Aug. 30, 1966 F. VECCHIARELLI ETAL 3,269,453

VENETIAN BLIND STRUCTURE

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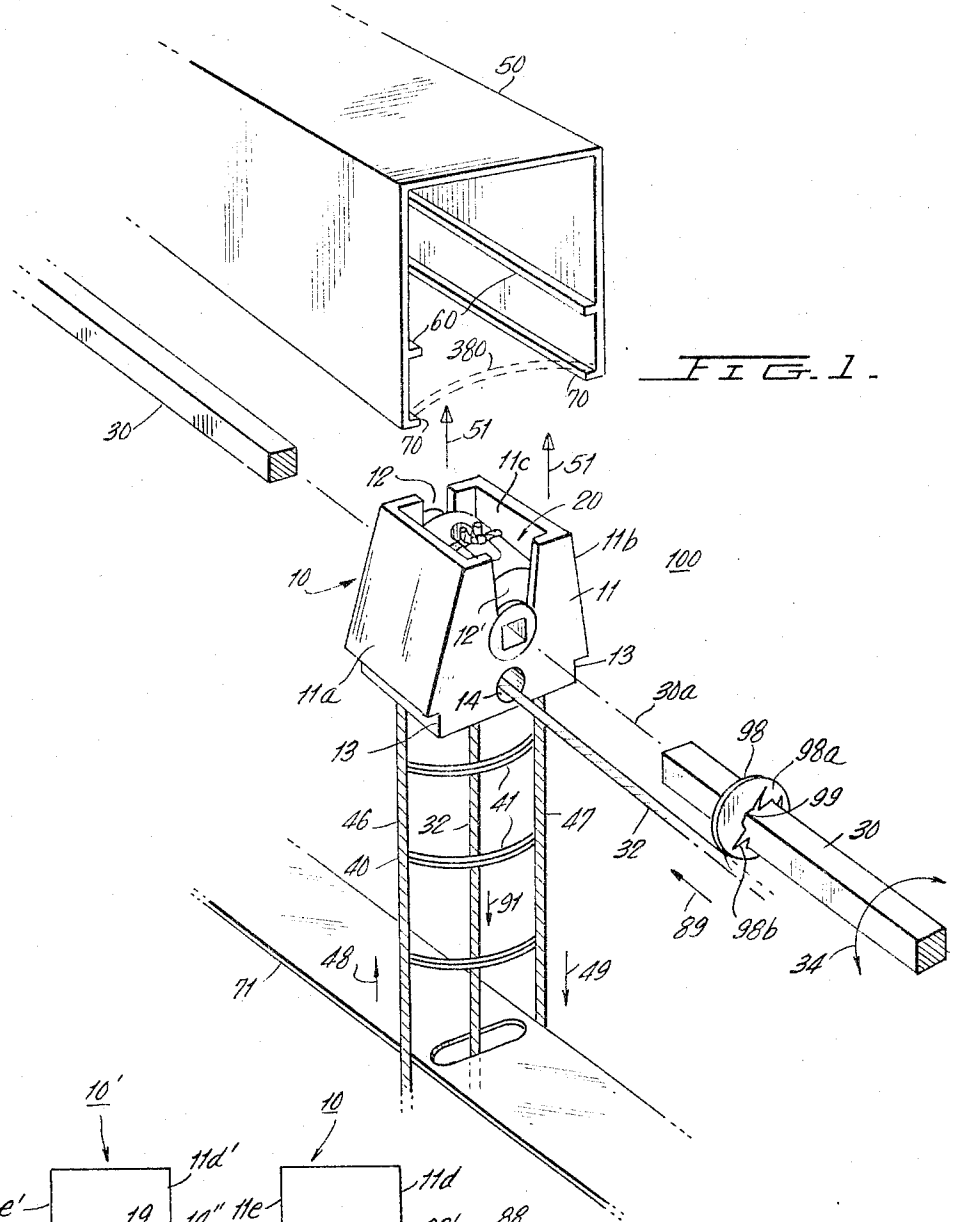


FIG. 1.

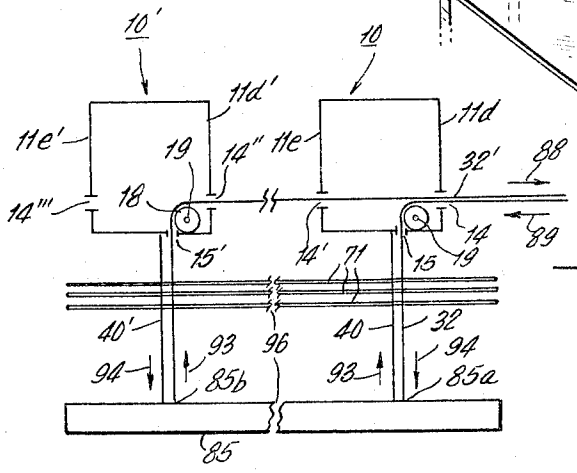


FIG. 5.

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FIG. 4.

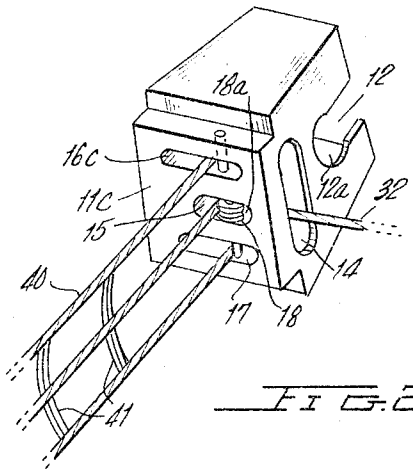


FIG. 2.

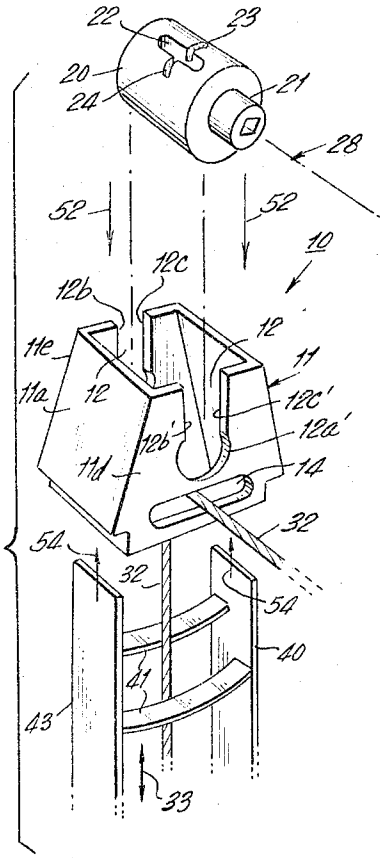


FIG. 3.

