Sept. 19, 1967 A. F. SALTER 3,342,243

WINDOW ASSEMBLY

Filed May 25, 1965 3 Sheets-Sheet 1

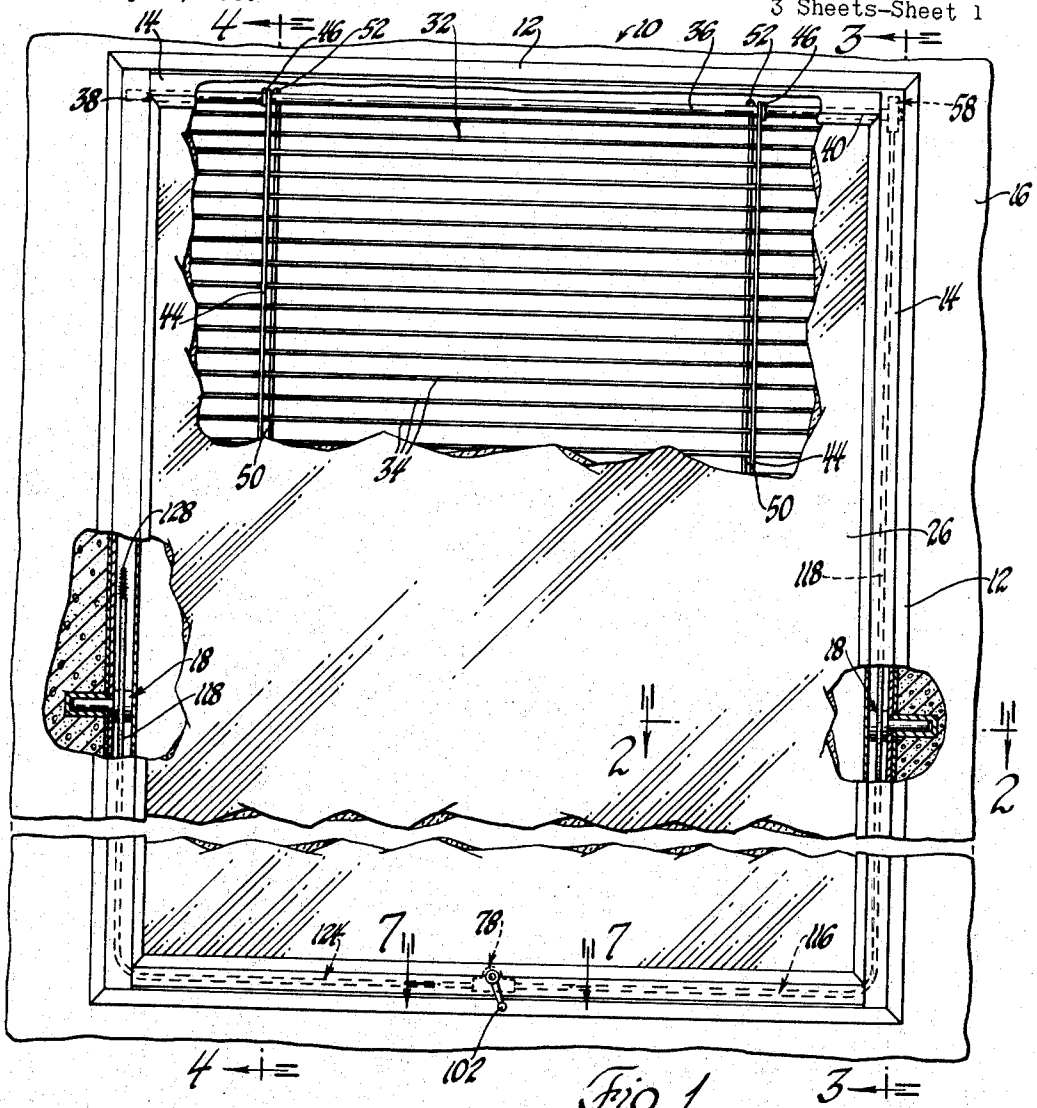


Fig. 1

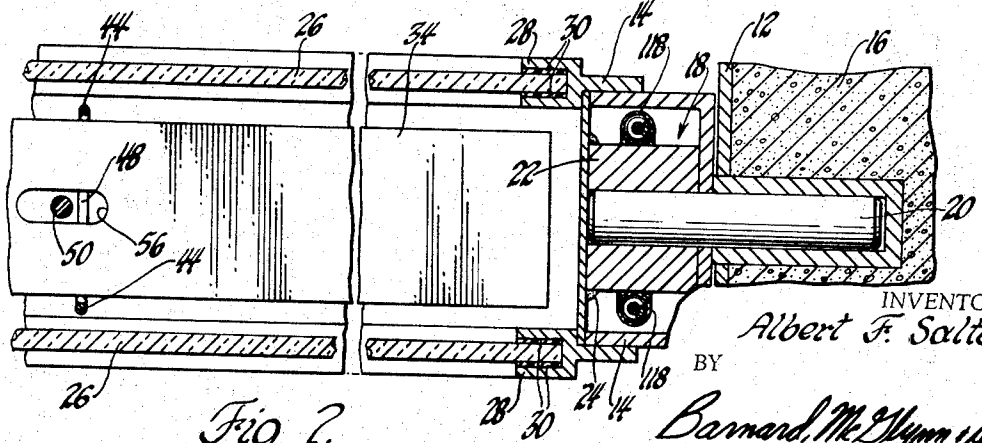


Fig. 2

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Sept. 19, 1967 A. F. SALTER 3,342,243

