United States Patent

[11] 3,630,264

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[54] **VENETIAN BLIND TILTING APPARATUS**
16 Claims, 20 Drawing Figs.

[52] **U.S. Cl.** **160/177**
[51] **Int. Cl.** **E06b 9/304,**
E06b 9/26
[50] **Field of Search** 160/172,
176, 177

[56] **References Cited**
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2,629,434	2/1953	Nelson	160/177
2,630,861	3/1953	Nelson	160/177
3,425,479	2/1969	Lorentzen et al.	160/176

Primary Examiner—Peter M. Oaun
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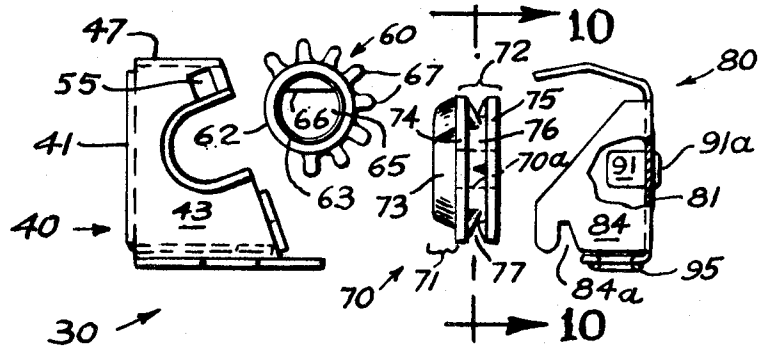
ABSTRACT: The arrangement includes a channel-mounted tilter that has front and rear shells which confront each other mouth-to-mouth and enclose a worm, a gear and a cord pulley. The rear shell is affixed to the head channel of the blind, with the expanse of the mouth of the shell extending lengthwise of the head channel. The front shell is readily attachable to and detachable from the rear shell.



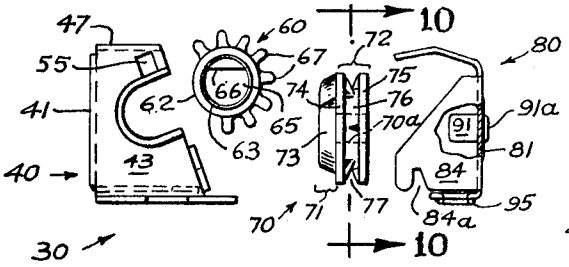


FIG. 1

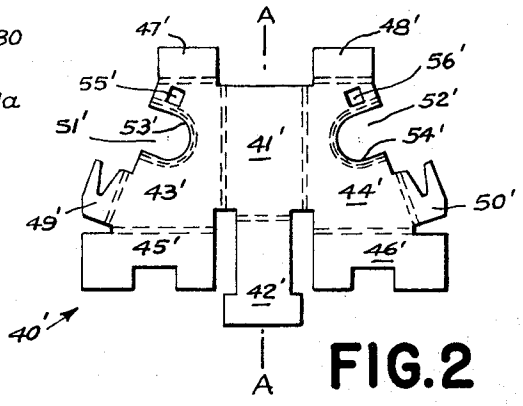


FIG. 2

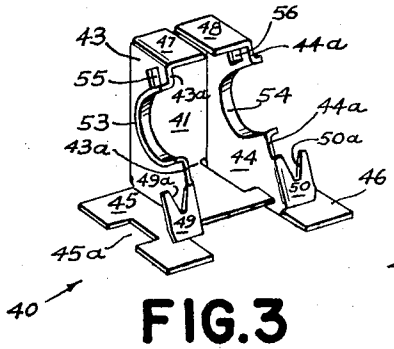


FIG. 3

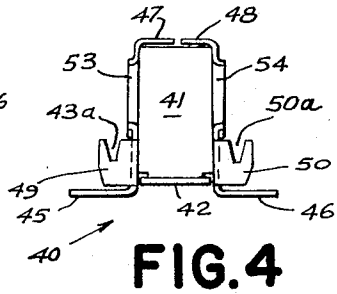


FIG. 4

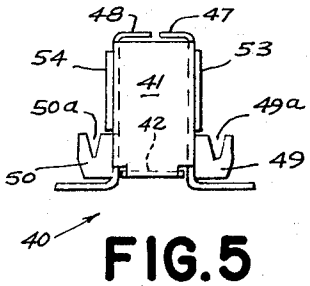


FIG. 5

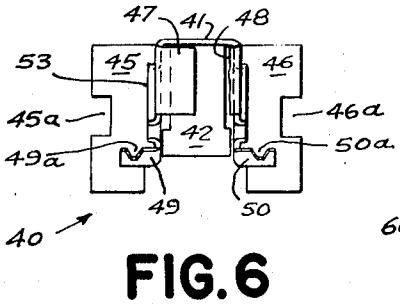


FIG. 6

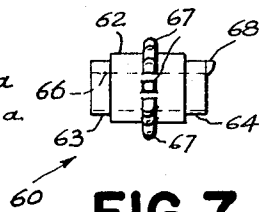


FIG. 7

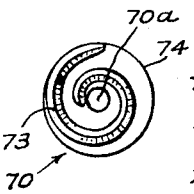


FIG. 8

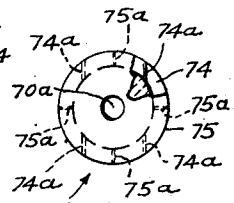


FIG. 9

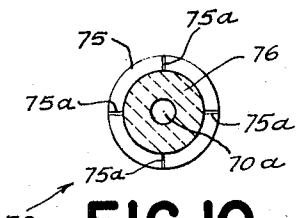


FIG. 10

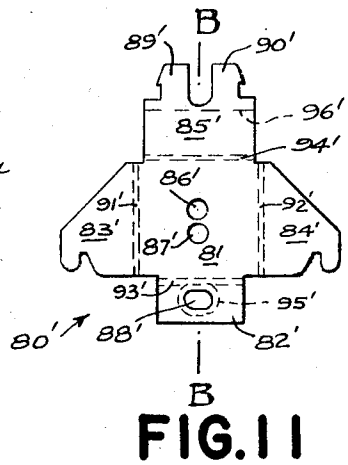


FIG. 11

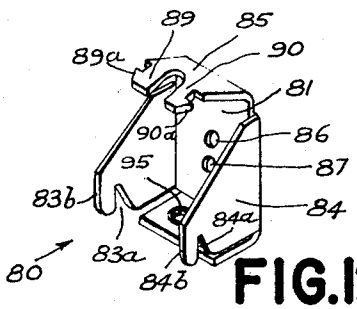


FIG. 12

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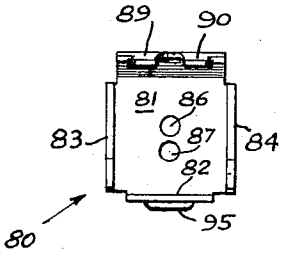