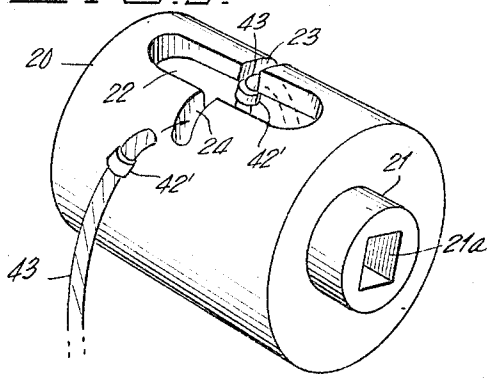


FIG. 10.

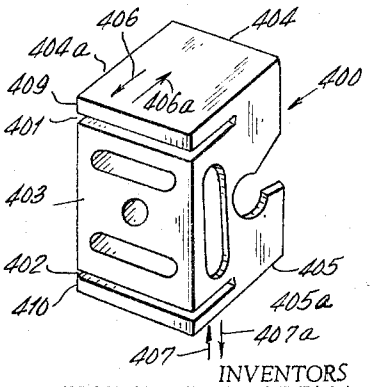
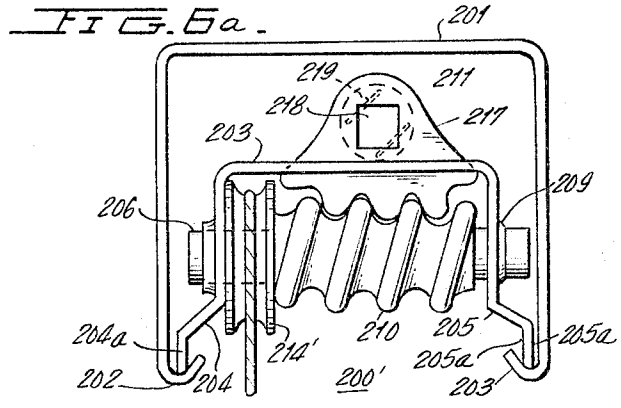


FIG. 6a.



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FIG. 6.

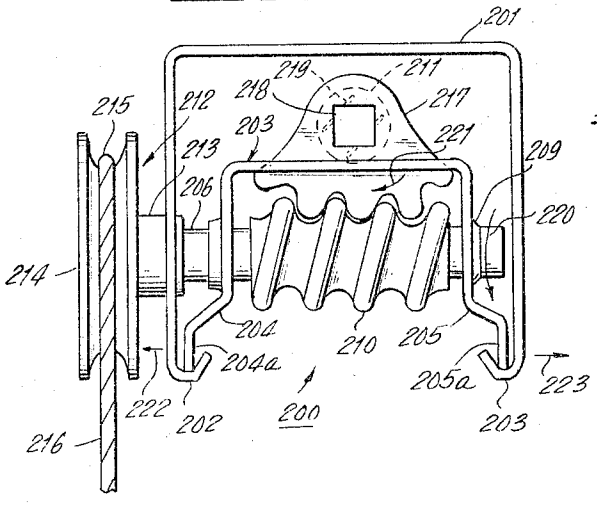


FIG. 8.

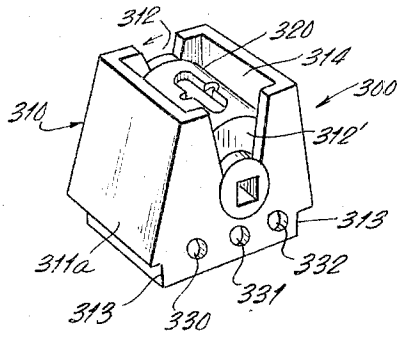


FIG. 9.

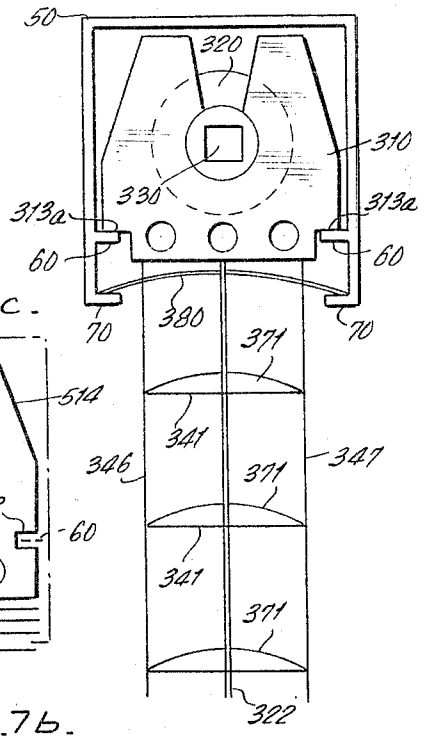


FIG. 8a.

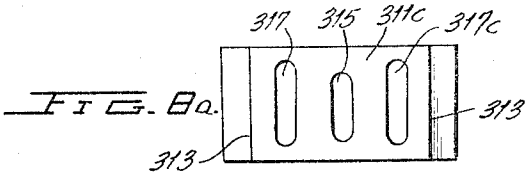


FIG. 8b.

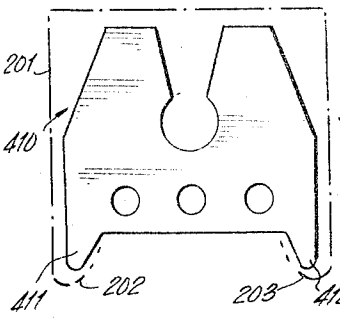


FIG. 8c.

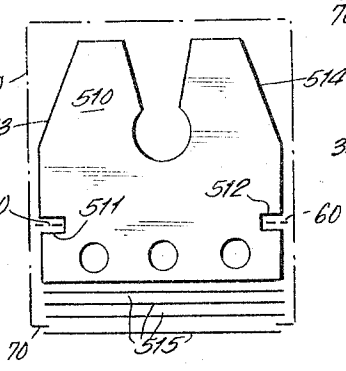


FIG. 7a.