WINDOW ASSEMBLY

Filed May 25, 1965 3 Sheets-Sheet 2

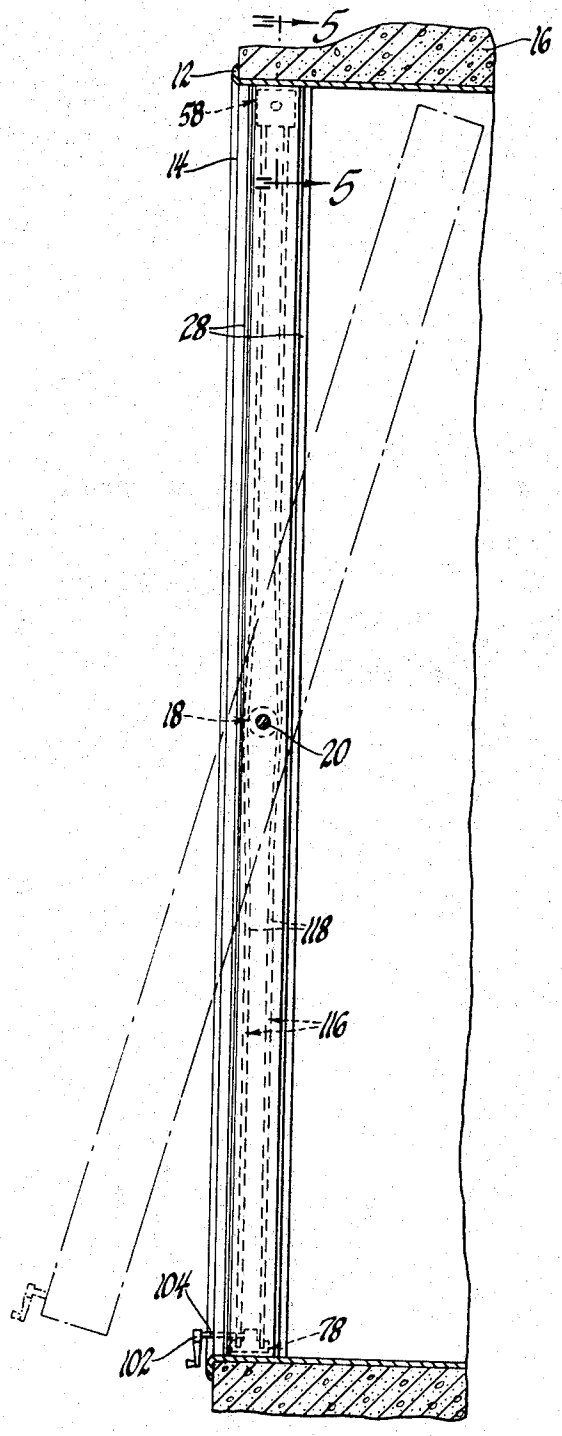


Fig. 3

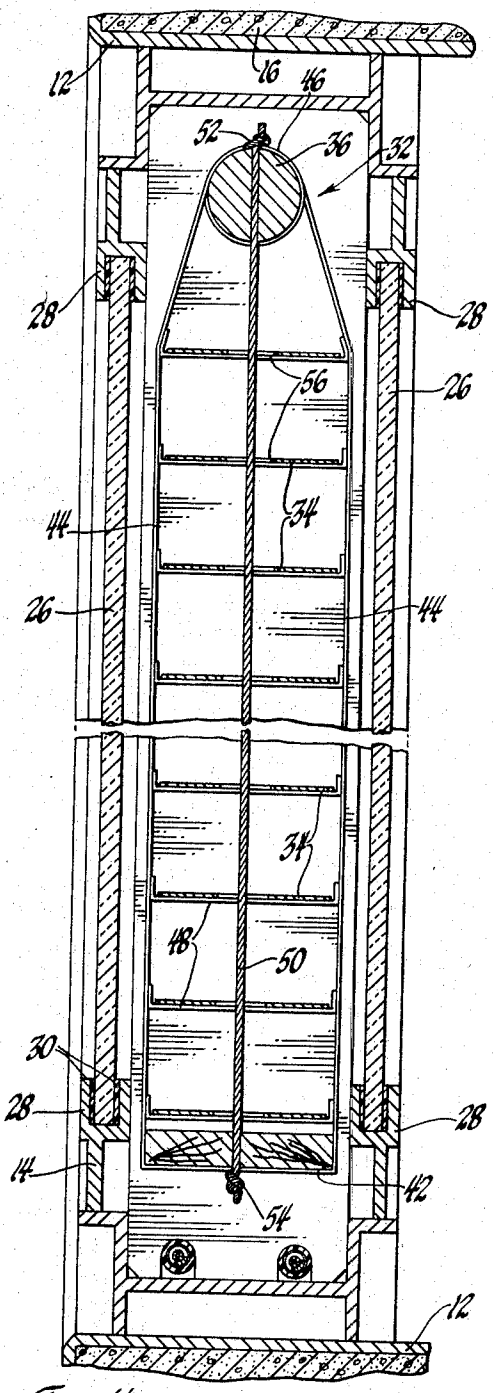


Fig. 4

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Sept. 19, 1967 A. F. SALTER 3,342,243