FIG.13

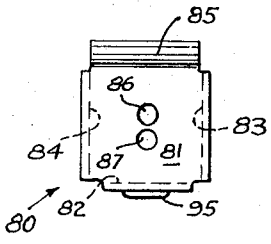

FIG.14

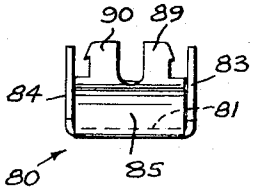

FIG.15

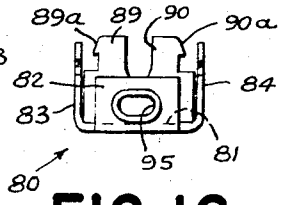

FIG.16

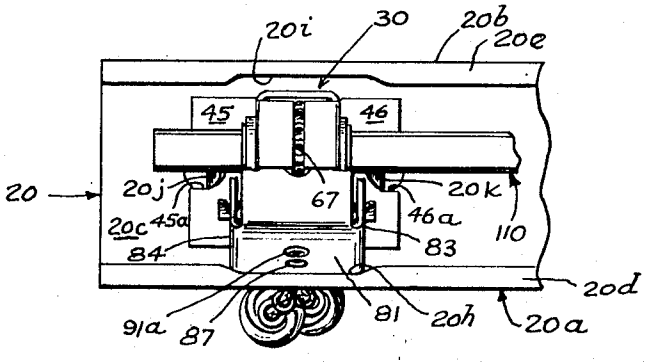

FIG.17

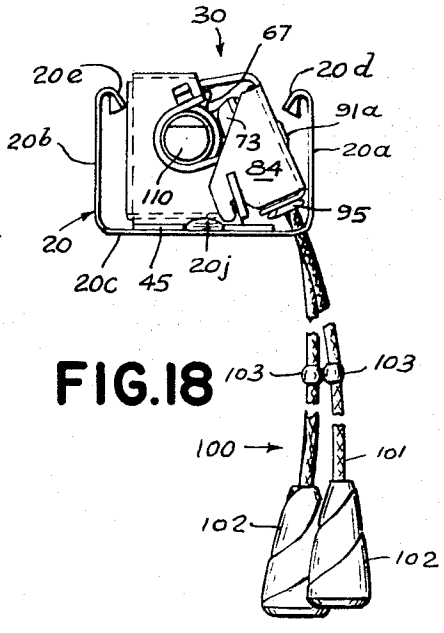

FIG.18

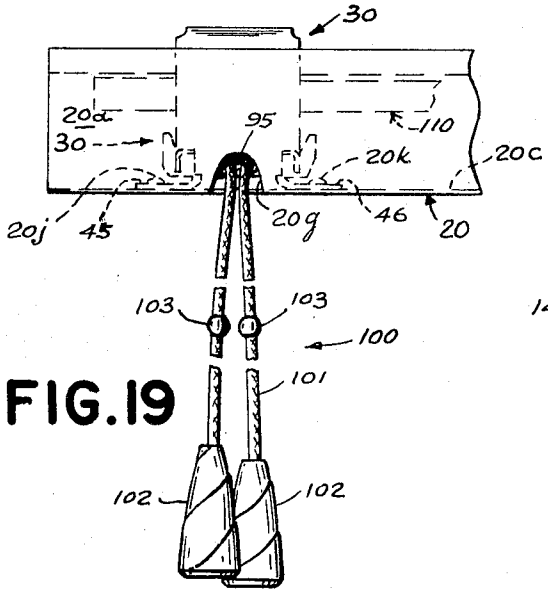

FIG.19

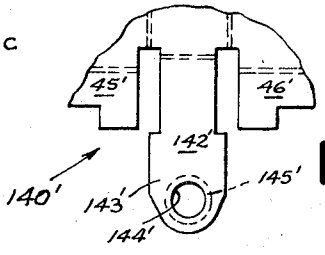

FIG.20

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VENETIAN BLIND TILTING APPARATUS

BACKGROUND OF THE INVENTION

In many venetian blinds a worm-and-gear tilter is mounted in a head channel and oscillates a tilt rod which extends longitudinally within the head channel. The tilting arrangement includes means, extending to the exterior of the head channel, by which the tilter is actuated. The head channel protects the tilter against airborne dust to only a limited extent; in many installations to a much too small extent.

The worm-and-gear tilters which are in general use may be classified as "open" and "enclosed." Open tilters are disclosed in U.S. Pat. Nos. 2,630,861 and 2,779,403. In these the worm, the gear and the bearings are largely exposed to the airborne dust which reaches the tilter. Enclosed tilters are disclosed in U.S. Pat. Nos. 2,223,997 and 2,269,213. In these the worm and the gear are enclosed within a housing or casing; and the worm, the gear and the bearings are largely protected against the airborne dust which reaches the tilter. However, the cord pulley is outside of the housing and, despite the housing and the added cost thereof the adjacent shaft bearing is accessible to the airborne dust which reaches the tilter.

The head-channel-mounted tilters that are in general use, whether open tilters or enclosed tilters, are composed of more parts than are desirable and require more expensive assembly than is desirable. Also, they are poorly suited for manufacture in small enough sizes for use in the tilting arrangements of venetian blinds which have narrow slats and low heads. In these blinds the slats may be as little as 1 inch wide and the head channel may be as little as 1½ inches wide and somewhat less than 1 inch high.