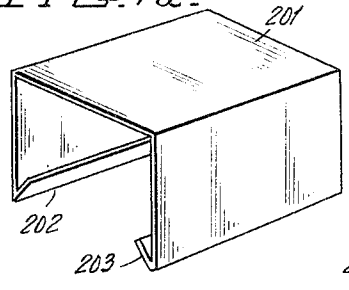
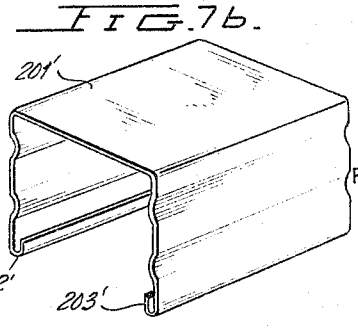


FIG. 7b.



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VENETIAN BLIND STRUCTURE

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Filed Oct. 17, 1962, Ser. No. 231,083
5 Claims. (Cl. 160—176)

This invention relates to Venetian blind structures and more particularly to a snap-in assembly for use in Venetian blind structures having the capabilities of controlling tilting of the Venetian blind tape ladder structure, as well as the raising and lowering operations of the Venetian blind structure.

Venetian blind assemblies finding wide spread use in present day installations, normally consist of a complex all metallic housing and operating mechanism for controlling the tilting of the individual Venetian blind slats and for the raising and lowering of the Venetian blind assembly.

Structures of the general type employed in commercial installation are not normally standardized but are more in the nature of a custom made construction. This means that a complex fabrication operation is required to produce a Venetian blind assembly each time a new Venetian blind is required, due to the fact that window dimensions being non-uniform in both commercial and industrial applications. The metallic enclosure which houses the Venetian blind operating mechanism must be mechanically altered so as to accommodate the ladder holding mechanisms, depending upon how close or how far apart such operating mechanism are placed within the housing. The construction involves cutting and/or punching of the housing and preparation of an operating mechanism for the Venetian blind which is suitable for the particular installation. These arrangements prevent the adoption of a uniform Venetian blind operating mechanism which may be mass produced and which may be very simply modified in order to accommodate any installation whatsoever.

Also, due to the relatively large dimensions that present day Venetian blind head portions require, space limitations therefore may limit installation of such Venetian blind assemblies.

The device of the instant invention is so designed as to permit its installation in limited space areas in a very rapid straightforward manner, while at the same time providing safe reliable operation. The devices further lend themselves to windows of any width dimensions thereby enabling substantially all of the components which comprise a Venetian blind operating mechanism to be mass produced since all such components will readily lend themselves to a wide scope of installations having varying dimensions.

The device of the instant invention is comprised of a snap-in assembly which is adapted to be simply and easily positioned into a head rail provided to house the snap-in assembly.

The snap-in assembly is comprised of a first member having suitable passageways for receiving the Venetian blind ladder and the lift cord so as to readily accommodate Venetian blind structures. A second rotatable member is positioned within the first relatively stationary member for movement therein under control of a tilting mechanism. The rotatable member has suitable provision for securing the Venetian blind ladder therein and for permitting safe reliable control of the ladder structure when the Venetian blind structure is tilted under control of the tilt mechanism.

The rotatable member is readily inserted and/or removed from the stationary member so as to permit a more rapid installation of the Venetian blind structure. The snap-in feature of the stationary member permits the snap-in assemblies to be positioned at any predetermined distance away from the next snap-in assembly, thereby readily lending itself to use in any width window in which the installation is to be employed.

Further provision is made in the stationary member for receiving and guiding the Venetian blind assembly lift cord so as to provide safe reliable lifting and lowering action of the Venetian blind assembly. The entire mechanism being comprised of only two basic elements better fitting than prior art Venetian blind structures and provides a more reliable useful operating life.

The tilt rod mechanism for operating the snap-in Venetian blind assembly is also adapted to operate as a snap-in assembly and cooperates with the head rail extrusion in a manner analogous to that of the snap-in assembly for supporting the Venetian blind string tape ladder. The snap-in tilt mechanism is comprised of a pulley means for receiving the tilt control cord, which roller assembly, or pulley, operates a worm which cooperates with a worm gear to control rotary action of the snap-in assembly tilt rod member. As is the case with the snap-in assemblies for the ladder, the tilter assembsy may be positioned anywhere along the length of the head rail extrusion and is not limited as to its application in the over-all assembly.

It is therefore one object of this invention to provide snap-in assemblies of Venetian blind structures which are so constructed as to enable their use in Venetian blind structures of varying dimensions.

Another object of this invention is to provide a snap-in assembly for Venetian blind structures which are so constructed as to permit extremely rapid installation thereof.

Another object of this invention is to provide a snap-in assembly for Venetian blind structures which is so designed as to produce a more compact installation for the Venetian blind operating mechanism.

Still another object of this invention is to provide a snap-in assembly for Venetian blind structures, having a novel construction for accommodating both Venetian blind tape ladders and lift cords so as to provide safe reliable operation thereof.

Still another object of this invention is to provide a snap-in assembly for Venetian blind structures which are so constructed as to permit relatively easy and rapid assembly and disassembly thereof, thereby enabling Venetian blind installations to be performed in a relatively safe-easy manner.

Another object of this invention is to provide a tilter mechanism for Venetian blind assemblies having a novel arrangement for controlling rotation of the Venetian blind assembly tilt rod.

Another object of this invention is to provide a snap-in tilter assembly for Venetian blind structures having a mechanical worm gear arrangement for controlling the Venetian blind assembly tilt rod member.

Still another object of this invention is to provide a tilter mechanism for Venetian blind structures which is so adapted as to be positionable into an inverted head rail extrusion at any point along the length of the head rail thereby facilitating the design of Venetian blind structures.

These and other objects will become apparent when considering the accompanying description and drawings in which:

FIGURE 1 is a perspective view of the snap-in assembly showing the inner-connection thereof with the Venetian blind assembly.

FIGURE 2 is a perspective view of the snap-in assembly showing an assembly in an exploded view.

FIGURE 3 is a perspective view of the snap-in assembly roller member showing the detail thereof.

FIGURE 4 is a perspective view of the snap-in assembly showing the bottom portion thereof.

FIGURE 5 is a schematic plan view showing of a substantially complete Venetian blind assembly incorporating the principles of the instant invention.

FIGURE 6 is a side plan view showing the tilter mechanism of the instant invention.

FIGURE 6*a* is a side plan view showing an alternative embodiment of the tilter mechanism of FIGURE 6.

FIGURES 7*a* and 7*b* are perspective views of alternative embodiments for the inverted head rail extrusion shown in FIGURE 1 of the drawings.

FIGURE 8 is a perspective view of an alternative embodiment of the snap-in assembly of FIGURE 1.

FIGURE 8*a* shows a view of the underside of the ladder assembly of FIGURE 8.

FIGURES 8*b* and 8*c* are end views respectively of modifications of the snap-in assembly of FIGURE 8.