WINDOW ASSEMBLY

Filed May 25, 1965 3 Sheets-Sheet 3

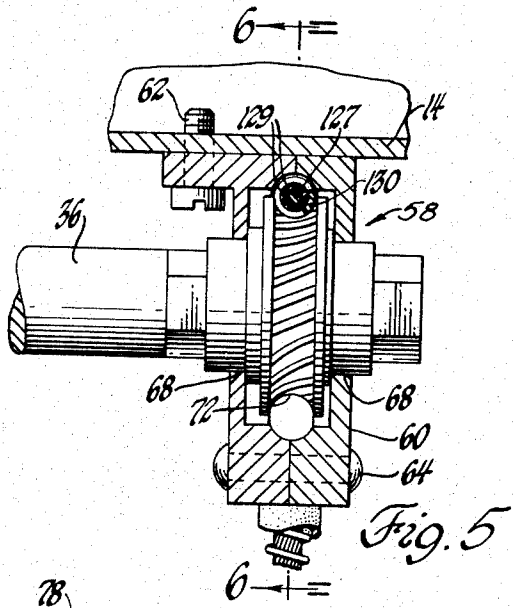


Fig. 5

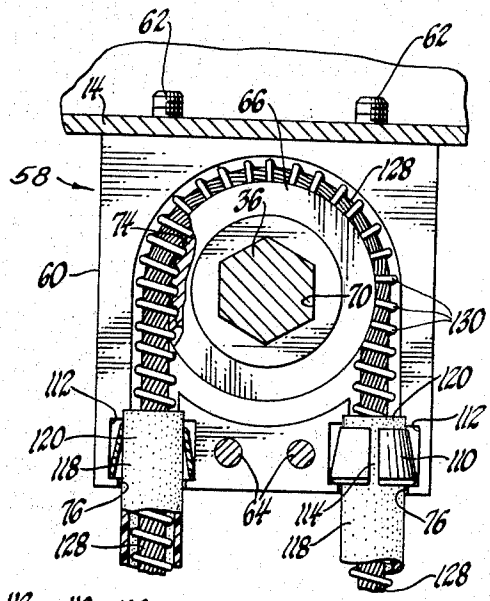


Fig. 6

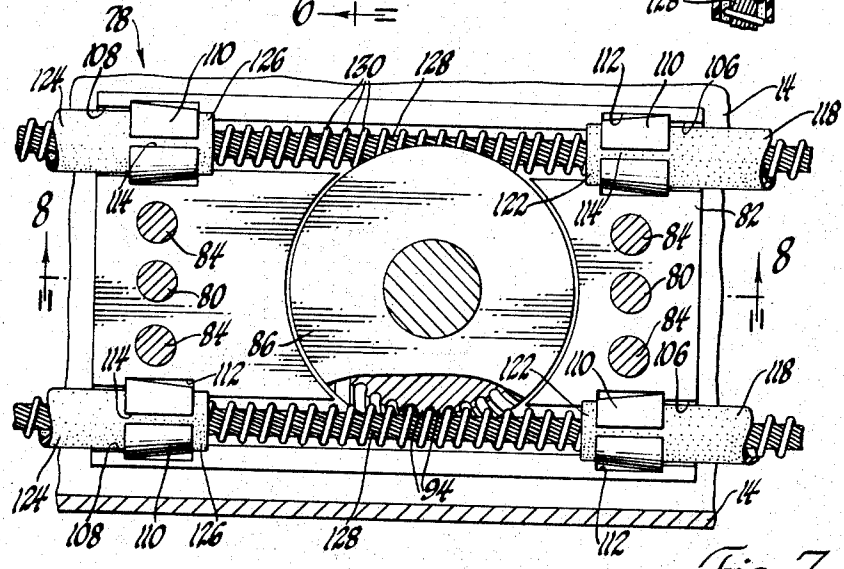


Fig. 7

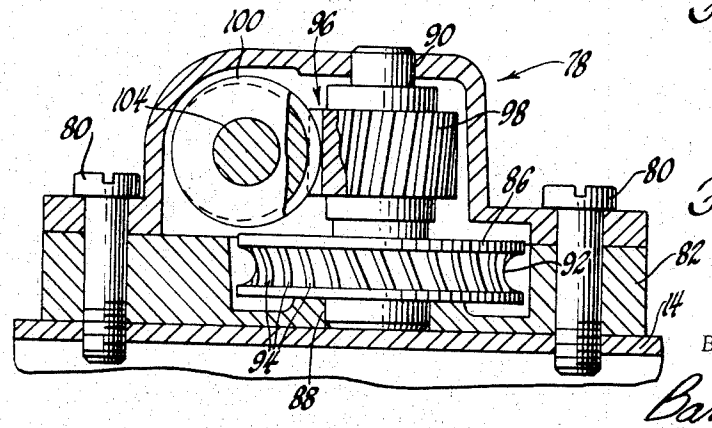


Fig. 8

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3,342,243

WINDOW ASSEMBLY

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Filed May 25, 1965, Ser. No. 458,560
9 Claims. (Cl. 160—107)

This invention relates to a window assembly including a window frame rotatably mounted in a window casing and having a Venetian blind mounted between two panes of glass which are disposed in the window frame, driven means attached to the window frame for actuating the Venetian blind, drive means disposed on the other side of the mounting connection between the window frame and the window casing than the driven means, and a flexible motion transmitting cable interconnecting the drive means and the driven means so that upon actuation of the drive means the cable is moved to operate the driven means for actuating the Venetian blind.

Venetian blinds per se are well known in the prior art and are typically actuated by one or more rope-like cords hanging along the sides of the Venetian blind so that they may pull to position the blind. Such rope-like cords are not satisfactory for use with a Venetian blind which is disposed between two panes of glass in a window frame because the cords would have to pass through the window frame and since such cords are subject to fraying and breaking by contact with the window frame, the entire window frame would have to be dismantled in order to replace the rope-like cords each time one of the cords broke.

The actuating mechanisms which have been utilized with such window frames to actuate the Venetian blind, therefore, are normally rigid constructions attached to the window frame. For example, a rack and pinion arrangement has been utilized frequently to actuate a Venetian blind by rotatably mounting a gear on the window frame such that it engages a rack slidably disposed on the window frame and operatively connected to the control elements of the Venetian blind. Other actuating mechanisms have utilized rods or links disposed within the window frame and connected to the control elements of the Venetian blind.

