United States Patent [19]

Debs

[11] **3,818,969**

[45] **June 25, 1974**

[54] **INCLINED-PLANE VENETIAN-BLIND INSTALLATION**

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[73] Assignee: **Levolor Lorentzen, Inc.**, Hoboken, N.J.

[22] Filed: **Nov. 22, 1971**

[21] Appl. No.: **201,040**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 829,069, May 29, 1969, Pat. No. 3,721,285.

[52] **U.S. Cl.** **160/168,** 160/172

[51] **Int. Cl.** **E06b 9/305**

[58] **Field of Search** 160/84, 168–178

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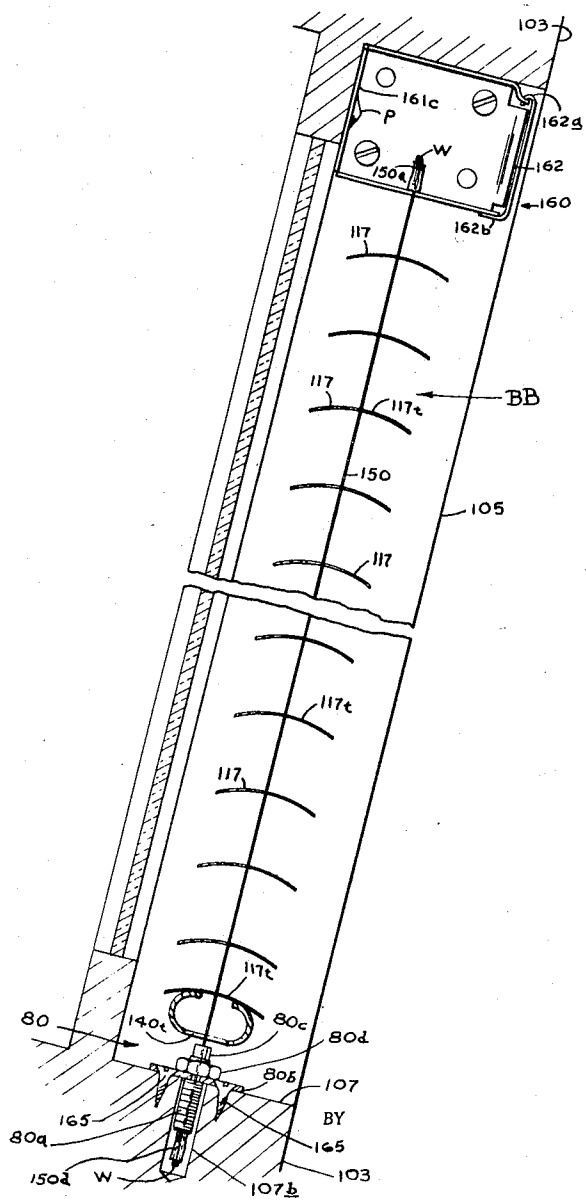
Primary Examiner—Peter M. Caun

Attorney, Agent, or Firm—Charles F. Chisholm

[57] **ABSTRACT**

A building wall inclines to the vertical and has a window opening therein which is provided with a Venetian blind. The general plane of the window opening inclines similarly to the inclination of the wall, and the plane of the ladder-and-slat assembly of the blind is inclined to correspond with the inclination of the window opening.