The tilting arrangement that is disclosed in U.S. Pat. No. 3,425,479 includes a tilter which is suited for manufacture in a small enough size for use in blinds having narrow slats and low heads. However, that tilter too leaves room for improvement as regards the number of parts and the expense of assembly. That tilter is baton actuated and isn't usable in those instances in which a cord-actuated tilter is desired.

SUMMARY OF THE INVENTION

In accordance with the present invention a venetian blind tilting arrangement is provided which includes a worm-and-gear tilter of few parts and inexpensive assembly, the tilter being cord actuated and being suited for manufacture in small enough size for use with a head channel that is as little as 1½ inches wide and somewhat less than 1 inch high.

In accordance with one feature of the invention the tilting arrangement includes front and rear shells which rotatably support the worm and the gear, the rear shell being affixed to the head channel and the front shell being readily attachable to and detachable from the rear shell.

In accordance with other features of the invention: The front shell is readily attachable to and detachable from the rear shell while the rear shell is affixed to the head channel. The journals of the gear are entered sidewise into circumferentially discontinuous bearings in the rear shell. The journal-receiving surfaces of these bearings extend rearwardly downwardly. The expanse of the mouth of the rear shell inclines upwardly rearwardly and the front shell is rocked toward the rear shell in attaching it to the rear shell. The front and rear shells are provided with interengaging formations at or toward the bottoms of the shells, and are provided with latching means at or toward the tops of the shells. The cord pulley is within the housing which encloses the worm and the gear. The worm is of molded material and the pulley is molded homogeneously with the worm. The worm is a spiral worm, the worm and pulley rotate on a stub shaft carried by the front shell, and movement of the front shell into attached position with respect to the rear shell moves the worm into position to cooperate with the gear.

Among other things the invention provides a venetian blind tilter in which the body includes first and second parts, the first part rotatably supports the worm, the second part rotatably supports the gear, and the second part is a single piece of stamped sheet metal that provides laterally spaced sidewalls having coaxial bearings which are circumferentially discontinuous, the journals of the gear being entered sidewise through the discontinuities.

In accordance with certain features of the invention pertaining to a tilter: The single piece of sheet metal which is the second part of the body provides top and rear walls in addition to the spaced sidewalls. The single piece of sheet metal which is the second part of the body provides a bottom member which extends between the sidewalls and contacts or closely approaches the sidewalls. The second part of the body is a shell, the mouth of which inclines from bottom to top toward the side of the shell that is opposite the mouth. The first part of the body is a stub-shaft-equipped shell which is in mouth-to-mouth relation with the shell which is the second part of the body. The two shells are latched by moving the top of one shell toward the top of the other.

The invention also provides a method of making a venetian blind tilting arrangement in which the second part of the tilter body is nested in the head channel and affixed thereto, the gear is assembled with the second part of the tilter body, the worm is assembled with the first part of the tilter body and, with the worm assembled with the first part of the tilter body, the first part of the tilter body is assembled with the second part of the tilter body.

In accordance with certain features of the invention pertaining to a method of making a venetian blind tilting arrangement: A gear is placed on a tilt rod and, with the gear on the tilt rod, the gear is assembled with the second part of the tilter body. A pulley is assembled with the first part of the tilter body along with the worm. A tilt cord is engaged with the pulley and extended to the exterior of the head channel, and the worm and pulley, with the tilt cord engaged with the pulley, are assembled with the first part of the tilter body. The first and second parts of the tilter body are first and second shells, the tilt cord is engaged with the pulley and extended to the exterior of the head channel, the pulley and worm are nested into the first shell in rotative relation thereto and, with the tilt cord extended to the exterior of the head channel and the pulley and worm nested in the first shell, the first shell is assembled with the second shell.

Taken collectively, the presently preferred forms of the invention provide all of the foregoing features and additional features which will be apparent from the disclosure hereinafter—the presently preferred forms being the presently preferred form of the venetian blind tilting arrangement, the presently preferred form of the venetian blind tilter, and the presently preferred form of the method of making a venetian blind tilting arrangement. It is left to the user to decide upon the omission of any feature or features which are not needed for his purpose.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded view of the tilter. The parts are seen in elevation, looking in the direction of the gear axis. From left to right the parts are the rear shell, the gear, the worm-and-pulley part, and the front shell including a stub shaft with which the front shell is provided and which is made visible by breading out a portion of the shell wall that is in front of it.

FIG. 2 is the blank of the rear shell of the tilter, i.e. it is a diagram showing the flat metal that is taken from the sheet and formed into the rear shell.

FIG. 3 is an isometric view of the rear shell of the tilter, looking at an angle into the mouth of the shell.

FIG. 4 is a front elevation of the rear shell of the tilter.

FIG. 5 is a rear elevation of the rear shell of the tilter.

FIG. 6 is a top plan view of the rear shell, with a part broken away.

FIG. 7 is an elevation of the tilter gear, looking from the right of the gear in FIG. 1.

FIG. 8 is an elevation of the worm-and-pulley part, looking from the left of the part in FIG. 1.

FIG. 9 is an elevation of the worm-and-pulley part, looking from the right of the part in FIG. 1.

FIG. 10 is a section of the worm-and-pulley part, taken on the line 10—10 of FIG. 1.

FIG. 11 is the blank of the front shell of the tilter.

FIG. 12 is an isometric view of the front shell, without the stub shaft, looking at an angle into the mouth of the shell.

FIG. 13 is a rear elevation of the front shell, without the stub shaft, looking directly into the mouth of the shell.

FIG. 14 is a front elevation of the front shell, without the stub shaft.

FIG. 15 is a top plan view of the front shell, without the stub shaft.

FIG. 16 is a bottom plan view of the front shell, without the stub shaft, viz, a plan view with the shell rotated 180° from the FIG.—15 position on an axis which would be vertical in FIG. 15.

FIG. 17 is a fragmentary top plan view showing the relevant portion of the tilting arrangement, including the head channel, the tilter, the tilt rod and the tilt cord.

FIG. 18 is an end elevation of the relevant portion of the arrangement, looking from the left of FIG. 17.

FIG. 19 is a front elevation of the relevant portion of the tilting arrangement. This elevation is looking from the bottom of FIG. 17.