Often window frames having a Venetian blind disposed between two panes of glass are rotatably mounted in a window casing so that the window frame may be rotated to an open position so that air may pass through the window casing into or out of the building in which the window casing is mounted. When a window frame is thus rotatably mounted in a window casing, the rigid actuating mechanisms of the type heretofore available cannot be utilized since the mounting connection for rotatably mounting the window frame to the window casing occupies a major portion of the width of the window frame so that such rigid actuating mechanisms cannot be attached to the window frame so as to extend past such mounting connections. Therefore, the actuating mechanisms which have heretobefore been utilized are rigid and complex to the extent that it is necessary to attach the entire actuating mechanism to a rotatable window frame as close as possible to the control elements of the Venetian blind and on one side of the rotatable connection between the window frame and the window casing. That is to say, the disposition of the control elements of the Venetian blind at the upper end of the window frame necessitates the attachment of the prior art actuating mechanisms on the window frame in closely spaced relationship to the top of the frame so as to be disposed above the rotatable connection between the window frame and the window casing, thereby preventing the positioning of the manually operable portion of the actuating mechanism at

various positions about the window frame, such as, for example, at the readily accessible bottom of the window frame. In addition, the rigid actuating mechanisms known to the prior art will not allow the manually operable portion of the actuating mechanisms to be displaced remotely from the window frame and window casing. For example, actuating mechanisms of the type heretofore utilized in the prior art may not be satisfactorily adapted for use with all windows so that the manually operable control member of the mechanism may be disposed in a wall in a hospital room adjacent a bed therein at a position remote from a rotatable window frame so that a hospital patient may manually control the position of a Venetian blind in the window frame without leaving the bed.