FIGURE 9 is an end view of a snap-in assembly of the type shown in FIGURE 8 incorporated in an inverted head rail extrusion of an alternative design from those shown in FIGURES 1, 7*a* and 7*b*.

FIGURE 10 is a perspective view of an alternative embodiment of the snap-in assembly housing of FIGURES 1 through 4.

Referring now to the drawings, and particularly to FIGURE 1, the invention is employed in a Venetian blind assembly **100**, having a head rail housing **50** for housing the Venetian blind operating mechanism. As is normally the case, the housing **50** is positioned within the window casing adjacent the window, and along the horizontal top surface thereof, with or without the use of mounting brackets. The housing **50** has a substantially U-shaped configuration and is provided with first and second pairs of flanges **60** and **70** respectively for positioning and seating the snap-in assemblies of the instant invention. The pairs of flanges **60** and **70** extend the entire length of the housing **50**, enabling the snap-in assemblies to be positioned at any point along the length of the housing in a manner to be more fully described.

The snap-in assembly **10** is comprised of a relatively stationary base mmeber **11**, having a substantially rectangular configuration, which base member **11** is provided with a pair of notches **13**, running the entire length of the front and rear sides **11***a* and **11***b* respectively of the base member **11**, wherein notches **13** are adapted to be seated upon either one of the two flange pairs **60** or **70**. The front and rear sides **11***a* and **11***b* respectively are tapered so that in moving the base member **11** in the direction shown by arrows **51** so as to be seated in the housing **50**, the tapered sides **11***a* and **11***b* serve as guides for enabling the base member **11** to be very easily wedged between the flange pair, such as the flange pair **70**, for example, until the notches **13** move to a position immediately above the flanges **70**, at which time, if the base member is released, the base member **11** will be firmly positioned and secured by the flanges **70** of the housing **50**. Since the flanges run the entire length of the housing **50**, it should be understood that the snap-in assembly base member **11** may be positioned at any point along the length of the housing **50**.

The base member **11** is provided with a cavity **11***c*, having first and second slots **12** and **12'** at its opposite ends, wherein said cavity **11***c* and said slots **12** and **12'** are provided for receiving the snap-in assembly roller member **20**. The lower ends of slots **12** and **12'** are provided with a substantially circular configuration **12***a* (see FIGURES 2 and 4), which are adapted to receive the ends, such as the end **21** of the roller member **20**, enabling roller member **20** to experience rotation along its central axis **28**, when seated in the cavity **11***c* of base member **11**. The edges **12***b* and **12***c* and **12***b'* of the notches **12** and **12'** respectively are tapered in the direction of their circular lower portions **12***a* and **12***a'* so as to facilitate the insertion of the roller member **20**.

As shown in FIGURE 2 with the roller member **20** in the position of FIGURE 2 moved in the direction of arrows **52** towards the base member **11**, the end portions **21** thereof are wedged between the tapered sides **12***b*–**12***c* and **12***b'*–**12***c'* of the slots **12** and **12'** respectively, until the end portions **21** thereof are positioned within the circular portions **12***a* and **12***a'* of the base member **11**. The dimensions of the circular portions **12***a* and **12***a'* are such as to permit rotation of the roller member **20** when properly seated in base member **11**.

The snap-in assembly **10** is adapted to support a ladder arrangement **40** which is provided for the purpose of positioning and securing the individual slats of the Venetian blind assembly, such as, for example, the slat **71** shown in dotted fashion in FIGURE 1. While FIGURES 1 and 4 show a ladder assembly formed of string-like members, it should be noted that the snap-in assemblies of the instant invention work equally well with tape ladder assemblies, such as, for example, the tape ladder assembly shown in FIGURE 2 of the drawings. In order to provide for simple and reliable installation of the ladder assembly **40**, the base member **11**, as shown in FIGURE 4 is provided with first and second elongated slots **16** and **17**, in its base portion **11***c*. The slots **16** and **17** are spaced from one another a distance sufficient to support the ladder assembly **41** with the vertical members, of the ladder assembly, being spaced apart a distance slightly greater than the width of each individual slat such as the slat **71** in order to properly support the slat on the horizontal cross members **41**. After passing the upper ends of the ladder assembly **40** through the slots **16** and **17**, the ladder assembly **40** is moved still further in the direction shown by arrows **54** of FIGURE 2 so that the upper ends **43** and **44** straddle the snap-in roller member **20**. The ladder assembly **40** is provided with metal clips **42**–**42'** which are positioned near the upper ends **43** and **44** respectively of the ladder assembly. While FIGURE 3 shows one method of securing the string members **43** to the roller member **20**, securement of the ladder **40** is in no way limited to this method and as an alternative arrangement the uppermost ends of the string members **43** may be tied together to form a suitable knot, such as is shown in FIGURE 1, in order to suitably secure the string members **43** to the roller **20**. As a further alternative, the upper ends of the string members may be joined to form a knot in the manner shown in FIGURE 1 and clips of the type shown as clips **42'** in FIGURE 3 may be also employed in order to maintain the position of the string members **43** relative to the slots **23** and **24** provided in the roller member **20**. With this arrangement the clips **42'** need not be rigidly secured to string members **43** but may be loosely fit thereto.

The roller member **20** is a substantially hollow drum which is provided with an elongated opening **22** wherein the length of the opening is substantially parallel to the central axis **28** of the roller. The first and second notches **23** and **24** are provided on opposite sides of the opening **22** and are designed to receive the upper ends **43** and **44** respectively of the ladder assembly in a manner to be more fully described. In order to properly fasten the ladder assembly to the snap-in assembly, the roller **20** is moved into engagement with the base member **11**, such that the opening **22** faces upward in the manner shown in FIGURES 1 and 2. The upper ends **43** and **44** of the ladder assembly **40** are then positioned so as to straddle the roller member **20** in the manner shown in FIGURE 3. In this position the portion of the upper end **43**, immediately below the metal clip **42'** is inserted in the notch **23** of the roller member **20**. The dimensions of the metal clip **42'** are such that it has a circumference substantially

greater than the dimensions of the notch 23, thereby preventing the metal clip 42' to pass through notch 23. Metal clip 42' is further adapted to be rigidly secured to the upper end 43 of the ladder assembly so that when the clip 42' bears against the inside surface of notch 23, the right-hand vertical member of the ladder assembly is sturdily restrained from moving out of engagement with the roller member 20.