10 Claims, 21 Drawing Figures



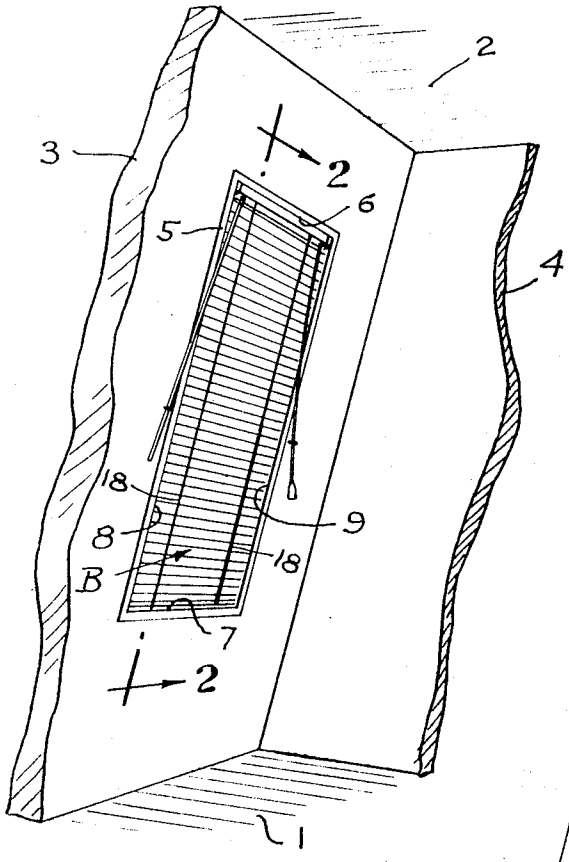


FIG. 1

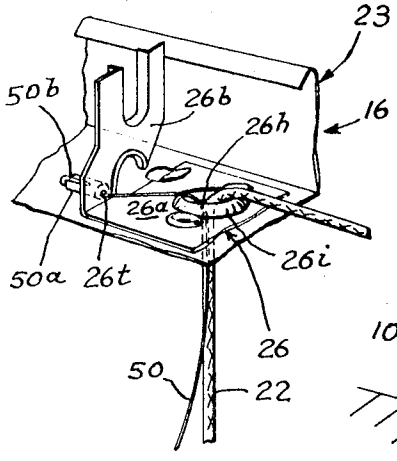


FIG. 3

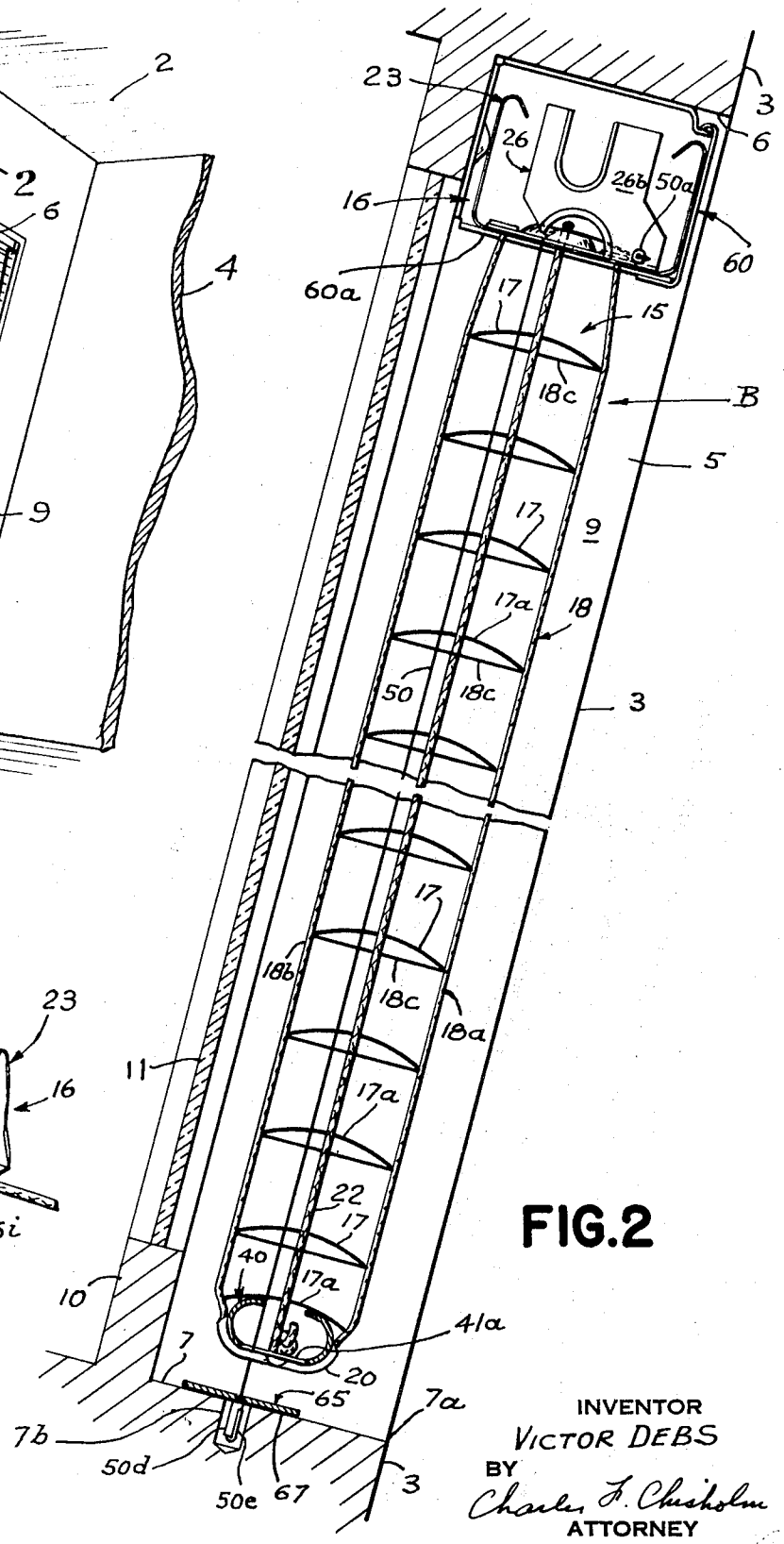


FIG. 2

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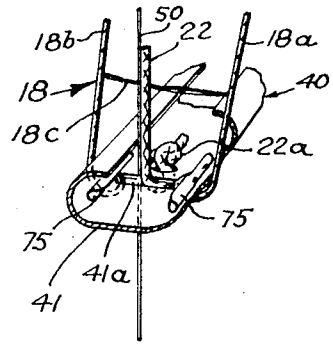


FIG.4

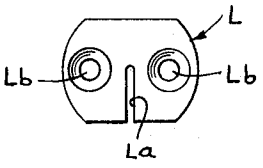


FIG.9

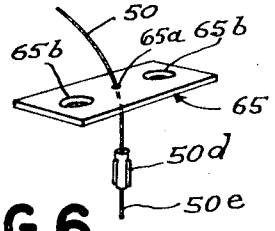


FIG.6

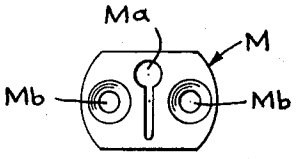


FIG.10

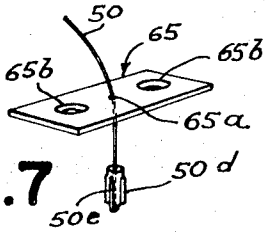


FIG.7

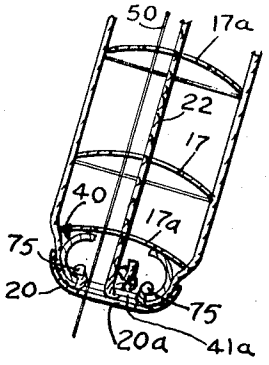


FIG.5

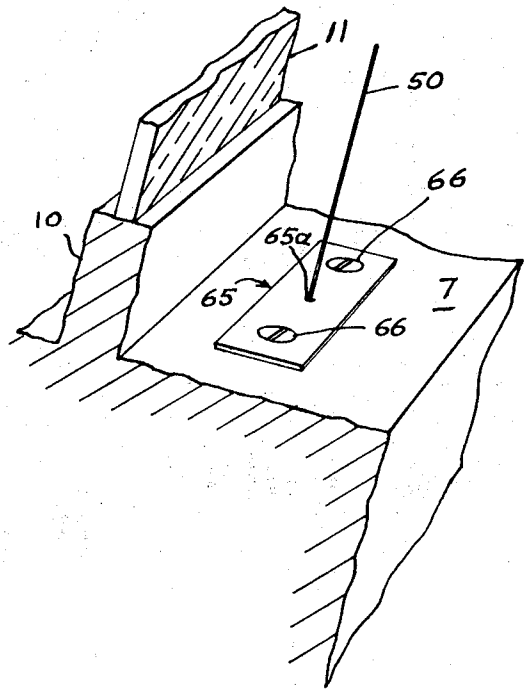


FIG.8

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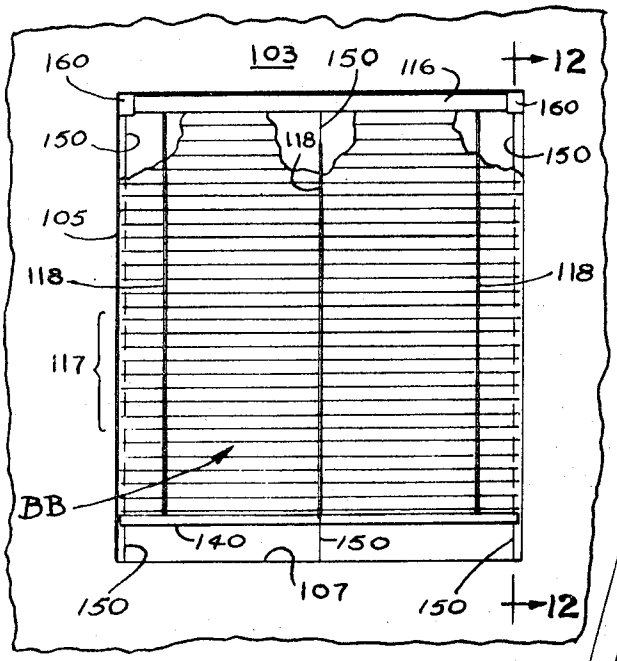