Accordingly, it is an object and feature of this invention to provide a window assembly including a window frame rotatably mounted in a window casing with a Venetian blind secured to the window frame between two panes of glass and a remote control assembly for actuating the Venetian blind, which remote control assembly is suitably adapted to be operatively connected to the control elements of the Venetian blind adjacent the upper end of the window frame and extend past the mounting connection between the window frame and the window casing to a manually operable means which may be disposed anywhere about the window frame or at a position remote from the window casing.

In general, these and other objects and features of this invention may be attained by a window assembly including a window casing, a window frame, and a mount means for rotatably mounting the window frame in the window casing. A pair of spaced panes of glass are disposed in the window frame and a Venetian blind is secured to the window frame between the panes of glass. The Venetian blind has a plurality of slats and includes control means operatively interconnecting the slats for opening and closing the slats upon actuation thereof and for raising and lowering the lower end of the blind upon actuation thereof. A driven means is attached to the window frame for actuating the control means and includes a first pulley operatively attached to the control means and having a groove disposed circumferentially thereabout with gear teeth means disposed at spaced intervals along the groove. There is also included a drive means which is disposed on the opposite side of the mount means than the driven means and includes a second pulley having a groove disposed circumferentially thereabout with gear teeth means disposed at spaced intervals along the groove and actuatable means comprising a crank operatively attached to the second pulley for rotating the second pulley. A motion transmitting means operatively interconnects the drive means and the driven means and includes; a first pair of conduits having first ends thereof supported adjacent said first pulley and extending about the mount means so that the second ends thereof are supported adjacent the second pulley, a second pair of conduits having first ends thereof supported adjacent the second pulley, and a motion transmitting cable having opposite ends thereof movably disposed in respective ones of the second pair of flexible conduits and movably disposed in the first pair of conduits to engage the first and second pulleys respectively. The cable includes means disposed thereabout for providing gear means engageable with the gear teeth means in the grooves of the pulleys so that upon actuation of the crank the second pulley rotates to move the cable, which in turn rotates the first pulley for actuation of the control means of the Venetian blind.

Other objects and attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIGURE 1 is an elevational view partly broken away and partly in cross section of a preferred embodiment of the window assembly of the instant invention;

FIGURE 2 is an enlarged fragmentary view in cross section taken substantially along line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged cross-sectional view taken substantially along line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged cross-sectional view taken substantially along line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged fragmentary view in cross section taken substantially along line 5—5 of FIGURE 3;

FIGURE 6 is a fragmentary cross-sectional view taken substantially along line 6—6 of FIGURE 5;

FIGURE 7 is an enlarged fragmentary cross-sectional view taken substantially along line 7—7 of FIGURE 1; and

FIGURE 8 is a fragmentary cross-sectional view taken substantially along line 8—8 of FIGURE 7.

Referring now to the drawings, wherein like numerals indicate like or corresponding parts throughout the several views, a window assembly is shown generally at **10** and includes a window frame **14** rotatably mounted in a window casing **12**. The window casing **12** is adapted to be supported in a building, the wall of which is shown at **16**.

Mount means, generally shown at **18**, are provided for rotatably mounting the window frame **14** in the window casing **12** and include the shafts **20** mounted in the window casing **12** and the wall **16** and extending into bushings or bearings **22**. The bushings **22** are secured by welding, brazing, or the like, as shown at **24**, to the window frame **14**. The bushings **22** rotate about the shafts **20** so that the window frame **14** may be rotated relative to the window casing **12**, as is illustrated in phantom in FIGURE 3, thereby allowing air to move into or out of the building in which the casing **12** is disposed.

A pair of spaced panes of glass **26** are mounted in the window frame **14** by the channels **28** of the window frame **14**. Weather stripping **30**, or the like, is disposed along the panes of glass **26** in the channels **28**.