In a like manner the upper end 44 of ladder assembly 40 is positioned within notch 24 of opening 22 so that the metal clip 42 is positioned so as to bear against the inside surface of notch 24 in a manner identical to that described with respect to metal clip 42'. In this manner, the ladder assembly 40 is rigidly positioned and secured to the snap-in assembly 10.

In order to provide the necessary tilt action inherent in Venetian blind assemblies, the roller member 20 which has previously been described as being a substantially hollow member, has an opening provided at each end thereof, only one of which is shown as can be seen in FIGURES 1–4, wherein the end 21 is provided with an opening 21*a*. It should be understood that the opening at the opposite end is identical thereto. The configuration of the opening 21*a* is substantially rectangular so as to receive a tilt rod 30, such as that shown in FIGURE 1.

The tilt rod 30 is a substantially elongated rod, having a rectangular cross section and which is insertable through the opening 21*a* of the roller member 20. Since the configuration of opening 21*a* is substantially identical to the cross section configuration of rod 30, any rotation experienced by tilt rod 30 is directly imparted to the roller member 20. The tilt rod 30, which may be of any prior art construction, is designed so as to rotate about its own longitudinal axis 30*a* in either the clockwise or counterclockwise direction, such as shown by the arrows 34. The dimensions of the roller member 20 are such that its own longitudinal axis 28 is colinear with the longitudinal axis 30*a* of tilt rod 30, so that roller 20 undergoes the same rotation as that experienced by tilt rod 30. The driving mechanism of tilt rod 30 may be of any well known prior art construction, and its mechanical arrangement plays no part in the instant invention. The only requirement for the tilt rod is that it have a cross section adapted to suitably engage the roller members 20, and that it be supported at its ends by any well-known rotational supports, so that it may rotate about its own longitudinal axis 30*a*. The length and cross sectional uniformity of the tilt rod 30 is such that the roller member 20 of the snap-in assembly 10 may be positioned at any point along tilt rod 30 without having any effect whatsoever upon the operation of the Venetian blind assembly. Although tilt rod 30 is shown to have a substantially square cross-section it should be noted that any polygonal cross-section would be equally advantageous. Some examples are: triangular, rectangular, pentagonal or hexagonal cross-sections. The opening 21*a* would then be provided with a similar polygonal shaped opening.

In order to retain the snap-in assembly 10 in a predetermined position along the length of the tilt rod 30, a speed nut 98 is provided on tilt rod 30 adjacent both sides of the assembly 10 (FIGURE 1 shows only one speed nut). The speed nut 98 is provided with an opening 99 for receiving rod 30. Two flanges 98*a* and 98*b* extend towards the open 98 to frictionally engage the rod 30 to lock the snap-in assembly into any selected position along the length of tilt rod 30. Each snap-in assembly of the Venetian blind structure may be retained in a similar manner.

With the rotation of tilt rod 30 in the counterclockwise direction, for example, the rotation of tilt rod 30 is imparted to roller member 20, causing the left-hand vertical member 46 of the ladder assembly 40 to move vertically upward in the direction shown by arrow 48, while the right-hand member 47 of ladder assembly 40 moves vertically downward in the direction shown by arrow 49. This movement causes the cross members 41 of ladder assembly 40 to change their orientation, thereby causing the slats; such as the slat 71, for example, being supported by the ladder assembly to be suitably tilted to any angle desired by the user. Since most Venetian blind structures require at least one pair of ladder assemblies for suitably supporting the Venetian blind slats, it should be understood that although FIGURE 1 shows only one snap-in assembly, that a second may be provided for suitably positioning a second ladder assembly wherein the second snap-in assembly may be spaced at any predetermined distance from the first snap-in assembly, due to the uniformity of the tilt rod 30, the uniformity of the holding flanges 60 and 70, and the flexibility of the snap-in assemblies 10.

FIGURE 6 shows the tilter mechanism 200 of the instant invention, which mechanism is readily adaptable for use with the snap-in assemblies shown in FIGURES 1–4 of the application. The tilter mechnism 200 is shown positioned in an inverted head rail 201 having upturned flanges 202 and 203 at its lower ends. The tilter mechanism proper is comprised of a substantially U-shaped supporting member 203, which supporting member or frame is provided with downwardly extending arms 204 and 205. The arms 204 and 205 are flanged outwardly at their ends 204*a* and 205*a*, respectively so as to be positionable to rest upon the inner surfaces of upwardly turned flanges 202 and 203, respectively. The arms 204 and 205 of frame member 203 are provided with suitable openings (not shown) for receiving a rotatably mounted rod or shaft 206. The shaft 206 is mounted for rotational movement about its longitudinal axis within the bearings 208 and 209 provided in the openings of arms 204 and 205 respectively. A straight worm portion 210 is provided along shaft 206 between the arms 204 and 205 of frame 203 and is adapted to cooperate with a worm gear 217 to operate the tilt rod 218, in a manner to be more fully described.

The left-hand end of shaft 206 extends through a suitable opening (not shown) in the left-hand side of head rail 201 so as to cooperate with a cord wheel member 212. The cord wheel member 212 is comprised of a substantially cylindrical projection 213 having a suitable opening (not shown) for receiving the left-hand end of shaft 206 so as to provide a force fit therebetween. The left-hand end of cylindrical portion 213 is flanged outwardly to form a roller or pulley portion 214 having a suitable groove 215 extending around the entire periphery of the roller 214. The circular groove 215 is adapted to receive a cord member 216 which is employed to rotate the shaft member 206.

The straight worm 210 is meshed with a worm gear member 217, which gear member 217 is provided with an opening 219 for receiving the tilt rod member 218.

The operation of the tilter mechanism 200 is as follows:

The pull cord 216 which is draped over the circular groove 215 in roller 214 is pulled down on the side which causes the roller to rotate in the direction shown by arrow 220. This in turn, causes the shaft 206 to rotate in the same direction, which rotation is thereby directly imparted to straight worm 210. The rotation of straight worm 210 causes the worm gear 217 to rotate clockwise, as shown by arrow 221, which clockwise rotation is imparted to the tilt rod member 218. The rotation of tilt rod 218 is imparted to the roller member 20 of the snap-in assembly 10, shown in FIGURES 1–4 of the drawings, causing operation of the ladder assembly in the same manner as was previously described. For rotation of the tilt rod 218 in the reverse direction, the pull cord 216 is simply pulled downwardly from its opposite side causing rotation of the shaft 206, straight worm 210, worm gear 217 and tilt rod 218 in their reverse directions, thereby causing the slats of the Venetian blind to be tilted or oriented in the reverse direction.