FIG.11

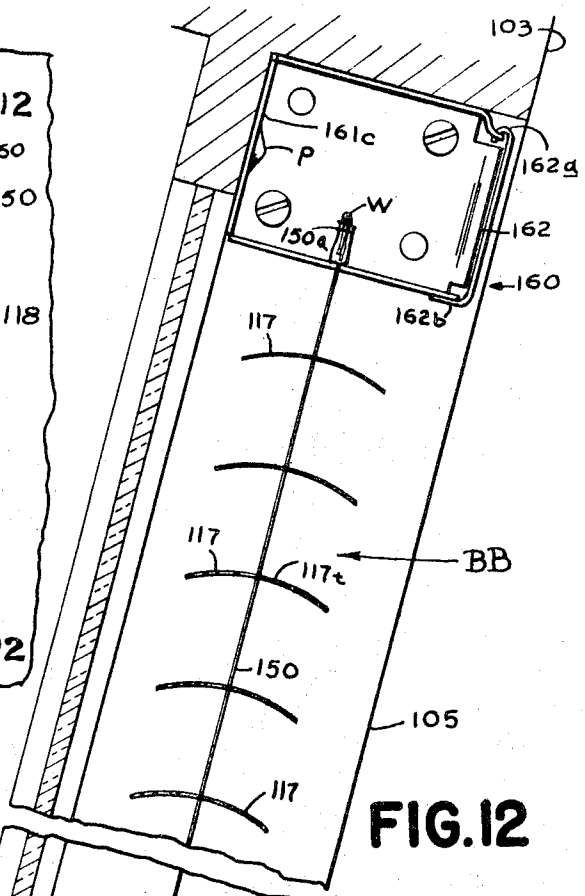


FIG.12

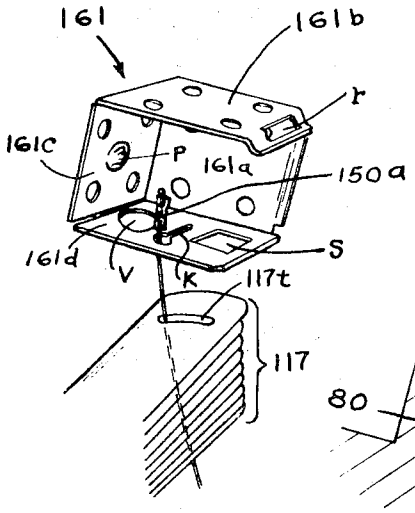
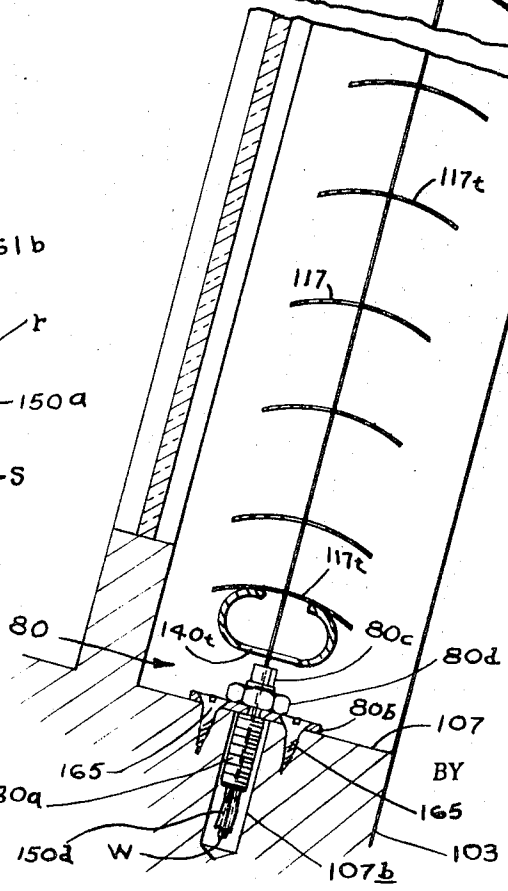


FIG. 13



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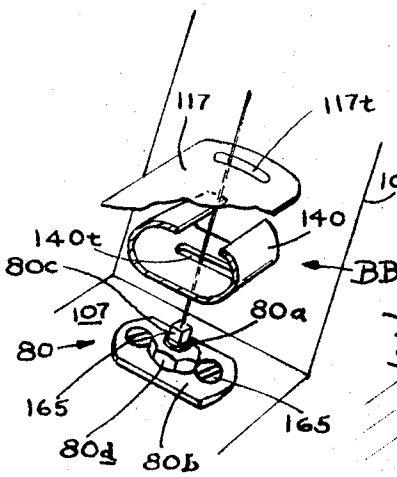


FIG. 14

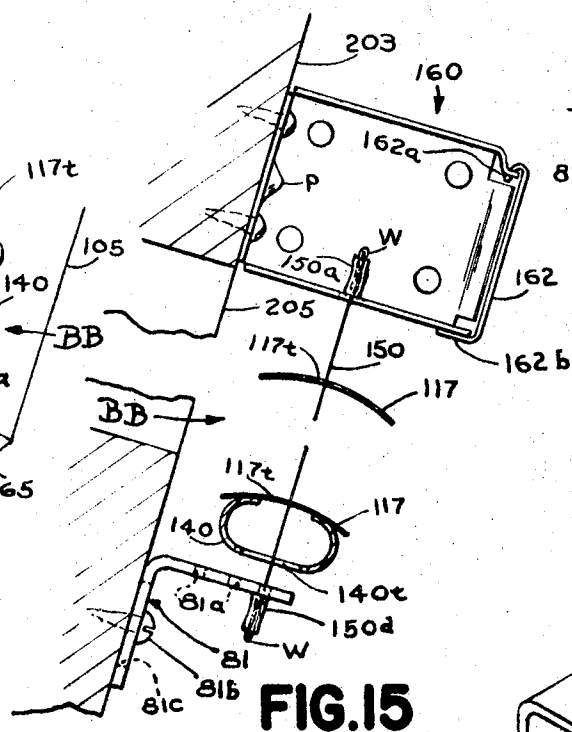


FIG. 15

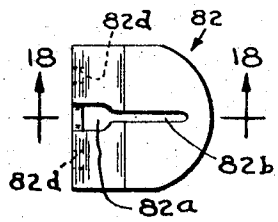


FIG. 17

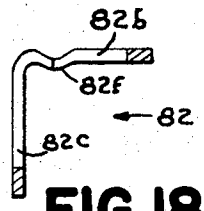


FIG. 18

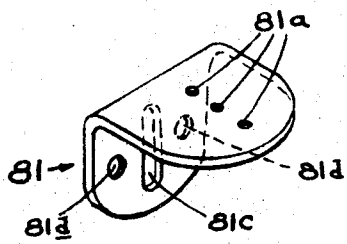


FIG. 16

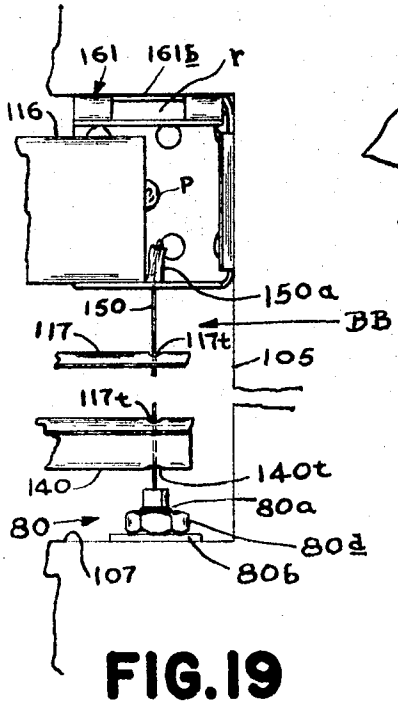


FIG. 19

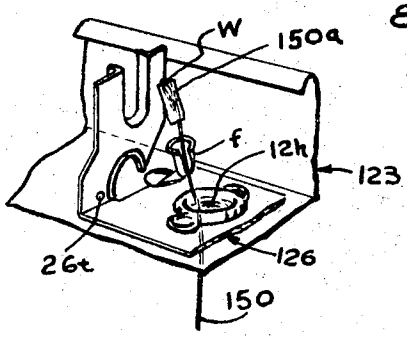


FIG. 20

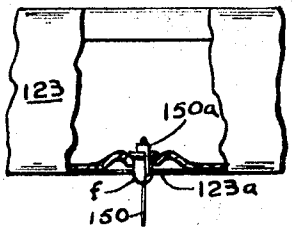


FIG. 21

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INCLINED-PLANE VENETIAN-BLIND INSTALLATION

PRIOR PATENT APPLICATION

The present application is a continuation-in-part of my prior application Ser. No. 829,069 filed May 29, 1969, now U.S. Pat. 3,721,285.

BACKGROUND OF THE INVENTION

Dormer constructions and the like have been used frequently when providing a window opening in an inclined building-wall. With these constructions the general plane of the window opening is vertical, despite the inclination of the building wall. The general plane of the window opening being vertical, a Venetian blind can be provided at the window opening in the conventional manner.

A saving in building cost can be effected and other advantages be achieved by eliminating dormerlike constructions and allowing the general plane of the window opening to incline similarly to the inclination of the wall. For such an inclined window-opening, a conventional Venetian-blind installation is unsuitable.

SUMMARY OF THE INVENTION

The building wall inclines to the vertical and the general plane of the window opening inclines similarly to the inclination of the building wall. A Venetian blind is mounted at the window opening, and means are provided to incline the general plane of the ladder-and-slat assembly of the blind to correspond with the general plane of the window opening. Such means includes a fixedly-positioned and fixedly-inclined tensioned wire, fastened top and bottom, which passes downwardly through holes in the slats that are elongated transversely of the slats. A ladder of the ladder-and-slat assembly may be aligned, front to rear, with the tensioned wire. Ordinarily there will be at least two such tensioned wires — one toward each end of the slats and, when desired, closely adjacent to the ends of the slats and to the associated jamb of the window opening. Depending upon the length of the slats, one or more additional tensioned-wires may be provided at intervening locations along the length of the slats. Typically, there may be a single intervening wire which is at the center of the blind and with which a ladder of the ladder-and-slat assembly is aligned front to rear, whether or not ladders are aligned with the end wires.