FIG. 20 shows a modification of the blank of FIG. 2, whereby the cord guide may be placed on the rear shell instead of on the front shell.

DESCRIPTION OF THE EMBODIMENTS THAT ARE PRESENTLY PREFERRED

The figures of the drawing, taken collectively, show the presently preferred embodiment of the venetian blind tilting arrangement and also show the presently preferred embodiment of the venetian blind tilter that is incorporated in the tilting arrangement. Except as may be otherwise indicated, the description hereinafter (prior to the claims) of the venetian blind tilting arrangement and of the tilter refers only to the particular form of the tilting arrangement and the particular form of the tilter that are shown in the drawing; it does not necessarily refer to any other form or forms in which these portions of the invention may be embodied. The claims, however, do embrace other forms in which these portions of the invention may be embodied. The best modes thus far contemplated of carrying out the various portions of the invention are herein disclosed. Nevertheless the disclosure is by way of illustration and example since other specific modes are possible.

FIGS. 17, 18 and 19 show the relevant portion of the venetian blind tilting arrangement. Among other things, these figures show a sheet-steel head channel which is designated as a whole by **20**, a tilter which is designated as a whole by **30** and which has an enclosing housing, a braided tilt-cord assembly which is designated as a whole by **100**, and a steel tilt rod which is designated as a whole by **110**.

The tilter **30** is composed of the four parts shown in FIG. 1. Each part is in one piece except for the right-hand part which is a composite of two pieces. From left to right in FIG. 1 the four parts are a rear shell of stamped sheet steel which is designated as a whole by **40**, a gear which is designated as a whole by **60**, a worm-and-pulley part which is designated as a whole by **70**, and a front part which is a stamped sheet steel front shell **80** provided with a steel stub shaft **91**.

The sheet-metal blank of the rear shell **40** is as shown in FIG. 2; it is designated as a whole by **40'** and is symmetrical about the central vertical axis A—A. The blank includes a central panel **41'**, a T-shaped tab **42'** extending from the bottom edge of the panel **41'**, and side panels **43'** and **44'** extending from the side edges of the panel **41'**. Extending from the bottom edges of the side panels **43'** and **44'** there are notched tabs **45'** and **46'**. Extending from the top edges of the panels **43'** and **44'** there are tabs **47'** and **48'**. Extending from the outwardly directed edges of the side panels **43'** and **44'** there are notched tabs **49'** and **50'**.

The outwardly directed edges of the side panels **43'** and **44'** are free edges, and leading to these edges there are arcuate spaces **51'** and **52'**. Along the edges of the arcuate spaces **51'** and **52'** there are arcuate zones of sheet metal **53'** and **54'**. A short distance above the arcuate spaces **51'** and **52'** there are rectangular open spaces **55'** and **56'**. In stamping the rear shell **40**, the narrow zones of sheet metal in the blank **40'** that are delineated by the pairs of closely spaced lines are bent and drawn into 90° arcs.

The rear shell **40** is best seen in FIGS. **1**, **3**, **4**, **5**, and **6**. The panel **41'** of the blank provides the metal for the rear wall **41**, and the panels **43'** and **44'** of the blank provide the metal for the laterally spaced sidewalls **43** and **44**; these three walls are vertical. The tabs **45'** and **46'** of the blank provide the metal for the horizontal support flanges **45** and **46** which extend outwardly from the bottom edges of the sidewalls **43** and **44**. The tabs **47'** and **48'** of the blank provide the metal for the horizontal top portions **47** and **48** which, taken together, constitute the top wall of the rear shell **40**. The tabs **49'** and **50'** of the blank provide the metal for the coplanar tabs **49** and **50** which extend laterally from the mouth of the shell **40** adjacent to the bottom thereof, the plane of these tabs inclining upwardly rearwardly. The arcuate zones **53'** and **54'** of the blank provide the metal for the coaxial bearings **53** and **54** which extend outwardly in opposite directions from the sidewalls **43** and **44**.

The shell **40** has a top wall (in two parts), a bottom wall, two sidewalls, and a rear wall. The front side is open and is the mouth of the shell. The sidewalls **43** and **44** have upstanding front edges **43*a*** and **44*a***. The edges **43*a*** and **44*a*** are coplanar free edges which incline upwardly rearwardly. These edges establish the general plane of the mouth of the shell, which plane inclines upwardly rearwardly in accordance with the inclination of the edges **43*a*** and **44*a*** and the inclination of the plane of tabs **49** and **50**. The lateral expanse of the mouth of the shell extends perpendicularly of the sidewalls **43** and **44**, which is lengthwise of the head channel **20** (FIG. **17**) when the tilter is installed therein.

The tabs **49** and **50** have upwardly opening V-shaped notches **49*a*** and **50*a*** at which these tabs are engaged by complementary formations on the front shell **80**, as will be explained. Rectangular holes **55** and **56** in the sidewalls correspond to the rectangular spaces **55'** and **56'** in the blank; these holes receive barblike latch members which are on tongues of the front shell **80**, as will be explained.

The bearings **53** and **54** are circumferentially discontinuous, the discontinuities being located at the front edges **43*a*** and **44*a*** and each discontinuity extending from a lower level to an upper level. The journal-receiving surfaces of the bearings **53** and **54** extend downwardly rearwardly from the lower ends of the discontinuities in the edges **43*a*** and **44*a***. The support flanges **45** and **46**, taken together, are support means for engaging the venetian blind head channel. These flanges rest against the bottom of the head channel and are secured thereto in customary manner, as will be explained.

The gear **60**, which is best seen in FIGS. **1** and **7**, is a single homogeneous piece of material. The gear has a tubular hub **62** from the ends of which tubular journals **63** and **64** project axially as shown in FIG. **7**. The hub **62** and the journals **63** and **64** have a common axial bore and have exterior surfaces which are at least substantially cylindrical. The bore **65** is D-shaped in cross section, being cylindrically concentric with the journals **63** and **64** except for a planar chordal surface **66**. As regards both the exterior and interior surfaces of the hub **62** and journals **63** and **64** slight tapering may be provided to facilitate removal from a mold, as is common practice. Projecting radially outward from the hub **62** there is a series of teeth **67** (eight shown). These teeth, which are approximately circular in cross section, have generally hemispherical outer ends. The longitudinal axis of each tooth **67** extends radially of the hub **62** and radially of the gear axis, the gear axis being the axis of the cylindrical surface of the bore **65**. A small projection **68** at the end of the journal **64** marks that journal and facilitates orientation of the gear when assembling it into the tilter.