The window assembly **10** has a movable portion which is movable relative to the remainder of the assembly and includes a Venetian blind, generally shown at **32**. The Venetian blind **32** having a plurality of slats **34** is secured to the window frame **14** between the two panes of glass **26**. The Venetian blind **32** also comprises control means, including a shaft **36** rotatably disposed adjacent opposite ends **38** and **40** thereof in opposite sides of the window frame **14**, and means operatively interconnecting the slats **34** and the shaft **36** for opening and closing the slats **34** upon rotation of the shaft **36** and for raising and lowering the lower end **42** of the blind **32** upon rotation of the shaft **36**. More specifically, the control means includes a pair of spaced flexible supporting members **44** each of which extends from the lower end **42** of the blind to traverse each of the slats **34** along one side thereof and then is disposed, as shown at **46**, about the shaft **36** and thereafter extends downwardly to traverse the other side of each of the slats **34** to return to the lower end **42** of the blind. The supporting members **44** are preferably made of a rope-like material and support the respective slats **34** by way of the cross pieces of material **48**. The control means further includes a pair of spaced cords **50** each of which is attached at one end **52** to the shaft **36** and is attached at the other end **54** to the lower end **42** of the blind **32**. The cords **50** extend through holes **56** in each of the respective slats **34**.

The supporting members **44** are wrapped about the shaft, as shown at **46**, so that as the shaft is rotated, the supporting members **44** will move to open or close the slats **34**. The supporting members **44**, however, will only move with the shaft **36** until the slats **34** are in the closed position, where they are abutting one another, and thereafter the wrap **46** of each of the support members **44** allows the shaft **36** to rotate relative to the support members **44**. For example, referring more particularly to FIGURE 4, the shaft **36** may be rotated in a clockwise direction so that the left side of each of the slats **34** is moved upward as the right side of each of the slats **34** is moved downward until the slats **34** abut one another so that the Venetian blind is closed. When the slats **34** abut one another, the shaft **36** rotates independently of movement of the support members **44** due to the wrap **46**, so that upon further rotation of the shaft **36**, the cord **50** continues to wind about the shaft **36** and raises the lower end **42** of the blind.

Driven means, generally shown at **58**, is provided for rotating the shaft **36** and includes a box **60** attached to the window frame **14** by an appropriate fastening means, such as the bolts **62**. The box **60** may be made in any appropriate manner, however, it is preferably made of molded plastic in two halves which are then secured together by a plastic rivet **64**, or any other appropriate means. A pulley **66** is rotatably mounted in the box **60** at **68** and is operatively attached to the shaft **36** by way of the hexagon-shaped portion of the shaft **36** being inserted into a mating hexagonal hole **70** in the pulley **66**. The pulley **66** has a groove **72** disposed circumferentially thereabout with gear teeth means **74** disposed at spaced intervals along the groove **72**. The box **60** also has a pair of spaced holes **76** in the end thereof.

Drive means, generally shown at **78**, is attached to the window frame **14** by bolts **80**, or the like, on the opposite side of the mount means **18** than the driven means **58**, as is more clearly illustrated in FIGURES 1 and 3. The drive means **78** includes a box **82** which, like box **60**, is preferably made of molded plastic in two parts and then secured together by plastic rivets **84**, or other appropriate means. A pulley **86** is rotatably disposed in the box **82**, as indicated at **88** and **90**. The pulley **86** also has a groove **92** disposed circumferentially thereabout with gear teeth means **94** disposed at spaced intervals along the groove **92**.

A manually actuatable means, generally shown at **96**, is operatively attached to the pulley **86** for rotating the pulley **86** and includes a gear **98** rotatably disposed in the box **82** and operatively connected to the pulley **86**. The gear **98** and pulley **86** may be operatively connected together in any appropriate manner, for example, a shaft may be journaled in the box **82** at **88** and **90** with the pulley **86** and the gear **98** each respectively secured to the shaft so as to rotate therewith, or the gear **98** and pulley **86** may be integrally molded of plastic. A worm gear **100** is rotatably disposed in the box **82** and is in operative engagement with the gear **98**. A crank **102**, shown in FIGURES 1 and 3, is secured to a shaft **104** which is secured to the worm gear **100** so that upon rotation of the crank **102**, the worm gear **100** will be rotated to rotate the gear **98** and, hence, to rotate the pulley **86**. The shaft **104** extends through the window frame **14** so that the crank **102** is disposed on the outside or the exterior of the window frame **14** thereby to be readily manually graspable.

The box **82** also has a pair of spaced holes **106** in one end thereof and a pair of spaced holes **108** in the other end thereof.