In accordance with a feature of the invention one or more of the tensioned wires may be fastened at the top to the head of the blind, as by being secured to a tilt-rod cradle which is part of the head and is on the interior thereof. In accordance with another feature of the invention the lower margin of the ladder-and-slat assembly is a bottom bar that is provided with through openings in alignment with and corresponding to the wire-receiving holes in the slats, which wire-receiving holes in the slats may be lift-cord holes; and the tensioned wires pass through these openings in the bottom bar as well as passing through the aforesaid holes in the slats. In accordance with a further feature of the invention the bottom bar may be equipped with one or more ladder caps which have through openings in alignment with and corresponding to the aforesaid through openings in the bottom bar, and tensioned wires pass through the through openings in the ladder caps. In accordance with a still further feature of the invention each tensioned wire passes through an anchor that is secured to the building structure below the bottom of the blind, and the bottom end of the wire is provided with an abutment that transmits the tensioning force from the anchor to the wire.

In accordance with additional features of the invention: The head of the blind is mounted on installation brackets that are affixed to the building structure adjacent to each side of the window opening, and the top ends of fixedly-positioned and fixedly-inclined tensioned wires are secured to the installation brackets. Each installation bracket is provided with a keyhole slot which affords entry of the associated wire into the slot, and removal therefrom, with an abutment affixed to the top end of the wire. The end of the head of the blind engages such wire-attached abutment and blocks removal of the wire from the keyhole slot while the head is in mounted position. The anchor to which the bottom end of the tensioned wire is attached may be adjustable to adjust the tension of the wire, such adjustment being either by movement of the anchor as a whole or by movement of one part of the anchor relative to another part. Movement of one part of the anchor relative to another part is preferably provided by an adjustable and lockable threaded stem that mates with a building-attached part of the anchor.

The presently preferred Venetian-blind installations, taken collectively, include all of the foregoing features and afford additional features and aspects that will be apparent from the drawing and the description in connection therewith. As regards all of the same, it is left to the user to select from alternative features and to decide upon the omission of any feature or aspect that is not needed for his particular purpose.

BRIEF DESCRIPTION OF THE DRAWING, OF WHICH THERE ARE FOUR SHEETS

Except for adjustment of reference characters, FIGS. **1, 2, 3, 4, 6, 7** and **8** are identical, respectively, with FIGS. 1, 2, 3, 4, 6, 7 and 8 of my aforesaid prior application Serial No. 829,069.

FIG. **1** is a diagrammatic perspective view showing a Venetian-blind installation in accordance with the present invention.

FIG. **2** is a largely-diagrammatic vertical section, on a larger scale, taken generally on the line **2—2** of FIG. **1.** This vertical section is composed of upper and lower portions with the intervening portion broken out. For clarity, and to fit the view to the sheet, the upper portion of FIG. **2** is shown aligned with the lower portion rather than being displaced to the right thereof.

FIG. **3** is a fragmentary perspective view showing how the top end of a wire that is to be tensioned may be attached to the head of the blind on the interior of the head.

FIG. **4** is a fragmentary perspective view showing the attachment of one of the ladders and the associated lift cord to the bottom bar, and showing an associated tensioned wire passing through the bottom bar.

FIG. **5** is a fragmentary vertical section of the lower portion of the ladder-and-slat assembly. The showing is the same as in FIG. **2** except that the ladder cap is shown in section, rather than in elevation as in FIG. **2.**

FIG. 6 is a detail view illustrating a step that may be used in preparing the bottom end of the wire for attachment to the window sill.

FIG. 7 is a detail view similar to FIG. 6 illustrating the next step that may be used in preparing the bottom end of the wire for attachment to the window sill.

FIG. 8 is a fragmentary perspective view, largely diagrammatic, showing the bottom end of a tensioned wire attached to the window sill.

FIG. 9 is a top plan view of a modified anchor, which may be used in lieu of the anchor shown in FIGS. 6, 7 and 8, for attaching the bottom end of a tensioned wire to the window sill.

FIG. 10 is a top plan view of a second modified anchor, which may be used in lieu of the anchor shown in FIGS. 6, 7 and 8, for attaching the bottom end of a tensioned wire to the window sill.

FIG. 11 is a diagrammatic view showing a second Venetian-blind installation in accordance with the present invention. The view is an elevation, with parts of the blind broken away, looking from the room side of the blind and looking perpendicular to the general plane of the ladder-and-slat assembly of the blind.

FIG. 12 is a largely-diagrammatic vertical section, on a larger scale, taken generally on the line 12—12 of FIG. 11 and showing the inclination to the vertical of the general plane of the ladder-and-slat assembly. This vertical section is composed of upper and lower portions with the intervening portion broken out. For clarity, and to fit the view to the sheet, the upper portion of FIG. 12 is shown aligned with the lower portion rather than being displaced to the right thereof.

FIG. 13 is a partly-diagrammatic perspective view showing how the top end of a wire may be attached to an installation bracket which supports one end of the head of the blind.

FIG. 14 is a perspective view showing how the bottom end of a wire may be attached to the window sill with the use of a fourth form of anchor, the anchor that is shown in FIG. 12.

FIG. 15 is a largely-diagrammatic vertical section corresponding to FIG. 12 but showing the blind mounted at the window opening without being nested within the window opening and showing a different anchor for attaching the bottom end of the tensioned wire to the building structure.

FIG. 16 is a perspective view of the anchor that is shown in FIG. 15.

FIG. 17 is a top plan view of a modified anchor that may be substituted for the anchor shown in FIGS. 15 and 16.

FIG. 18 is a section taken on the line 18—18 of FIG. 17.

FIG. 19 shows how the end of the head of the blind blocks disengagement of the top end of the associated tensioned wire from the installation bracket which supports the end of the head. The view is a fragmentary and largely-diagrammatic elevation, with the keeper of the installation bracket omitted, looking from the room side of the blind and looking perpendicularly to the general plane of the ladder-and-slat assembly of the blind.

FIG. 20 is a fragmentary perspective view, similar to FIG. 3, showing another way in which the top end of a wire for tensioning may be attached to the head of the blind.

FIG. 21 is a fragmentary sectional elevation, looking perpendicularly to the front wall of the head of the blind, showing the completion of the fastening of the top end of the wire to the head in the manner indicated in FIG. 20.

DESCRIPTION OF THE PRESENTLY-PREFERRED EMBODIMENTS OF THE INVENTION

The drawing shows the presently-preferred embodiments of the invention, i.e., the best modes thus far contemplated of carrying out the invention. Except as may be otherwise indicated, the description hereinafter (prior to the claims) refers only to the particular forms of the invention that are shown in the drawing. Nevertheless, the disclosure is by way of illustration and example; the claims embrace other specific forms in which the invention may be embodied.

FIG. 1 shows diagrammatically the corner of a room having a floor 1, a ceiling 2, an outer building-wall 3, and a wall 4 which may be either a wall within the building or an outer wall of the building. The floor 1 and the ceiling 2 are horizontal, and the wall 4 is vertical. The wall 3 is inclined to the vertical, by about 15° as is best seen in FIG. 2. As is seen in FIG. 1, the wall 3 overlies a portion of the floor that is adjacent to it. The wall 3 is formed with a window opening 5, which has a top face 6 and a bottom face or sill 7. The lengths of the faces 6 and 7 extend horizontally. However, each of the faces 6 and 7 is an inclined plane that is perpendicular to the face of the wall 3, as is seen in FIG. 2. The sides of the window opening 5 are jamb faces 8 and 9 which are vertical planes, but the lengths of which incline similarly to the inclination of the wall 3. The general plane of the window opening itself is inclined similarly to the inclination of the wall 3, i.e., at about 15° to the vertical.

The building structure which provides the faces 6, 7, 8 and 9 may be plaster, concrete, wood or other suitable material. Some or all of these faces may be on wooden members which are parts of the main building structure, or are parts of a window frame that is incorporated in the building structure.