The gear **60** may be provided with teeth **67** throughout its entire circumference or only a portion of its circumference. As shown, the teeth are provided throughout somewhat more than half of the circumference of the gear, leaving the remainder of the circumference blank. This circumferential gap in the series of teeth is to permit the gear to "escape" from the worm for readjustment of the tilt cord after a certain amount of cumulative slippage of the tilt cord in either direction—all as is now well understood in the art. The "escapement" of the gear from the worm and the arrangement and procedure for readjusting the tilt cord after a certain amount of cumulative slippage were devised by Harry H. Nelson and disclosed in his U.S. Pat. No. 2,174,994. That patent discloses a spring to restore the gear to meshing relationship with the worm after the gear has "escaped" and the tilt cord has been readjusted. With most venetian blinds the use of such a spring is unnecessary; the unbalanced weight of the fully tilted slats biases the escaped gear into meshing relationship with the worm.

The gear **60** is shown with teeth **67** over a sufficient arc to afford full tilting of the slats of the blind from full forward tilt to full rearward tilt. In some instances it is desired to limit the tilting of the slats to a lesser range. With the tilter disclosed limitation of the tilting to a lesser range can be effected by removing one or more of the eight teeth **67** that are shown.

The worm-and-pulley part **70**, which is best seen in FIGS. **1**, **8**, **9**, and **10**, is a single homogeneous piece of material. As is seen in FIG. **1**, the part **70** includes a worm **71** and a pulley **72**, the part having a central bore **70***a* for rotatably mounting the part **70** on a shaft. The worm is a spiral worm as distinguished from a helical worm; the thread of the worm progresses spirally and advances transversely of the worm axis, instead of progressing helically and advancing lengthwise of the worm axis.

The worm **71** has a spiral thread **73** that continues for somewhat more than one convolution; it continues to the extent shown in FIG. **8**. The thread **73** is on the outer face of a disclike portion **74** of the material, which portion is axially spaced from another disclike portion of the material **75**. The disclike portion **74** serves as the body of the worm **71** and also as one of the cheeks of the pulley **72**. The disclike portion **75** is the other cheek of the pulley **72**. The pulley cheeks **74** and **75** are homogeneously connected by a hub **76**, the space at **77** between the cheeks being a circumferential groove to receive the tilt cord.

Slippage of the tilt cord on the pulley is inhibited by integral ribs which project from the confronting faces of the cheeks **74** and **75**. These ribs extend radially or quasiradially, and they become less pronounced as they progress outwardly. Four such ribs **74***a* are shown for the pulley cheek **74** (FIG. **9**) and four such ribs **75***a* are shown for the pulley cheek **75** (FIGS. **9** and **10**). The ribs **74***a* and **75***a* are interspersed circumferentially and are more or less equally spaced; see FIG. **9**. The ribs **75***a* extend radially but the ribs **74***a* extend quasiradially. To facilitate molding or casting of the part **70**, the ribs **74***a* extend as shown in FIG. **9**.

The gear **60** and the worm-and-pulley part **70** may each be made of suitable metal and may each be formed by suitable known metallurgical procedures and/or metal-shaping or metal-forming operations. Suitable contrasting metals may be used to impart desirable operating and wear characteristics to the worm and gear. At present it is preferred to mold the gear **60** and the worm-and-pulley part **70** from plastic—a plastic which provides parts that are strong and tough and have good wear characteristics. Commercial molders of plastic are able to provide suitable plastic gears **60** and suitable worm-and-pulley parts **70**. Satisfactory plastic gears **60** and worm-and-pulley parts **70** have been obtained by specifying that they be molded from glass-filled acetal (Celcon or Delrin). It is understood that this is acetal plastic, either Celcon brand or Delrin brand, with glass fibers mixed with the acetal plastic before molding, the material being the same for both the worm and the gear.

The sheet-steel blank of the front shell **80** is as shown in FIG. **11**, the blank being designated as a whole by **80'** and being symmetrical about the central vertical axis B—B. The blank includes a central panel **81'**, a rectangular tab **82'** extending downwardly from the bottom edge of the panel **81'**, and side tabs **83'** and **84'** extending laterally from the side edges of the panel **81'**. Extending upwardly from the top edge of the panel **81'** there is a two-tongued tab **85'**.

The panel **81'** has two circular open spaces **86'** and **87'** that are arranged as shown. The tab **82'** has the oval open space **88'** as shown. The tabs **83'** and **84'**, which are of the shape shown, have the notched lower edges as shown. The tab **85'** has the tongues **89'** and **90'** which are spaced apart as shown and are of the form shown.

In stamping the front shell **80** the sheet steel is bent and drawn in narrow zones which are indicated by means of dotted lines. The narrow zones of sheet steel **91'**, **92'** and **93'**, each delineated by closely spaced dotted lines, are bent and drawn into 90° arcs. The narrow zone **94'**, also delineated by closely spaced dotted lines, is bent and drawn into an arc that is somewhat less than 90°. The oval-shaped zone **95'** which embraces the opening **88'** is drawn downwardly and outwardly into a funnel-mouthed thimble of oval cross section; this thimble is a guide for the tilt cord. A small angle bend is made in the metal at the line **96'**.

The front shell **80** is seen to advantage in FIGS. **1** and **12–16**. The panel **81'** of the blank provides the metal for the front wall **81**, and the tab **82'** provides the metal for the bottom wall **82**. The tabs **83'** and **84'** of the blank provide the metal for the laterally spaced sidewalls **83** and **84**. In harmony with the notched lower edges of the tabs **83'** and **84'** of the blank, the sidewalls **83** and **84** have downwardly opening V-shaped notches **83***a* and **84***a* (FIG. **12**) which are located toward the free edges **83***b* and **84***b* of the sidewalls. The two-tongued tab **85'** provides the metal for the top wall **85** of the shell including the spaced parallel tongues **89** and **90** thereof. The tongues **89** and **90** are notched and shaped as shown to provide the tongues with barblike latch members **89***a* and **90***a* (see also FIGS. **15** and **16**).

