent movement axially of said shaft, and cam means

operable upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind for moving said driven clutch member axially along the rotatable shaft out of operable engagement with the driving clutch member.

9. A tilting mechanism for a Venetian blind comprising a pulley, a rotatable shaft supporting said pulley for free rotatable movement thereon, an operating cord extending over said pulley, a driving clutch member operably connected with said pulley, a driven clutch member carried by said rotatable shaft and adapted for rotatable movement with said shaft and for independent movement axially of said shaft, and means operable upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind for moving said driven clutch member axially along the rotatable shaft out of operable engagement with the driving clutch member.

10. A tilting mechanism for a Venetian blind comprising a pulley, a rotatable shaft supporting said pulley for free rotatable movement thereon, an operating cord extending over said pulley, a driving clutch member operably connected with said pulley, a driven clutch member carried by said rotatable shaft and adapted for rotatable movement with said shaft and for independent movement axially of said shaft, a rockable member supported by said shaft for pivotal movement independent thereof and adapted to be rocked about said shaft upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind, and cam means operable upon pivotal movement of said rockable member for moving said driven clutch member axially along the rotatable shaft out of operable engagement with the driving clutch member.

11. A tilting mechanism for a Venetian blind comprising a pulley, an operating cord operably engaging said pulley, tilting means adapted to be operated upon rotation of said pulley, means for operably connecting said pulley and said tilting means, a rockable member adapted for pivotal movement relative to said tilting means upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind, and means for operably disconnecting said pulley from said tilting means upon pivotal movement of said rockable member.

12. A tilting mechanism for a Venetian blind comprising a pulley, an operating cord operably engaging said pulley, a rotatable shaft supporting said pulley, a rockable member supported by said shaft for pivotal movement independent thereof and adapted to be moved pivotally about said shaft upon arcuate movement of said cord in a plane substantially parallel to the plane of the blind, and means for operably disconnecting said pulley from said tilting means upon pivotal movement of said rockable member.

13. A tilting mechanism for a Venetian blind comprising a pulley, an operating cord extending over said pulley, a rotatable shaft supporting said pulley, clutch means operably connecting said pulley and said rotatable shaft and movable axially of said shaft, a rockable member supported by said shaft for pivotal movement independent thereof and adapted to be rocked pivotally about said shaft by said cord, and cam means adapted to move said clutch means axially of said shaft upon pivotal movement of said rockable member to operably disconnect said pulley and said shaft.

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