A retaining means in the form of a conical clip **110** is disposed adjacent each of the holes **76**, **106** and **108** in the boxes **60** and **82** respectively. The boxes **60** and **82** have cavities **112**, adjacent the respective holes **76**, **106** and **108**, in which a conical clip **110** is disposed and retained. Each of the clips **110** has a slit **114** therealong which provides for spring-like expansion of each respective clip, the purpose of which will be explained more fully hereinafter.

There is also included a motion transmitting means, generally shown at **116** in FIGURES 1 and 3, for operatively interconnecting the drive means **58** and the driven means **78** and includes a first pair of flexible conduits **118** having first ends **120** supported adjacent the pulley **66** by being inserted through the holes **76** in the

box **60** and retained by the clips **110**. The ends **120** of the conduits **118** are inserted into the conical-shaped clips **110** to expand the clips so that each clip **110** bites into the circumference of the conduit **118** to prevent the conduit **118** from being pulled out of the box **60**. The second ends **122** of the conduits **118** are similarly inserted into the holes **106** of the box **82** and retained in the clips **110** so that they are prevented from being pulled from the box **82**. As is more clearly illustrated in FIGURES 2 and 3, the conduits **118** extend from the driven means **58** about the mount means **18** and around a corner of the window frame **14** to the drive means **78**. An important attribute of the instant invention is that the conduits **118** are flexible so that they may be disposed about the mount means **18** between the window frame **14** and the window casing **12**, or may pass into the wall **16** adjacent the mount means **18** so as to lead to a drive means disposed in the wall **16** at a position remote from the window casing **12**. The motion transmitting means **116** also includes a second pair of flexible conduits **124** having ends **126** supported adjacent the pulley **86** by being inserted through the holes **108** in the box **82** and retained in the clips **110** adjacent the holes **108**. As illustrated in FIGURE **1**, the second pair of flexible conduits **124** extend along the window frame **14** away from the drive means **78**. A motion transmitting cable **128** has one end movably disposed in one of the conduits **124** so as to extend through the box **82** to engage the groove **92** in the pulley **86** and then to extend through one of the conduits **118** so as to engage the groove **72** and the pulley **66** after which the cable **128** passes through the other of the conduits **118**, through the box **82**, and into the other of the conduits **124**. The motion transmitting cable **128**, therefore, has opposite ends movably disposed in respective ones of the pair of flexible conduits **124** and is movably disposed in the other pair of conduits **118** so as to engage the pulley **86** and the pulley **66**. The cable **128** has a peripherally disposed means comprising the wire **130** helically wound thereabout on a short lead to form spaced convolutions providing gear means engageable with gear teeth means **74** and **94** of the respective pulleys **66** and **86**. The cable **128** also includes an inner member **127** with a plurality of filaments **129** wound about the inner member **127** on a relatively long lead, as is best illustrated in FIGURE 5.

Due to the flexibility of the cable **128** and the conduits **118** and **124**, the drive means **78** may be disposed anywhere about the window frame **14** or at a position remote from the window casing **12**.

It is to be noted that the conduits **124** may be replaced by a continuous length of conduit having each of its ends inserted into the holes **108** of the box **82** so that an endless loop of cable may be slidably disposed in the conduits for engagement with the respective pulleys **66** and **86**. It is also to be understood that many variations of the mount means **18** may be utilized to rotatably support the window frame **14** in the window casing **12**. Also, an electric motor or the like may be utilized to actuate the drive means **78**.

In operating the assembly, the crank **102** may be rotated to rotate the pulley **86** through the gears **98** and **100** so that the cable **128** is moved through the respective conduits **118** and **124** to rotate the pulley **66** which in turn rotates the shaft **36**. Upon rotation of the shaft **36**, the flexible supporting members **44** are moved to position the slats **34** while at the same time the cord **50** is wound about the shaft **36**. Once the slats **34** are moved to a closed position, the flexible supporting members **44** will discontinue to move with the rotating shaft **36** so that there is relative movement between the shaft **36** and the flexible support members **44** whereby, upon closure of the slats **34**, the shaft **36** rotates independently of the flexible support members **44** to wind the cords **50** about the shaft **36** to raise or lower the lower end **42** of the Venetian blind **32**.