FIGS. **1** and **12–16** show the front shell **80** in an oriented position which places the front wall **81** vertical. When the front shell **80** is assembled with the rear shell **40**, the oriented position of the front shell shifts and the front wall **81** thereof moves into the inclined position that is seen in FIGS. **17** and **18**. In the oriented position of the front shell **80** in FIGS. **1** and **12–16** the sidewalls **83** and **84** are vertical, and the sidewalls remain vertical when the front shell **80** is assembled with the rear shell **40**.

As is best seen in FIG. **12**, the front shell **80** has a top wall, a bottom wall, a front wall, and two sidewalls. The rear side is open and is the mouth of the shell. The free edges **83***b* and **84***b* of the sidewalls taken with the free ends of the tongues **89** and **90** establish the general plane of the mouth of the shell **80**. The lateral expanse of the mouth of the shell extends perpendicularly to the sidewalls **83** and **84**.

The front shell **80** is provided with a stub shaft **91** (FIG. **1**) which is a screw machine part that is made of steel. The body of the shaft **91** is cylindrical. One end of the shaft is machined and drilled to provide (a) an annular shoulder (not shown) which bears against the back surface of the front wall **81** and (b) a hollow rivet portion **91***a* (FIGS. **1**, **17**, and **18**) which extends through the circular hole **86** in the front wall of the shell (FIGS. **12**, **13**, and **14**) and is set in the manner of an eyelet to firmly attach the stub shaft **91** to the front shell **80**.

Below the hole **86**, which receives the rivet portion **91***a* of the stub shaft **91**, there is a hole **87** through the front wall **81** of the shell. The purpose of the hole **87** will be explained.

The tilt-cord assembly **100** (FIGS. **17–19**) includes a tilt cord **101**, which is a single length of cord. It is presently preferred that the cord of the tilt cord **101** be approximately three thirty-seconds inch in diameter, be of high strength, and have little stretch. Braided cord made from Dacron brand polyester fibers is contemplated. Affixed to the two ends of

the tilt cord **101** there are two conventional pull tassels **102**. Affixed to each of the depending branches of the tilt cord **101** there is a sheet-metal bead **103**. The two beads **103** are properly located and spaced to enable them to appropriately act as stops in readjusting the tilt cord after a certain amount of cumulative slippage, all as is now well understood in the art.

The tilt rod **110** (FIGS. **17–19**) extends for quite a distance along the length of the head channel **20**, being rotatably supported by two or more cradles (not shown), and carrying two or more drums or rockers (not shown) from which the ladders of the blind (not shown) are suspended—all as is well known in the art. When one of the tassels **102** is pulled the slats of the blind are tilted. The tilting arrangement disclosed herein and the tilter disclosed herein are particularly adapted for the venetian blind disclosed in U.S. Pat. No. 3,425,479; in fact, the herein-disclosed tilter **30** and tilt cord assembly **100** are adapted to be substituted directly for the tilter **30** and the baton or wand **38** disclosed in U.S. Pat. No. 3,425,479.

The parts and components that have been described are used in making the tilting arrangement that is disclosed in FIGS. **17–19**. The head channel **20** shown in these figures has a front wall **20***a*, a rear wall **20***b*, and a bottom wall **20***c*. Along the upper edges of the front and rear walls **20***a* and **20***b*, there are longitudinally extending flanges **20***d* and **20***e* which are folded inwardly and downwardly. Longitudinally spaced sheet-metal fingers **20***j* and **20***k* are struck up from the bottom **20***c* of the head channel and secure the tilter to the head channel in a manner that is well known in the art. At a position along the length of the head channel which is midway between the fingers **20***j* and **20***k* there is an opening **20***g* (FIG. **19**) through the head channel which is spread over an area that includes the juncture of the front wall **20***a* and the bottom wall **20***c*. This opening **20***g* is the same as opening **20***g* in U.S. Pat. No. 3,425,479. To provide clearance for the entry of the tilter **30** and parts thereof into the head channel, the longitudinal flanges **20***d* and **20** *e* at the upper edges of the front and rear walls of the head channel are locally collapsed and flattened at **20***h* and **20***i* as is seen in FIG. **17**.

The presently preferred method of making the tilting arrangement shown in FIGS. **17**, **18** and **19** will now be explained. The cradles (not shown) and the rear shell **40** of the tilter **30** are nested in the head channel **20** and affixed to the bottom wall **20***c* thereof. For the cradles and their attachment to the bottom wall **20**, see cradles **26** and their attachment in U.S. Pat. No. 3,425,479. The rear shell **40** of the tilter **30** is positioned with the mouth of the shell facing forwardly. The support flanges **45** and **46** rest against bottom **20***c* of the head channel and are secured by the clinched tabs **20***j* and **20***k* which pass upwardly through the notches **45***a* and **46***a* (see also FIGS. **3** and **6**) and are clinched against the top faces of support flanges **45** and **46**. The gear **60** is now telescoped onto the tilt rod **110** with the marking projection **68** (FIG. **7**) pointing to the right. The tilt rod is placed in the bearings of the cradles and the journals **63** and **64** of the gear **60** are entered sidewise, through the discontinuities, into the bearings **53** and **54** of the rear shell **40**. The worm-and-pulley part **70**, the tilt cord **101**, and the front shell **80** are prepared for combining with the rear shell **40** and the gear **60**.

The worm-and-pulley part **70** is rotatably positioned on the stub shaft **91** (FIG. **1**) before the front shell **80** is assembled with the channel-mounted rear shell **40**, and the tilt cord **101** is engaged with the pulley **72** before the worm-and-pulley part **70** is placed on the stub shaft **91**. The tilt cord **101** is not only engaged with the pulley **72**, but it is also extended to the outside of the head channel **20**; different sequences are possible for accomplishing this, but it is presently preferred to first complete the tilt-cord assembly **100** by providing the tilt cord **101** and affixing to it the two tassels **102** and the two beads **103**. Then the cord **101** is arranged in two branches of equal length with a bight where the two branches merge. The bight is threaded upwardly through the hole **20***g* in the head channel and thence through the hole of the cord guide **95**—the front shell **80** not having been assembled with the rear shell **40** as yet. The tilt cord **101** is now engaged with the pulley **72** of the not-yet-installed worm-and-pulley part **70**.