The outside of the window opening is provided with suitable framing and glazing, shown diagrammatically at 10 and 11 in FIG. 2. The glazing may be sealed shut or may be arranged for opening and closing, using constructions that are known in the art pertaining to windows.

A Venetian blind is customarily mounted at a window opening in one or the other of two locations with respect to the window opening, viz., nested within the window opening or extending across the window opening without being nested within the window opening. In FIGS. 1 and 2 the Venetian blind, which is designated as a whole by B, is mounted at the window opening 5, being nested within the window opening. As will become apparent, many specific forms of Venetian blinds are suitable for the blind B. The particular Venetian blind shown in the drawing has the construction that is disclosed in H. K. Lorentzen et al, U.S. Pat. No. 3,425,479 issued Feb. 4, 1969, the cradle-and-lift-cord organization of the blind being also disclosed in H. K. Lorentzen et al, U.S. Pat. No. 3,447,585 issued June 3, 1969. The bottom bar and the attachments thereto shown in the drawing, and also the bottom-bar ladder-cap shown in the drawing, are disclosed in H. K. Lo-

rentzen et al, U.S. Pat. No. 3,485,286 issued Dec. 23, 1969.

The Venetian blind B includes a ladder-and-slat assembly that is designated as a whole by **15**, this assembly being suspended from a head which is designated as a whole by **16**. The ladder-and-slat assembly **15** includes a series of slats **17** that are supported and articulated together in known manner by two or more ladders **18**, one of which is shown in FIG. **2**. The ladder **18** has front sidepiece **18***a* and rear sidepiece **18***b*, the two sidepieces being interconnected by vertically-spaced crosspieces or rungs **18***c* on which the slats **17** rest. The ladder shown is of the string type, the sidepieces **18***a* and **18***b* being braided cords and each crosspiece **18***c* being a plurality of filaments which may be braided or twisted into one or more strands. The head **16** consists primarily of a sheet-metal channel **23** and the mechanism that is contained therein, viz: cradles, a tilt rod, rockers or drums to which the upper ends of the ladder sidepieces **18***a* and **18***b* are connected, tilting mechanism to oscillate the tilt rod and rockers, cord guides for the lift cords, and a cord lock to hold the raised or partially raised bottom bar of the blind in adjusted position — all as is well known in the art.

At the bottom of the ladder-and-slat assembly **15** there is a bottom bar. The bottom bar, which is designated as a whole by **40**, is a bar such as the bottom bar **40** that is disclosed in H. K. Lorentzen et al, U.S. Pat. No. 3,485,286; and the lower ends of the ladder sidepieces **18***a* and **18***b* are attached to the bottom bar in the manner disclosed in that patent. In that patent the lower ends of the ladder sidepieces are attached to the bottom bar by means of sheet-metal fittings (sometimes called "barbs") which are the same as the fittings or barbs **75,75** shown in FIG. **4** hereof. In U.S. Pat. No. 3,485,286 the bottom wall **41** of the bottom bar **40** has three holes that are aligned from front to rear, viz., a front hole, a rear hole and a midpoint hole. The barbs **75,75** of that patent are inserted upwardly through the front and rear holes; the lift cord of that patent passes downwardly through the midpoint hole and is then brought back to the interior of the bottom bar through a longitudinally offset hole, being knotted on the interior of the bottom bar to complete the attachment of the lift cord to the bottom bar. In the Venetian blind B the ladder sidepieces **18***a* and **18***b* and the lift cord **22** are attached to the bottom bar **40** in the same manner as in U.S. Pat. No. 3,485,286 — even through in blind B the three aligned holes of the bottom bar of U.S. Pat. No. 3,485,286 are replaced by the single slot **41***a* that is shown in FIGS. **4** and **5** hereof. The front end of the slot **41***a* corresponds with the front hole of U.S. Pat. No. 3,485,286, the rear end of slot **41***a* corresponds with the rear hole of U.S. Pat. No. 3,485,286, and the midpoint of slot **41***a* corresponds with the midpoint hole of U.S. Pat. No. 3,485,286. The barbs **75,75** are inserted upwardly through the ends of the slot **41***a* and, once inserted, attach the ladder sidepieces **18***a* and **18***b* to the bottom bar in the same manner as in U.S. Pat. No. 3,485,286. The lift cord **22** passes downwardly at the midpoint of the slot **41***a* and is attached to the bottom bar **40** in the same manner as in U.S. Pat. No. 3,485,286.

For each ladder **18** of the Venetian blind B the bottom bar **40** is provided with a plastic ladder-cap, designated as a whole by **20**, which is in vertical alignment with the ladder, i.e., the center of the ladder cap is in the plane of the ladder. Except for slotting of the ladder cap, or at least the ladder caps through which tensioned wires are to pass, the ladder caps **20** hereof are the same as in U.S. Pat. No. 3,485,286; and they are attached to the bottom bar in the same manner as in U.S. Pat. No. 3,485,286.

Each ladder cap **20** for the two ladders **18** shown in FIG. **1** is provided with a transverse slot **20***a* (FIG. **5**) that is midway between the ends of the ladder cap. This slot **20***a* isn't seen in FIG. **2** because, to better show the ladder cap in FIG. **2**, the ladder cap is there shown in end elevation even though the general plane of FIG. **2** passes midway between the ends of the ladder cap. The ladder-cap slot **20***a* is of the same width and length as the bottom-bar slot **41***a* and registers therewith. The slots **20***a* and **41***a* are in alignment with, and correspond to, the super-imposed tier of slots **17***a* that constitute lift-cord holes in the slats **17**. The lift-cord holes **17***a* have a width (lengthwise of the slats **17**) which is greater than the thickness of the lift cord **22** and, to afford tilting of the slats in an amount that is normal for a Venetian blind, the lift-cord holes **17***a* have a length (transversely of the slats **17**) which is very much greater than the thickness of the lift cord **22**. Thus there is ample space for the tensioned wire **50**, hereinafter referred to, to pass through the lift-cord holes **17***a* along with the lift cords **22**. The slot **41***a* in the bottom bar (FIGS. **4** and **5**) and the slot **20***a* in the ladder cap (FIG. **5**) afford ample space for the passage of the tensioned wire **50** through the bottom bar and ladder cap for attachment of the wire to the building structure beneath the ladder-and-slat assembly of the blind (FIGS. **2** and **8**).

A tensioned wire **50** is provided in conjunction with the lift cord **22** at each of the two ladders **18** that are shown in FIG. **1**, these ladders being toward the ends of the blind (i.e., toward the jamb-adjacent ends of the blind), as is shown in FIG. **1**. Additional wires **50** may be provided at intervening ladders and lift cords if any be added to blind B. As regards each of the wires **50** of blind B (see FIGS. **1–8**) the arrangement of the wire and the steps taken in connection with it are the same. Therefore, the description and explanation hereinafter in connection with the wire **50** that is toward one end of the blind B will apply to the wire **50** that is toward the other end of the blind, and will apply also to intervening wire or wires **50** if any intervening wires be added to blind B.

As wire for the wire **50**, stainless-steel spring-wire having a diameter of approximately 0.025 inch has been used. For wire **50** a piece has been cut which is excessively long as compared to the extended height of the ladder-and-slat assembly **15** of the blind B. The top end of the wire **50** is fastened to the head of blind B, and the bottom end of the tensioned wire is fastened to the building structure beneath the ladder-and-slat assembly **15** of the blind B — the wire passing through the lift-cord holes **17***a* in the slats, through the slot **41***a* in the bottom bar, and through the slot **20***a* in the ladder cap. The pair of wires **50**, one toward each end of the blind, are the heart of the means which inclines the general plane of the ladder-and-slat assembly **15** to correspond with the general plane of the window opening, as will more fully appear.