The invention has been described in an illustrative manner and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A window assembly comprising: a window casing; a window frame supporting a pair of spaced window panes; mount means for rotatably mounting said window frame in said window casing; a Venetian blind disposed between said panes and secured to said frame, said Venetian blind having a plurality of slats; control means operatively interconnecting said slats for opening and closing said slats upon actuation thereof and for raising and lowering the lower end of said blind upon actuation thereof; driven means attached to said window frame for actuating said control means; drive means disposed on the opposite side of said mount means from said driven means; and motion transmitting means operatively interconnecting said drive means and said driven means and including, a flexible motion transmitting cable engaging said drive means and extending along said window frame between said panes and then about said mount means to engage said driven means whereby upon actuation of said drive means said cable is moved to actuate said driven means for actuating said control means; a pair of flexible conduits having first ends thereof supported adjacent said driven means and having second ends thereof supported adjacent said drive means and extending about said mount means in said window frame; said flexible motion transmitting cable being movably disposed in said conduit; said mount means rotatably interconnecting said window frame and said window casing on each side of said window frame to mount said window frame for rotation about a horizontal axis; said control means including a shaft rotatably disposed at the ends thereof in opposite sides of said window frame; said driven means including a first pulley operatively attached to said shaft and having a groove disposed circumferentially thereabout with gear teeth means disposed at spaced intervals along said groove; said drive means including a second pulley having a groove disposed circumferentially thereabout with gear teeth means disposed at spaced intervals along said groove; said cable having means disposed thereabout for defining gear means engageable with said gear teeth means in said groove of each of said pulleys.

2. An assembly as set forth in claim **1** including a first box, said first pulley being rotatably disposed in said first box, said first box having a pair of spaced holes in one end thereof for receiving and retaining said first ends of said conduits, a second box, said second pulley being rotatably supported in said second box, said second box having a pair of spaced holes in each end thereof, said second ends of said conduits being received and retained in one pair of said holes in said second box, second conduit means having ends thereof received and retained in the other pair of holes in said second box, said cable extending through said second box and being movably supported in said second conduit means.

3. An assembly as set forth in claim **2** including manually actuatable means operatively connected to said second pulley for rotating said second pulley, said control means including a pair of spaced flexible supporting members each extending from the lower end of said blind to traverse each of said slats along one side thereof and disposed about said shaft and extending downward to traverse the other side of each of said slats and to said lower end for supporting said slats, a pair of spaced cords each attached at one end thereof to said shaft and attached at

the other end thereof to said lower end of said blind, said supporting members being wrapped about said shaft so as to move with said shaft until said slats are closed and thereafter allowing said shaft to rotate relative thereto for wrapping said cords thereabout to raise and lower said lower end of said blind.

4. An assembly as set forth in claim 3 including a conical clip retained adjacent each of said holes in said first and second boxes, each of said clips having a slit therealong for allowing spring-like expansion thereof, said ends of said conduits and said conduit means being retained in said clips.

5. An assembly as set forth in claim 3 including a first gear rotatably disposed in said second box and operatively connected to said second pulley for rotating said second pulley, a worm gear rotatably disposed in said second box and in operative engagement with said first gear, said manually actuable means comprises a crank attached to said worm gear for rotating said worm gear.

6. A window assembly comprising: a window casing; a window frame supporting a pair of spaced window panes; mount means for rotatably mounting said window frame in said window casing; a Venetian blind disposed between said panes and secured to said frame, said Venetian blind having a plurality of slats; control means operatively interconnecting said slats for opening and closing said slats upon actuation thereof and for raising and lowering the lower end of said blind upon actuation thereof, said control means including a shaft rotatably disposed in opposite sides of said window frame; driven means attached to said window frame for actuating said control means and including a first pulley operatively attached to said shaft and having a groove disposed circumferentially thereabout with gear teeth means disposed at spaced intervals along said groove; drive means displaced from said driven means and including a second pulley having a groove disposed circumferentially thereabout with gear teeth means disposed at spaced intervals along said groove; motion transmitting means operatively interconnecting said drive means and said driven means and including a flexible motion transmitting cable having means disposed thereabout for defining gear means engageable with said gear teeth means in said grooves of each respective pulley, and a pair of flexible conduits having first ends disposed adjacent said driven means and second ends disposed adjacent said drive means, said cable being movably disposed in said conduits.

7. A window assembly as set forth in claim 6 including a first box, said first pulley being rotatably disposed in said first box, a second box, said second pulley being rotatably supported in said second box.

8. An assembly as set forth in claim 7 including a first gear rotatably disposed in said second box and operatively connected to said second pulley for rotating said second pulley, a worm gear rotatably disposed in said second box and in operative engagement with said first gear, said manually actuatable means comprises a crank attached to said worm gear for rotating said worm gear.

9. An assembly as set forth in claim 7 wherein at least one of said first and second boxes has a hole therein for receiving and retaining an end of a conduit, a conical clip retained adjacent said hole and having a slit therealong for allowing spring-like expansion thereof, and a conduit retained in said clip.

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