The insertion of the tilter assembly **200** into the head rail member **201** is as follows:

The worm gear **217** is first positioned so that its opening **219** receive tilt rod **218**. The frame member **203** is then positioned beneath the upwardly turned flanges **202** and **203** of head rail member **201** and moved upwardly into the open bottom portion of head rail member **201**. Frame member **203** is formed of a material which is sufficiently yieldable so that the outwardly turned flanged portions **204***a* and **205***a* of arms **204** and **205**, respectively, will bend inwardly as the flanges **204***a* and **205***a* engage the edges of upwardly turned flanges **202** and **203**. As the outwardly turned flanges **204***a* and **205***a* move to a position above the upwardly turned flanges **202** and **203**, the arms **204** and **205** then snap outwardly in the directions shown by arrows **222** and **223** respectively. The frame member **203** may then be released so that the bottom edges of flanges **204***a* and **205***a* rest within the upper surfaces of the upwardly turned flanges **202** and **203** respectively. It should be understood that the frame member **203** should be positioned so as to be immediately adjacent the worm gear member **217**. The straight worm member **210** is then positioned so that it meshes with the teeth **217***a* of worm gear **217**. The straight worm **210** is held in this position while the shaft **206** is inserted through the openings in the left-hand side of head rail **201**, the bearing **208**, a suitable opening (not shown) provided in straight worm **210** and bearing **209**. The cord wheel assembly **212** is then inserted into the opening provided in the lefthand side of head rail **201**.

FIGURE 6*a* shows an alternative embodiment for the tilter mechanism of FIGURE 6 wherein like elements contain identical numerals to those shown in FIGURE 6. The embodiment of FIGURE 6*a* differs from that shown in FIGURE 6 in that a pulley, **214'**, having a smaller diameter than that of the pulley **214**, shown in FIGURE 6, is positioned between the arm **204** and the left-hand end of straight worm **210** instead of being positioned in the manner shown in FIGURE 6. The diameter of pulley **214'** is smaller than that of the pulley **214** of FIGURE 6 in order to fit into the area in the manner shown in FIGURE 6*a*. It can also be noted that the shaft **206** need not be extended substantially beyond the left-hand edge of bearing **208** due to the repositioning of the pulley **214'**. The embodiment of FIGURE 6*a* thereby avoids the need for drilling, or punching, an opening in the left-hand arm of housing **201**, thereby facilitating the fabrication of a Venetian blind structure. Another advantage of the embodiment of FIGURE 6*a* is that the tilter assembly **200'** of FIGURE 6*a* may be installed into the housing **201** without being dismantled previous to the installation therein since the shaft **206** and pulley **214**, as shown in FIGURE 6, do not act to prevent the insertion of the fully assembled tilter mechanism **200'**. Another advantage of tilter assembly **200'** is the total concealment of pulley **214'** thereby providing a more aesthetic Venetian blind structure. Observation and maintenance of the assembly of FIGURE 6*a* is also facilitated simply by snapping out the tilter mechanism **200'** in much the same manner in which it was snapped in.

In order to provide means for lifting the Venetian blind structure, the snap-in assemblies **10** are constructed so that base member **11** is provided with a pair of elongated slots **14** and **14'**, along the bottom edge of surfaces **11***d* and **11***e* of base member **11**. As shown in FIGURES 1, 2 and 4, only one slot **14** is shown in side **11***d*.

Referring to FIGURE 5, two snap-in assemblies **10** and **10'** are shown schematically, wherein assembly **10** is shown as having slots **14** and **14'** in walls **11***d* and **11***e* respectively, while snap-in assembly **10'** has elongated slots **14''** and **14'''** in walls **11***d'* and **11***e'* respectively. Also, provided in the bottom portion **11***c* of each base member **11** is a slot **15** which is positioned between the elongated slot **16** and **17**. This can best be seen in FIGURES 4 and 5. A rotatable roller member **18** is positioned within the slot **15** and is secured to the shaft **19** which is provided to permit rotation of the roller **18**.

The pin, or shaft **19** has a length which is just slightly less than the length of the bottom **11***c* of base member **11**, such that it passes through each of the slots **15**, **16** and **17**, and is thereby positioned and secured in suitable apertures (not shown) within the base member **11**. While the pin **19** is shown to be of the length as portrayed in FIGURE 4, it should be understood that a shorter pin may be used, which is only slightly wider than the width of opening **15**, in order to suitably rotatably support roller **18**.

A lift cord **32**, shown also in FIGURES 1, 2 and 4, is provided for raising and lowering the Venetian blind in a manner to be more fully described and is placed in operating position by passing the lift cord **32** in the direction of arrow **89**, as shown in FIGURE 1, through the opening **14**, over the roller **18**, as shown in FIGURE 5, so that the lift cord rides in the groove **18***a*, provided in roller **18** (see FIGURE 4), and then downward in the direction shown by arrow **91** of FIGURE 1 through the slot **15** so that the lift cord **32** hangs in close proximity to the ladder assembly **40** and substantially parallel to the left and right hand supports **46** and **47** of the ladder assembly.

As shown in FIGURE 5 the lift cord **32** has its bottom end securely fastened to a bottom rail **85** of the Venetian blind assembly at a point **85***a*. The fastening means for securing lift cord **32** to bottom rail **85** may be any suitable fastening means adapted to secure cord **32** to bottom rail **85**.

A second lift cord **32'** is provided and is placed in the operating position in the following manner:

Referring to FIGURE 5 the lift cord **32'** starting from the right-hand side of FIGURE 5 is moved in the direction shown by arrow **89**, first through the opening **14** and then through the opening **14'** of snap-in assembly **10**. The lift cord **32'** is then inserted through the opening **14'** in snap-in assembly **10'** and over roller **18'** in the same manner as described with respect to lift cord **32**, then downward through slot **15'** in snap-in assembly **10'** so that lift cord **32'** hangs substantially vertically and parallel to ladder assembly **40'** and has its bottom end secured to bottom rail **85** at the point **85***b*.

This arrangement may be operated with any prior art lifting and lowering mechanism which need only provide operation satisfactorily to concurrently move both lift cords **32** and **32'** in the opposing horizontal directions **88** and **89**, as shown in FIGURE 5. Assuming that the operating mechanism (not shown) moves both lift cords in a direction of arrow **88**, the lift cords slide over their respective rollers **18** and **18'**, causing the lift cords to move upwardly in the direction shown by arrows **93**, which vertical upward movement is imparted to bottom rail **85**. This causes all the slats **71** (only three of which have been shown in FIGURE 5) to be collected and moved upwardly under the influence of lift cords **32** and **32'** and bottom rail **85**, while the ladder assembly substantially becomes "accordion pleated" causing the entire Venetian blind assembly to be collapsed in a position (not shown) immediately below the lower edges of snap-in assemblies **10** and **10'**.