The worm-and-pulley part **70**, with the tilt cord **101** engaged with the pulley **72**, is telescoped onto the shaft **91** for rotation thereon; as this is done the two branches of the tilt cord **101** are pulled downwardly to obviate slack within the front shell. While still pulling downwardly on the tilt-cord branches to obviate slack, the front shell **80** is assembled with the rear shell **40** in mouth-to-mouth relation therewith. The front shell **80** is moved downwardly, and the downwardly opening notches **83***a* and **84***a* of the front shell (FIG. **12**) engaged with the upwardly opening notches **49***a* and **50***a* of the rear shell **40** (FIGS. **3–6**), thereby making a lower level holding engagement between the two shells. With the worm **60** in the rotative position shown in FIG. **1**, i.e. with the flats of the tilt rod **110** and the bore **65** at the top, the front shell **80** is now rocked rearwardly about the axis of the lower level engagement of the front shell **80** with the rear shell **40**; this axis is at the bottoms of the notches **49***a* and **50***a*. The worm **71** moves into mesh with the gear **60** as the tongues **89** and **90** are telescoped between the front upper portions of the sidewalls **43** and **44** of the rear shell **40**. The latch members **89***a* and **90***a* of the tongues **89** and **90** have cam surfaces as best seen in FIGS. **15** and **16** which, as the tongues enter between the sidewalls **43** and **44** of the rear shell, engage the sidewalls adjacent to their front edges and generate edgewise squeeze pressure upon the two tongues **89** and **90** taken together. By reactive force, the two tongues, taken together, exert seperating pressure on the two sidewalls **43** and **44** adjacent to the upper portions of their front edges.

The tongues **89** and **90** are capable of some resilient yielding toward one another; also the upper front portions of the sidewalls **43** and **44** are capable of substantial resilient separation, since the top wall of the shell is divided front to rear by the discontinuity that exists between the portions **47** and **48** of the top wall. As an aid to forcing the ends of the tongues **89** and **90** between the front upper portions of the sidewalls of the rear shell, a screwdriver or similar implement may be used as a pry bar, being inserted downwardly behind the front wall **20***a* of the head channel (FIG. **18**) and then rocked rearwardly to apply rearward pressure to an upper portion of front shell **80**. As soon as the front shell **80** is rocked into fully assembled mouth-to-mouth relation with the rear shell **40**, the latch members **89***a* and **90***a* snap outwardly into the rectangular holes **55** and **56** and, in conjunction with the forward margins of these holes, constituting latching means which latch the two shells together at an upper level.

To replace a worn tilt cord, a screwdriver may be inserted at a forward location between the confronting edges of the top-wall portions **47** and **48** of the rear shell and then twisted; this will forcibly separate the upper front portions of the sidewalls **43** and **44** sufficiently to unlatch the front shell from the rear shell. If care is exercised in unlatching the front shell the resiliency of the rear shell will sufficiently restore the original spacing between the upper front portions of the sidewalls **43** and **44** and afford proper relatching of the front shell to the rear shell after the cord has been replaced. If the resiliency of the rear shell is insufficient, or if too great separation of the upper front portions of the sidewalls has been effected in unlatching the front shell, then the upper front portions of the sidewalls of the rear shell can be squeezed toward one another with pliers to the extent needed. The hole **87** in the front wall of the front shell **80** permits the insertion of a punch, awl, pencil point or the like to push the worm-and-pulley part from the stub shaft **91** for replacement of the tilt cord.

A special function of the bottom wall **42** of the rear shell **40** remains to be explained. The metal for the bottom wall **42** is provided by the T-shaped tab **42'** (FIG. **2**) of the blank. The bottom wall **42** has a corresponding T-shaped configuration and the ends of the cross bar of the T-formation lie against or closely adjacent the sidewalls **43** and **44** of the shell; see FIGS. **3–6**. Thus the crossbar of the T acts as a spacer or stop which

helps protect the sidewalls against being squeezed too closely together, for example when the tabs **20***j* and **20***k* (FIG. **17**) are clinched to affix the rear shell **40** to the bottom wall **20***c* of the head channel **20**. The spacer or stop action of the cross bar of the T-formation of the bottom wall **42** may also be helpful during certain forming operations which may be used in making the shell **42**.

An alternative placement of the cord guide also remains to be explained. The cord guide **95** (FIGS. **1, 13, 14, 15, 16, 18** and **19**) is on the front shell **80**. If desired, the cord guide may be placed on the rear shell. For this purpose the blank of the rear shell may be modified as shown in FIG. **20**. In FIG. **20** the blank is designated as a hole by **140'** and is the same as the blank **40'** (FIG. **2**) except for the tab **142'**. The tab **142'** adds on to the tab **42'**; in other words, tab **142'** is the same as tab **42'** except for the extension thereof this is designated **143'**. The extension **143'** is of the form shown; it has a narrowing and rounded free end, and has a circular open space **144'**. Embracing the open space **144'** there is an annular zone **145'** of the sheet steel which zone is delineated by the dotted circle.

In stamping the rear shell from the sheet steel provided by the modified blank **140'**, the narrow annular zone of metal **145'** is drawn into a flaring eyelet which is circular. This eyelet is the cord guide for the tilt cord **101**. So that there will be no danger of this cord guide striking the head channel **20** when the modified rear shell is installed therein, the metal of the annular zone **145'** may be drawn upwardly in forming the cord guide.

The annular zone of metal **145'** is so located that the cord guide formed therefrom will be properly aligned with the groove of the pulley **72** (FIG. **1**) when the tilting arrangement has been completely assembled; compare with FIG. **18** where the center of the cord guide is in the central cross axial plane of the pulley. If need be, the tip of the extension provided by the blank metal **143'** may project somewhat through the head channel hole **20***g* (FIG. **19**) when the modified rear shell is mounted in the head channel **20**.