Mounted within the head **16** as a part of the same there is a tilt-rod cradle which is designated as a whole by **26**. The base **26***a* of the cradle (FIG. **3**) is against the

bottom of the head channel **23** and is provided with a central hole **26*h*** which registers with a hole (not shown) in the bottom of the head channel to afford vertical passage of the lift cord as shown in FIG. **3.** The metal surrounding the hole **26*h*** in the base of the cradle is embossed at **26*i*** in the manner shown in Lorentzen U.S. Pat. No. 2,872,976; this provides a smooth bearing-surface for the lift cord **22,** which comes up through the hole **26*h*** and then proceeds horizontally to a cord lock at the end of the head **16.** The wire **50** passes upwardly to the interior of the head **16** along with the lift cord **22** and is fastened to the head by being secured to the vertical leg **26*b*** of the cradle **26.** The leg **26*b*** is provided with a small hole **26*t*** through which the wire **50** passes and, beyond the leg, the wire is provided with an abutment **50*a*** which engages the leg **26*b*** and prevents withdrawal of the wire **50.** When the wire is tensioned the abutment transmits the tensioning force between the cradle **26** and the wire **50.**

The abutment **50*a*** may be any suitable abutment that can be attached conveniently to the wire **50.** A type of abutment that has been used for similar purposes is a metal cylinder that is pierced axially for the passage of the wire and is provided with a radial set-screw that makes clamping engagement with the wire. It is preferred to use a small-bore seamless copper-sleeve which is telescoped onto the wire and then clinched with a plierlike tool of the type used by electricians in crimping small sleeves for making solderless electrical connections between wires or between a wire and a terminal that is provided with a sheet-metal sleeve. The sleeve-abutment **50*a*** is affixed to the top "end" of the wire **50,** i.e., to the end portion of the wire. When crimping the sleeve into holding engagement with the wire a 3/16 inch protruding length **50*b*** of the wire is left for bending back against the sleeve as is seen in FIG. **3.** This provides the wire **50** with a bight which securely holds the sleeve-abutment **50*a*** against slippage when the wire is tensioned.

Each of the excessively long wires **50** can be placed in the blind B and fastened to the head **16** before the blind is mounted, the wire being left to dangle beneath the bottom bar **40** while the blind is being mounted. The order of steps in placing the wire in the blind may be varied at pleasure. The abutment **50*a*** (FIG. **3**) may be attached to the wire, after which the wire may be threaded through the holes **26*t*** and **26*h*** in the cradle, then through the lift-cord holes **17*a*** in the slats, and thence through the slots **41*a*** and **20*a*** in the bottom bar and ladder cap. In the alternative, the wire **50** may be threaded upwardly through the ladder cap and bottom bar, thence through the slats, and thence through the holes **26*h*** and **26*t*** in the cradle — after which the abutment **50*a*** is affixed. A second alternative is to begin at the upper slat of the blind, thread the bottom end of the wire downwardly through the ladder-and-slat assembly, thread the top end of the wire through the holes **26*h*** and **26*t*** in the cradle, and then affix the abutment **50*a*** to the top end of the wire.

The blind B is mounted on a pair of suitable installation brackets, various specific forms of suitable brackets being known. For mounting the blind B within the window opening **5,** the installation brackets are secured against the jamb faces **8** and **9** adjacent to the tops thereof. Each installation bracket has a flangelike shelf on which one end of the head channel **23** rests, and each bracket also has a keeper or other suitable means for preventing fortuitous disengaging movement of the end of the head channel. FIG. **2** shows the installation bracket, designated as a whole by **60,** which is secured against the jamb face **9;** the fastening screws are omitted. The installation brackets and their attachment to the building are conventional except that, as shown in FIG. **2,** the bracket is rotatively displaced so that the flange or shelf **60*a*** on which the end of the head channel rests is inclined to the horizontal by an amount which is equal to the inclination of the wall **3** to the vertical. However, this gives the installation bracket the same position relative to the wall **3** that it would have if the wall were vertical. The installation bracket which is affixed against the face of jamb **8** for supporting the other end of the head **16** is the same as the bracket **60** but of opposite hand.

With the head of the blind B in place on the installation brackets and the excessively long wires dangling below the bottom bar **40,** each wire **50** will reach below the front corner **7*a*** (FIG. **2**) of the bottom face or sill of the window opening. Each wire **50** is to be tensioned and the bottom end thereof attached to the window sill at a predetermined location which will place the wires **50,** taken together, in a plane that inclines similarly to the inclination of the general plane of the window opening; at the same time each individual wire **50** is to be in a vertical plane which is perpendicular to the general plane of the window opening. Such predetermined location for the wire **50** shown in FIG. **2** is at the center of the bore **7*b*** in the window sill. The attachment of the bottom end of the wire to the building is to be by means of an abutment attached to the wire and a co-operating anchor that is attached to the building, the anchor being adapted to maintain wire-tensioning pressure on the wire-attached abutment, and the wire-attached abutment transmitting the tensioning force between the anchor and the wire. In FIGS. **2, 6, 7** and **8** the anchor for attachment to the building is a flat metal-plate **65** which is provided with a central hole **65*a*** for passage of the wire **50** and provided with countersunk holes **65*b*,65*b*** to receive screws **66,66** (FIG. **8**) for securing the plate **65** to the sill **7** and drawing the plate against the sill to establish and maintain the desired tension on the wire. For engagement by the plate **65,** the wire **50** is to be provided with a fixed abutment **50*d*** which will be the same as the abutment **50*a*** at the top of the wire.

The head of the blind B having been mounted on the installation brackets with each wire **50** dangling below the bottom bar **40,** the plate **65** may be telescoped onto the wire and a seamless copper sleeve be telescoped onto the wire beneath the plate **65.** The sleeve is to form the wire-attached abutment **50*d*** at the bottom end of the wire; and the abutment **50*d*** is to be in such spaced relation to the head of the blind that, with the wire cut off below the abutment and the abutment **50*d*** nested within the bore **7*b*** and pulled down by plate **65** and screws **66,66,** the wire **50** will be sufficiently tensioned for satisfactory inclining of the plane of the ladder-and-slat assembly to correspond with the general plane of the window opening. The correct spacing from the head of the blind for the abutment **50*d*** may be determined by the method disclosed in said prior application Ser. No. 829,069, now U.S. Pat. 3,721,285. An alternative procedure is to tension the wire manually and measure the wire distance between the head of the blind and the sill of the window. This will give the cor-

rect location for the top of the abutment 50*d*. In the case of difficulty in locating the abutment 50*d* at precisely the correct spacing from the head of the blind, the abutment may be attached a little high on the wire and, if necessary, one or more shims be used under plate 65 to afford the desired tension on the wire without overtensioning it. One shim 67 is shown in FIG. 2.

With the sleeve for the bottom abutment correctly positioned along the length of the excessively long wire, the sleeve is firmly crimped to form the fixed abutment 50*d* which is the same as the abutment 50*a* at the top of the wire. The wire 50 is now cut off below the abutment 50*d*, leaving a 3/16 inch protruding length 50*e* (FIG. 6) which is bent back upon the abutment 50*d* as shown in FIG. 7 to form a bight which prevents the possibility of the abutment slipping under the tensioning pressure that will be applied by the plate 65. The abutment 50*d* (see FIG. 7) is now swung into alignment with the bore 7*b* and the screws 66,66 inserted to attach the bottom end of the wire 50 to the window sill as shown in FIGS. 2 and 8. If the sill is of wood, suitable wood screws may be used. For sills of other material, suitable known fastenings are used to fasten the plate 65. A common arrangement where the sill is of concrete or masonry construction is to use wood screws but first embed a suitable expansible screw-receiving plug into the building structure of the sill.

When the plate 65 is provided with the hole 65*a* as shown in FIGS. 6, 7 and 8, the plate must be placed on the wire 50 before the abutment 50*d* is placed on the wire. However the plate or other anchor may be provided with a slot which extends to the edge or with a keyhole slot, thereby enabling the plate or other anchor to be applied to the wire 50 after the abutment 50*d* has been affixed to the wire. For platelike anchor 65 there may be substituted platelike anchor L (FIG. 9) which has a slot L*a* extending to the edge and has fastener-receiving holes L*b*,L*b*. Or for platelike anchor 65 there may be substituted platelike anchor M (FIG. 10) which has a keyhole slot M*a* and has fastener-receiving holes M*b*,M*b*.