When the operating mechanism (not shown) moves the lift cords **32** and **32'** in a direction shown by arrow **89**, the reverse action takes place; that is, lift cords **32** and **32'** move vertically downward in a direction shown by arrows **94** causing bottom rail **85** to likewise be lowered. Ladder assemblies **40** and **40'** move to their fully extended positions, thereby supporting the slats **70** of the Venetian blind assembly so that they are positioned at spaced intervals and substantially parallel to one another.

If it is desired to mount the lifting and lowering mechanism to the left of the snap-in assemblies **10** and **10'**, this may be done simply by threading the lift cords **32** and **32'** exactly opposite from that shown in FIGURE 5 so

that the arrangement is the mirror image of that shown in FIGURE 5. This may be readily done, since the snap-in assemblies **10** and **10'** are both provided with suitable openings, **14–14'–14'''**, thereby permitting threading therethrough of the lift cords. The snap-in assemblies, as previously mentioned, may be positioned at any distance away from one another in order to accommodate windows of any variety of width dimensions. This can be appreciated from the lift cord **32'** and the slats **71**, which have been shown by the broken designation **96**, and likewise the bottom rail **85** which has been shown in the same manner. The head rail or housing **50**, which is provided with two pairs of flanges **60** and **70** permits insertion of the snap-in assemblies at either one of two horizontal levels and, if desired, additional levels may be provided so long as they are spaced apart a distance sufficient to clear the upper ends of the snap-in assemblies, while the notched portions **13** thereof, are properly seated upon one of the desired pair of flanges. It can therefore be seen that this invention provides a snap-in assembly for Venetian blind structures which is light in weight, extremely simple in design, reliable in operation and which is completely adaptable to accommodate windows of any dimensions. In addition, the assembling of such a Venetian blind structure is greatly simplified since no cutting, punching, drilling, or any other efforts are required to mount the snap-in assemblies into the Venetian blind head rail housing **50**. The installation, therefore, consists simply of mounting the head rail housing **50** by any suitable means to a position adjacent the upper horizontal end of the window, together with the tilt rod and lift and lower mechanism.

The ladder assemblies are then suitably secured to the roller members of the snap-in assemblies, and the roller members are then easily inserted into their associated base portions. Each snap-in assembly is then very easily slid along the tilt rod **30** to points along the tilt rod, such that they are positioned at a spaced distance desired by the user. The snap-in assemblies are then moved upwardly into the housing so that their parallel notches are received by the cooperating flanges provided in the housing, thereby completing the Venetian blind installation. The remainder of the installation; namely, the installation of the Venetian blind slats and bottom rail extension is then identical with prior art structures, and neither plays a part, nor lends any novelty to the assembly of the instant invention.

FIGURES 8–8*c* show an alternative arrangement for the snap-in assemblies of FIGURES 1–4 wherein the arrangement **300** of FIGURES 8*a*–8*c* is numbered so that identical parts of the arrangement of FIGURE 8 bear the same numbers as identical parts of the snap-in assemblies shown in FIGURES 1–4. The only difference in FIGURE 8 is comprised of the provision of three openings **330**, **331** and **332** in the parallel faces of the housing member **310** (FIGURE 8 shows only one such wall, **311**, it being understood that the opposing parallel face has three like openings). These cord guide holes **330–332** are provided for receiving the lift cord and any other cords utilized in the Venetian blind structure for control purposes.

The under-side **311***c* of the housing member **310**, as shown in FIGURE 8, is provided with openings **317**, **315** and **317***c*, in a manner identical to those shown in FIGURE 4. As the opening **315** receives the lift cord **32**, as shown in FIGURE 4 of the drawings, the housing **310** when formed of a suitable plastic material having a low co-efficient of friction does not require a roller structure such as the roller member **18** shown in FIGURE 4 thereby enabling the lift cord **32** to be inserted through opening **315** without passing the lift cord **32** over a roller member even though the lift cord will frictionally engage the upper or lower edges of opening **315**. Since the coefficient of friction of the housing material is low there will be substantially no wear of the lift cord **32**.

FIGURE 8*b* shows an end view of an alternative arrangement for the housing **310**, such that the housing **410**, shown in FIGURE 8*b* is provided with tapered projections **411** and **412** at its lower ends, which projections are adapted to be seated upon the inner surfaces of upwardly turned flanges in a head rail arrangement such as the head rail arrangement shown in FIGURE 6 of the drawings, which head rail **201** is provided with the flanges **202** and **203**. Thus, it can be seen that the tapered projections **411** and **412** will rest upon the inner surfaces of flanges **202** and **203** in a manner substantially identical to the manner in which the outwardly turned flanges **204***a* and **205***a* of tilt mechanism **200** rest upon the flanges **202** and **203**.

FIGURE 8*c* shows a slightly modified snap-in housing member **510** which is provided with grooves **511** and **512** on opposite sides of the housing **510**, which grooves are adapted to receive the inwardly projecting flanges **60**, shown in the head rail **50** of FIGURE 1 of the drawings. The housing member **510** is snapped into the head rail **50** of FIGURE 1 in the same manner as the snap-in assemblies previously described. The lower set of inwardly directed flanges **70** in housing **50** will not be inserted into the grooves **511** and **512** since as the housing member **510** is inserted into the housing, or head rail member **50**, the tapered sides of housing **510** urge the downwardly extending arms of head rail member **50** outward such that when the grooves **511** and **512** are opposite the inwardly turned flanges **70**, the flanges **70** do not move into grooves **511** and **512** due to the action of tapered sides **513** and **514** which abut flanges **60** thereby keeping the flanges **70** away from grooves **511** and **512**. As the housing member **510** moves to a position whereby the flanges **60** are opposite the grooves **511** and **512**, these flanges will then "snap-in" to grooves **511** and **512** thereby locking the snap-in member **510** into the housing **50**. With this arrangement the inwardly projecting flanges **70** act as light traps which prevent the entrance into the bottom of head rail extrusion **50** of any reflected light, thereby making it difficult to see the snap-in assembly elements. This gives the Venetian blind structure a more aesthetic appearance. If, however, it is desired to observe the Venetian blind snap-in assembly for maintenance or other purposes, this may be done simply directing a light, such as, for example, a flashlight into the bottom opening of the head rail extrusion **50**. A second feature of the inwardly projecting flanges **70** is such that the arrangement, as shown in FIGURE 8*c*, may be employed so as to conceal the slats of the Venetian blind when it is completely drawn upward so that they are substantially invisible to the eye with the Venetian blind structure in this position. This can be seen in FIGURE 8*c* where the horizontal lines **515** represent the slats of the Venetian blind structure. Thus, when the Venetian blind lift cord is operated so as to draw the Venetian blind slats to their upward most position, the flanges **70** act to substantially conceal the entire Venetian blind structure thereby providing a more aesthetic appearance. It should be understood that the inwardly projecting flanges **70** may be positioned at any predetermined distance below the inwardly turned flanges **60** so as to accommodate all of the slats of a Venetian blind of any predetermined height.