When the cord guide is placed on the rear shell the blank of the front shell is modified by eliminating the tab **82'** (FIG. **11**); the lower edge of the panel **81'** becomes a free edge in prolongation of the lower edges of the tabs **83'** and **84'**. Elimination of the tab **82'** of the blank eliminates the bottom wall **82** of the front shell **80** (FIGS. **12, 13, 14** and **16**).

We claim:

1. A venetian blind tilting arrangement in which a tilter is mounted in a head channel, actuating means for the tilter extends to the exterior of the head channel, the tilter includes (a) a worm, (b) a gear, and (c) a body which rotatably supports the worm and the gear, and the body has two shells which have mouths and confront each other mouth to mouth—wherein the improvement comprises:

the lateral expanse of the mouth of each of the two shells extends lengthwise of the head channel,

one of the shells is a front shell and is provided with means that rotatably supports the worm,

the other of the shells is a rear shell and is provided with means that rotatably supports the gear on an axis which is parallel to the lateral expanse of the mouth of the shell,

the rear shell is affixed to the head channel,

and the front shell is readily attachable to and detachable from the rear shell.

2. A venetian blind tilting arrangement as in claim **1** wherein the improvement further comprises:

the front shell is readily attachable to and detachable from the rear shell while the rear shell is affixed to the head channel.

3. A venetian blind tilting arrangement as in claim **1** wherein the improvement further comprises:

the rear shell is provided with bearings which are circumferentially discontinuous,

and the gear is provided with journals which are entered sidewise into the bearings through the circumferential discontinuities.

4. A venetian blind tilting arrangement as in claim **3** wherein the improvement further comprises:

the circumferential discontinuities in the bearings are at the mouth of the rear shell and extend from a lower level to an upper level,

and the journal-receiving surfaces of the bearings extend rearwardly downwardly from the lower ends of the circumferential discontinuities in the bearings.

5. A venetian blind tilting arrangement as in claim **1** wherein the improvement further comprises:

the expanse from bottom to top of the mouth of the rear shell inclines upwardly rearwardly,

and the front shell is rocked toward the rear shell in attaching it to the rear shell.

6. A venetian blind tilting arrangement as in claim **1** wherein the improvement further comprises:

the front and rear shells are provided with interengaging formations at or toward the bottoms of the shells, and are provided with latching means at or toward the tops of the shells.

7. A venetian blind tilting arrangement as in claim **5** wherein the improvement further comprises:

the front and rear shells are provided, at to toward the bottoms of the shells, with interengaging formations which are engaged by moving the front shell downwardly with respect to the rear shell,

and the front and rear shells are provided, at or toward the tops of the shells, with latching means which are latched by moving the top of the front shell toward the top of the rear shell.

8. A venetian blind tilting arrangement as in claim **1** wherein the improvement further comprises:

a pulley is connected to the worm,

the front and rear shells constitute a housing which encloses the pulley, the worm and the gear,

the front shell and the head channel are perforated for the passage of a pulley-engaged cord to and from the exterior of the head channel,

and a tilt cord engages the pulley and extends to the exterior of the head channel.

9. A venetian blind tilting arrangement as in claim **8** wherein the improvement further comprises:

the worm is of molded material and the pulley is molded homogeneously with the worm.

10. A venetian blind tilting arrangement as in claim **1** wherein the improvement further comprises:

the worm is of molded plastic and is a spiral worm,

a pulley is molded homogeneously with the worm,

the front shell is provided with a stub shaft on which the worm and pulley rotate,

the front and rear shells constitute a housing which encloses the pulley, the worm and the gear,

the front shell and the head channel are perforated for the passage of a pulley-engaged cord to and from the exterior of the head channel,

a tilt cord engages the pulley and extends to the exterior of the head channel,

and movement of the front shell into attached position with respect to the rear shells moves the worm into position to cooperate with the gear.

11. A venetian blind tilter in which a gear and a worm are rotatably supported by a body that includes first and second parts which are made of sheet metal and mate with each other—wherein the improvement comprises:

the first part of the body rotatably supports the worm,

the second part of the body is a single piece of stamped sheet-metal which provides (a) laterally spaced sidewalls have upstanding front edges, (b) a member that connects the sidewalls, and (c) support means for engaging a venetian blind head channel,

the sidewalls of the second part of the body are provided with coaxial bearings,

the axis of the bearings extending perpendicularly to the sidewalls and the bearings having circumferential discontinuities located at the front edges of the sidewalls,

and the gear is provided with journals which are entered sidewise into said bearings through the circumferential discontinuities.

12. A venetian blind tilter as in claim **11** wherein the improvement further comprises:

the second part of the body is a single piece of stamped sheet metal which provides a top wall and a rear wall, one of these walls being the member that connects the sidewalls of the body.

13. A venetian blind tilter as in claim **12** wherein the improvement further comprises:

the second part of the body is a single piece of stamped sheet metal which additionally provides a bottom member which extends between the sidewalls and contacts or closely approaches each of the sidewalls.

14. A venetian blind tilter as in claim **11** wherein the improvement further comprises:

the second part of the body is a shell having a mouth,

and the expanse of the mouth inclines, from bottom to top, toward the side of the shell that is opposite the mouth.

15. A venetian blind tilter as in claim **14** wherein the improvement further comprises:

the first part of the body includes a shell having a mouth,

and the first shell is in mouth-to-mouth relation to the shell which is the second part of the body.

16. A venetian blind tilter as in claim **15** wherein the improvement further comprises:

the two shells are provided, at or toward the bottoms of the shells, with interengaging formations which are engaged by moving one of the shells downwardly with respect to the other,

and the two shells are provided, at or toward the tops of the shells, with latching means which are latched by moving the top of one shell toward the top of the other.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,630,264 Dated December 28, 1971

Inventor(s) Victor Debs, et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet, after Primary Examiner, "Peter M. Oaun" should read -- Peter M. Caun -- . Column 1, line 21, after "thereof" insert a comma. Column 10, line 23, "to" should read -- or -- ; line 61, "shells" should read -- shell -- ; line 69, after "sidewalls" insert -- that -- .

Signed and sealed this 31st day of October 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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