The tensioned wires 50 incline the plane of the ladder-and-slat assembly 15 of the blind B to correspond with the inclination of the general plane of the window opening, as is perhaps best seen in FIG. 2. The lift cord 22 and the lift-cord holes 17*a* are in alignment with the ladder 18 as viewed from front to rear of the ladder-and-slat assembly 15; and the wire 50 blends with the lift cord and ladder and is substantially invisible when the blind is fully lowered. The blind can be raised and lowered in normal manner and can be opened and closed in normal manner. When the blind is raised, the wires 50 are exposed below the bottom bar 40, but they are of such small diameter that they are relatively inconspicuous. The slat-holes through which the tensioned wires pass have a diameter transversely of the slats which permits tilting of the slats in the amount that is normal to a Venetian blind.

The only required modifications of the known blind chosen for illustration as blind B hereof are the provision of means for attaching the wires 50 to the head of the blind and the provision of slot-like through openings in the bottom bar and ladder caps for the passage of the wires therethrough. Various other specific Venetian blinds may be similarly modified for use in the present invention.

FIGS. 11–21 relate primarily to Venetian blind installations having an alternative blind, which is designated as a whole by BB. FIGS. 11, 12, 14 and 19 show the blind nested within the inclined window-opening, and FIG. 15 shows the blind BB mounted at the inclined window-opening without being nested therein. The constructions shown in FIGS. 11–21, and their functioning, are analogous to the constructions and their functioning that have already been described — so much so that it will be sufficient to briefly describe and explain what is shown in FIGS. 11—21 and point out the significant differences from what has already been described and explained.

In FIGS. 11, 12, 14 and 19 the blind BB is nested in the window opening 105, the general plane of which inclines similarly to the inclination of the wall 103. The 15° inclination of the wall 103 is shown in FIG. 12. The blind BB is mounted on installation brackets in the same manner as blind B. The blind BB, which is shown closed in FIG. 11 and open in FIGS. 12, 14, 15 and 19, has three string ladders 118 (FIG. 11). In FIG. 11 the bottom bar is shown elevated somewhat. Lift cords (not shown) are conventionally associated with the two end-ladders 118, the same as with the two ladders 18 shown in FIG. 1. No lift cord is associated with the center ladder 118 but, in alignment with the center ladder 118, the slats 117 are slotted transversely as for lift cords; and the bottom bar 140 is similarly slotted in alignment with the center ladder 118. Closely adjacent to their ends the blind-slats 117 and the bottom bar 140 are slotted the same as their slotting that is in alignment with the center ladder 118; see the end-adjacent transverse slots 117*t* and 140*t*.

The blind BB is mounted in the same manner as the blind B but on installation brackets which are adapted to have tensioned wires fastened thereto. Brackets, one right and one left, such as the bracket 160 shown in FIGS. 12 and 15 (see also FIGS. 13 and 19) are suitable. The bracket 160 is in two parts, a body 161 and a keeper 162, the keeper being removable and replaceable.

The body 161 of the installation bracket (FIG. 13) is a one-piece sheet-steel stamping which is boxlike; it has a vertical wall 161*a* (attachable to a window jamb), a top wall 161*b* (attachable to the top face of a window opening), a back wall 161*c* (attachable to the face of a wall adjacent to a window opening), and a bottom wall 161*d* (on which the end of the head of the blind rests). The walls 161*a*, 161*b* and 161*c* are amply provided with fastener-receiving holes; and suitable fasteners will be inserted through some of these holes to attach the bracket to the building structure.

A one-piece sheet-metal stamping constitutes the keeper 162. This has an upper formation 162*a* which hooks into the rectangular opening *r* (FIGS. 13 and 19) in the front end of the top wall 161*b*. The keeper 162 also has an inturned lip 162*b* at the bottom which resiliently snaps under the front end of the bottom wall 161*d*, the lip 162*b* having an upstruck latch (not shown) which snaps into the rectangular opening *s* and engages behind the front edge of that opening. The rectangular opening *s* and the circular opening *v* afford entry of a screw driver for driving mounting screws through openings in the top wall 161*b*. *The back wall 161c* is stamped with a forwardly-extending protuberance *p* which is spaced from the keeper 162 by the amount needed for the head of the blind but which

leaves space for screw heads between the head of the blind and the back wall **161***c*. The bottom wall **161***d* is provided with a keyhole slot *k;* this receives the top end of the wire for tensioning, as will be explained. The bracket **160** is suitable for mounting the blind B of FIGS. **1** and **2,** but the keyhole slot *k* will be idle in the case of blind B.

In connection with blind BB three forms of adjustable anchors are shown for anchoring the bottom end of a tensioned wire to the building structure, these adjustable anchors being usable also in connection with the blind B of FIGS. **1** and **2.** The anchor that is designated as a whole by **80** in FIGS. **12, 14** and **19** is a 3-piece anchor that is especially adapted for anchoring the bottom end of a tensioned wire to the window sill, the anchors being omitted in FIG. **11** because of the small scale of that figure. The anchor **81** (FIGS. **15** and **16**) and the anchor **82** (FIGS. **17** and **18**) are especially adapted for anchoring the bottom end of a tensioned wire when the blind is mounted at an inclined window opening without being nested therein.

The anchor **80,** which is preferably made of steel, is adjustable by moving one part of the anchor relative to another part. This anchor has an axially-pierced threaded-stem **80***a* which is threaded through a heavy plate **80***b* and is axially adjustable with respect thereto. The upper end **80***c* of the stem is square in cross section to enable it to be appropriately engaged with pliers or a small wrench for rotating the stem and thereby shifting the stem lengthwise of itself. A lock nut **80***d* is used to lock the stem **80***a* in adjusted position. The window sill **107** is provided with a bore **107***b* into which the stem **80***a* telescopes. The plate **80***b* is attached to the window sill by suitable fasteners, indicated diagrammatically by screws **165,165** in FIG. **12.**

A wire **150** for tensioning, corresponding to the heretofore described wire **50** and of appropriate length, prepared with a top-end abutment **150***a* and a bottom-end abutment **150***d*. These abutments are crimped copper sleeves as already described. Before the second abutment is put on, the wire is passed through the axial bore in the threaded stem **80***a* which, if desired, may be separated from the plate **80***b* at this stage. Abutments **150***a* and **150***d* are alike and are the same as each of the abutments **50***a* and **50***d*, though the end of the wire is shown arranged somewhat differently in connection with abutments **150***a* and **150***d*. With the abutment-forming sleeve telescoped onto the wire, the end of the wire is bent back upon itself and the sleeve retracted over the bent back end. The sleeve is then firmly crimped, leaving a small wire loop *w* protruding from the crimped sleeve. This loop guards against slippage of the abutment when the wire is tensioned.

Three of the wires **150** are prepared for the blind BB. Two of these wires are passed through the tiers of holes that are closely adjacent to the ends of the slats in the ladder-and-slat assembly of the blind BB; see the holes **117***t* and the holes **140***t*, all of which are in the form of transverse slots. The third wire **150** is passed through the tier of holes that is associated with the center ladder **118** that is shown in FIG. **11.**

The head of the blind BB is provided, halfway between its ends, with a center tilt-rod cradle **126** (FIG. **20**), which is the same as the cradle **26** in FIG. **3.** There is no lift cord at the center of the blind BB, though there is a ladder **118** at the center. The top end of the center wire **150** is passed upwardly through the hole **123***a* (FIG. **21**) in the bottom of the head channel **123,** through the registering hole, **12***h* (FIG. **20**) in the base of the center cradle **126,** and then secured to the head in the manner indicated in FIGS. **20** and **21.** After the top abutment **150***a* has been passed upwardly to the position shown in FIG. **20,** a split sheet-metal ferrule *f* of the shape shown is applied to the wire beneath the abutment **150***a* and the wire pulled down to the position shown in FIG. **21.** The ferrule *f* nests in the hole **126***h* but is unable to pass through it. This secures the upper end of the center wire **150** to the head of the blind as is seen in FIG. **21.**

Preparatory to placing the head of the blind BB on the two installation brackets, the tops of the end-wires **150** are connected to the installation brackets by passing the abutments **150***a* through the large ends of the keyhole slots *k* (FIG. **13**) and then shifting the wires to the small ends of the slots. The head **116** of the blind BB is then placed on the installation brackets (see FIG. **19**), the end of the head that is on each bracket being substantially against the adjacent wire-attached abutment **150***a* and thereby blocking shifting of the wire toward the large end of the keyhole slot *k* (see also FIG. **13**). Thus disengagement of the wires **150** from the installation brackets is prevented so long as the head of the blind is in place on the installation brackets.