FIGURE 7*a* shows a perspective view of the inverted head rail extrusion **201** shown in FIGURE 6 which is provided with the upwardly turned flanges **202** and **203**. FIGURE 7*b* shows a slightly modified embodiment **201'** for the head rail extrusion **201** wherein the head rail extrusion **201'** of FIGURE 7*b* may be rolled into the appropriate configuration without providing the substantially sharp right angle corners which are characteristic of the head rail section **201** shown in FIGURE 7*a*.

FIGURE 9 shows a typical assembly for the snap-in housing **310** of FIGURE 6 into a head rail **50** such that like elements in FIGURES 8 and 9 bear like designating

numerals. The shoulders 313*a* of notches 313 in housing 310 are shown seated upon the flanges 60. The ladder assembly, as previously described, is comprised of vertical members 346 and 347 having crosstie members 341 affixed thereto. The slats 371 rest upon the crosstie members 341 in the same manner as was previously described. Suitable openings (not shown) are provided in slats 371 to receive the lift cord member 332. If it is desired to provide a completely enclosed housing for the snap-in hardware assembly, this is accommodated by the inclusion of the cover slat member 380 which is a substantially thin resilient sheet which may be readily snapped into position so that its left and right-hand edges rest on the upper surfaces of flanges 70 as shown in FIGURE 9. The length of cover slat 80 is determined by the distance between the two ladder assemblies such that the cover slat completely conceals the entire area between the tape ladder assemblies.

FIGURE 10 shows an alternative embodiment 400 which may be substituted for the housings 10 or 310 shown in FIGURES 1 and 8 respectively. The housing 400 is formed of a substantially resilient material and is provided with first and second slots 401 and 402 which run substantially perpendicular to the under-side 403 of the housing 400. The sides 404 and 405 of housing 400 are slightly tapered to facilitate insertion into a housing such as the housing 50, shown in FIGURE 1, which arrangement was described previously with references to the snap-in housings 10 and 310, shown in FIGURES 1 and 8 respectively. The elongated slots 401 and 402 replace the elongated notches 13 of the housing 10 of FIGURE 1 by enabling the lower ends 404*a* and 405*a* of sides 404 and 405, respectively, to be bent inwardly in the directions shown by arrows 406 and 407 respectively, during the insertion of the housing member 400 into the inverted housing member 50 of FIGURE 2. As soon as the housing member 400 clears the flanges 60 of the inverted housing 50, the lower ends 404*a* and 405*a* of sides 404 and 405 return to their original shape, due to the inherent resiliency, causing the lower edges 409 and 410 of sides 404 and 405, respectively, to rest upon the upper surfaces of the flanges 60 in housing 50. Thus, it can be seen that the slots 401 and 402, by providing a resiliency to housing sides 404–405, performs the function of the notches 13 of housing 10, shown in FIGURE 1, thereby enabling the housing 400 to be properly positioned and secured in the inverted housing 50. The remaining functions and structures of housing 400 are identical to the housings 10 and 310 of FIGURES 1 and 8, respectively, and for this reason a detailed description has been omitted.

The simplicity in design, fabrication, and installation of the snap-in assemblies permits them to be fabricated of virtually any type of material. However, it has been found that very satisfactory snap-in assemblies are achieved when forming the assemblies from plastic materials such as Lustran, Lurex, or any other similar materials. If it is desired, however, the snap-in assembly may further be formed of metal or possibly even wood, if so desired, without any loss in the operating characteristics of the snap-in assembly.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosures herein, but only by the appending claims.

What is claimed is:

1. An assembly for use in Venetian blind structures having a housing with a pair of spaced generally vertical walls defining a downwardly facing opening for the Venetian blind operating mechanisms, and ladder means for supporting Venetian blind slats, comprising:

(a) snap-in means slidably retained in said housing for supporting and controlling said ladder means, including

(i) a body portion defining an interior cavity, a pair of opposed walls of said body portion having lower parallel portions and upper converging portions, and detent means associated with each of said lower body wall portions and extending the length thereof,

(ii) roller means retained for rotation within said interior cavity and connected to said ladder means, rotation of said roller means being adapted to wind and unwind opposed sides of said ladder means, thereby to cause selective tilting thereof;

(b) a pair of inwardly directed flanges extending along opposed lower portions of said housing vertical walls, said flanges being proportioned and spaced apart sufficient to be spread apart by said upper converging portions of said body portion and to enter and be slidably retained within said detent means in said lower parallel body wall portions.

2. An assembly according to claim 1, further wherein said detent means comprise slots.

3. An assembly according to claim 1, further wherein said detent means comprise a slot in each said parallel wall portion; wherein said housing includes a pair of parallel inwardly directed flanges extending along opposed lower portions of each of said housing vertical walls; and wherein said upper converging portions of said body portion are adapted to engage and spread apart the housing vertical walls by driving apart the upper ones of each of said pair of flanges sufficient to allow said slots to pass the lower ones of each of said pair of flanges and be received within the upper ones, said lower ones thereby forming a light screen to obscure the interior parts within said housing against background light and to receive the Venetian blind when raised.

4. An assembly according to claim 1, further comprising a rod running through said roller means, being rotationally fixed and axially slidable therein; and further comprising tilter means engaged with said rod, being rotationally fixed and axially slidable thereon, including a tilter body portion having opposed detent means for snap-in engagement with said housing flanges for slidable movement therealong, a gear concentric with said rod for rotation therewith, and a second gear engaged with said gear for driving said rod through said gear.

5. An assembly according to claim 1, further comprising a rod running through said roller means, being rotationally fixed and axially slidable therein; and further comprising tilter means engaged with said rod, being rotationally fixed and axially slidable thereon, including a tilter body portion having opposed detent means for snap-in engagement with said housing flanges for slidable movement therealong, a gear concentric with said rod for rotation therewith, and a worm engaged with said gear for driving said rod through said gear.

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