Once the head of the blind has been installed on the installation brackets **160** of FIGS. **11, 12** and **19** — with the top of the center wire **150** connected to the head and with the tops of the two end-wires **150** connected to the installation brackets— the ladder-and-slat assembly of the blind is swung into an inclined plane corresponding to the general plane of the window opening and each of the three wires **150** then connected at the bottom to the window sill **107** by an adjustable anchor **80,** the anchor then being adjusted to appropriately tension the wire. Because of the small scale of FIG. **11,** the three anchors **80** for the bottom ends of the three wires **150** are omitted.

In FIG. **15** the blind BB is considered to have the same dimensions as in FIGS. **11, 12, 14** and **19,** but the window opening **205** in the inclined wall **203** is considered to be somewhat smaller than the window opening **105.** In FIG. **15** the blind is mounted at the window opening without being nested therein. The bottom end of each wire **150** is attached to the building structure by an anchor **81** which is an L-shaped bracket of stamped sheet-steel, the wire **150** being passed through one of the three holes **81***a* (see also FIG. **16**) before the bottom abutment **150***d* is applied to the wire **150.** The anchor or bracket **81** is attached to the face of the inclined wall **203** by a suitable fastener, shown diagrammatically as a screw **81***b*. This fastener passes through the slot **81***c* in the lower leg of the bracket, whereby this anchor is adjustable as a whole to tension the wire **150** and adjust the tension thereof. Once the anchor **81** has been correctly adjusted, the fastener **81***b* is tightened securely and, if desired, screws or other fasteners inserted through one or both holes **81***d* to guard against slippage of the anchor.

The three holes **81***a* in the anchor **81** provide for mounting of the blind with the bottom bar **140** a little closer or a little farther from the face of the wall **203.** It is likewise with the anchor **82,** which is shown in FIGS. **17** and **18** and which may be substituted for anchor **81** and be attached and adjusted in the same manner. Like the anchor **81,** the anchor **82** is an L-shaped

bracket of stamped sheet-steel with a fastener-receiving slot (82*c*) in the lower leg of the bracket. In the upper leg of the bracket **82** there is a keyhole slot composed of a large end **82***a* and an elongated narrow-slot portion **82***b*. This keyhole slot enables the wire **150** to be engaged with the anchor **82** after the bottom abutment **150***d* has been applied to the wire. The wire **150** can be placed at any desired point along the narrow-slot portion **82***b* preparatory to tensioning the wire by adjusting the anchor **82** downwardly. A depressed formation **82***f* guards against fortuitous disengagement of the wire from the adjusted anchor **82**. Two holes **82***d* provide for the insertion of one or two additional fasteners after the anchor has been adjusted, to guard against slippage of the anchor.

In the blind BB the center wire **150** is masked by the center ladder **118** when the blind is in lowered position. The two end-wires **150** are closely adjacent to the window jambs in FIG. **11** and, therefore, are relatively inconspicuous. When the blind BB is small enough to not need the center wire **150**, the center wire is normally omitted. When the center ladder **118** is not needed, that too is normally omitted. The ladder-and-slat assembly of the blind is observed as the wires (**50** or **150**) are tensioned. Preferably, the wires are given only as much tension as is required to eliminate significant sag of the ladder-and-slot assembly from the inclined plane that the wires are adapted to impart to the ladder-and-slat assembly.

I claim:

1. A Venetian blind installation in which (*a*) the Venetian blind has a head and a ladder-and-slat assembly that depends from the head, (*b*) tensioned wires which are anchored top and bottom extend throughout the height of the ladder-and-slat assembly, and (*c*) the tensioned wires are inclined and dispose the ladder-and-slat assembly in an inclined plane — wherein the improvement comprises: the tensioned wires are at least three in number, the tensioned wires include two end wires and an intervening wire,

the end wires are toward the opposite ends of the slats and the intervening wire is remote from the ends of the slats,

these tensioned wires extend upwardly through individual tiers of holes in the slats, each end wire, after passing upwardly through the tier of holes in the slats, terminate substantially straight ahead at a location which is generally in prolongation of the tier of holes in the slats,

the ladder-and-slat assembly includes end ladders and at least one intervening ladder,

and an intervening ladder is aligned front to rear with said intervening tensioned wire.

2. A Venetian blind installation as in claim **1** in which the head of the blind is mounted on installation brackets, and wherein the improvement additionally comprises:

the end wires, after passing upwardly through the slats, terminate at and are fastened to the installation brackets.

3. A Venetian blind installation as in claim **2** wherein the improvement additionally comprises:

the end wires are fastened to the installation brackets by quick-attachable connections.

4. A Venetian blind installation as in claim **2** in which the head is mountable on and demountable from the installation brackets, and wherein the improvement additionally comprises:

the end wires are fastened to the installation brackets by quick-detachable connections,

and the head, when mounted on the installation brackets, prevents detachment of the end wires from the installation brackets.

5. A Venetian blind installation as in claim **1** wherein the improvement additionally comprises:

said intervening tensioned wire, after passing upwardly through the slats, enters the head of the blind and is anchored on the interior of the head.

6. A Venetian blind installation as in claim **1** in which the head includes at least one tilt-rod cradle, and wherein the improvement additionally comprises:

the upper end of said intervening wire is anchored to the tilt-rod cradle.

7. A Venetian blind installation as in claim **1** in which the ladder-and-slat assembly includes a bottom bar that serves as the lowermost slat and is of the same length as the next higher slat, and wherein the improvement additionally comprises:

the body of the bottom bar is provided with holes through which the end wires and said intervening wire pass.

8. A Venetian blind installation in which (*a*) the Venetian blind has a head and a ladder-and-slat assembly that depends from the head, (*b*) there are installation brackets at the opposite ends of the head, (*c*) the head is mountable on and demountable from the installation brackets,

(*d*) tensioned wires which are anchored top and bottom extend throughout the height of the ladder-and-slat assembly, and

(*e*) the tensioned wires are inclined and dispose the ladder-and-slat assembly in an inclined plane — wherein the improvement comprises:

the tensioned wires include at least two wires which are end wires that are toward the opposite ends of the slats,

these end wires extend upwardly through individual tiers of holes in the slats,

these end wires, after passing upwardly through the slats, are attached to the installation brackets by quick-detachable connections,

and the head, when mounted on the installation brackets, prevents detachment of these end wires from the installation brackets.

9. A Venetian blind installation as in claim **8** wherein the improvement additionally comprises:

the quick-detachable connection for each of the end wires includes a slot in the installation bracket that receives the wire sidewise and an abutment on the wire which prevents the wire from being pulled longitudinally through the slot,

and the head of the blind, when mounted on the installation bracket, blocks reverse sidewise movement of the wire that would disengage the wire from the installation bracket.

10. A Venetian blind installation as in claim **9** wherein the improvement additionally comprises:

the slot which receives the wire sidewise is the narrow portion of a key-hole slot,

and the wide portion of the key-hole slot receives the wire-attached abutment by movement of the wire longitudinally of itself, preparatory to moving the wire sidewise into the narrow portion of the key-hole slot.

* * * * *