March 10, 1970 TAKASHI NIWA 3,499,477

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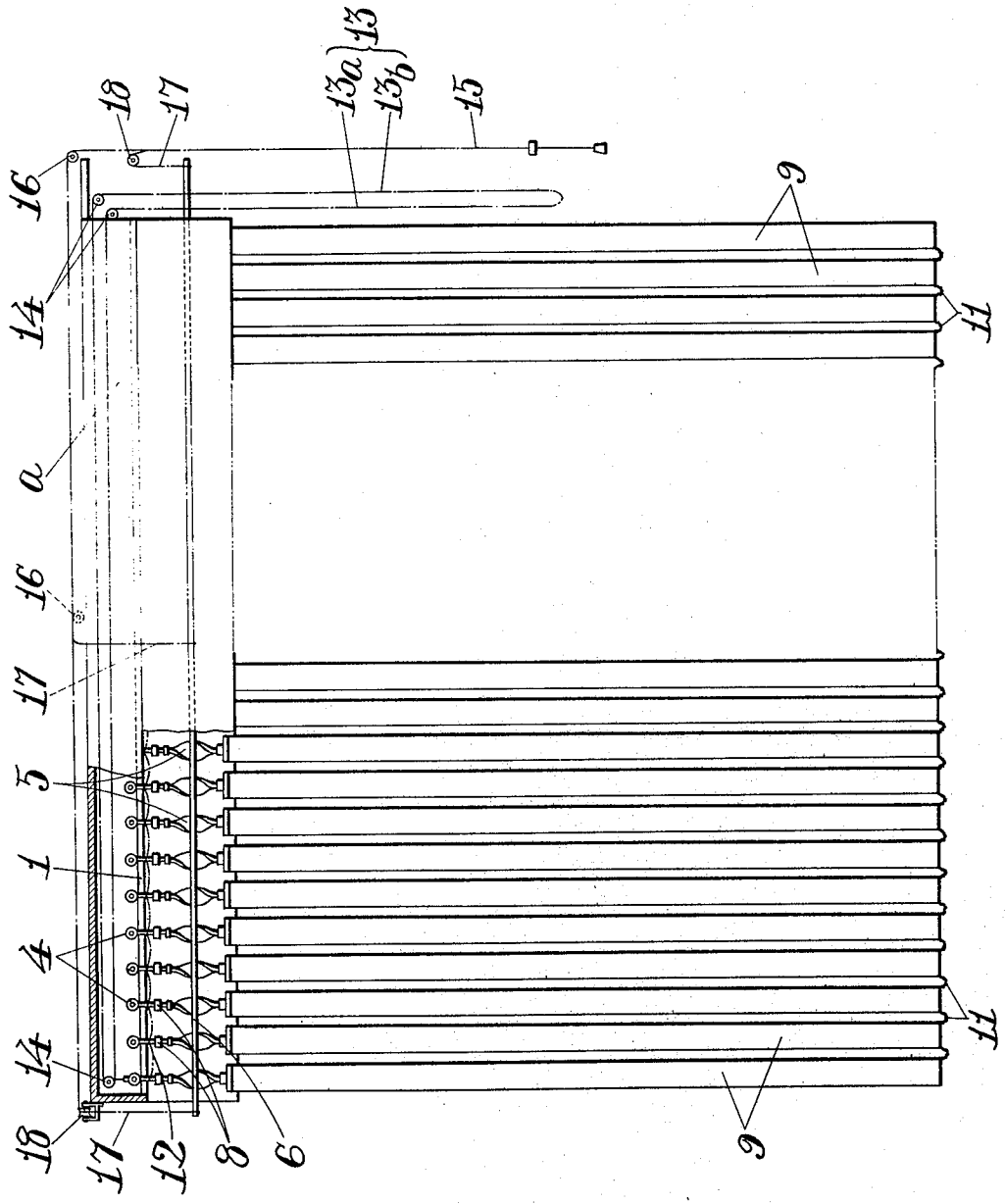


Fig. 1

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March 10, 1970 TAKASHI NIWA 3,499,477

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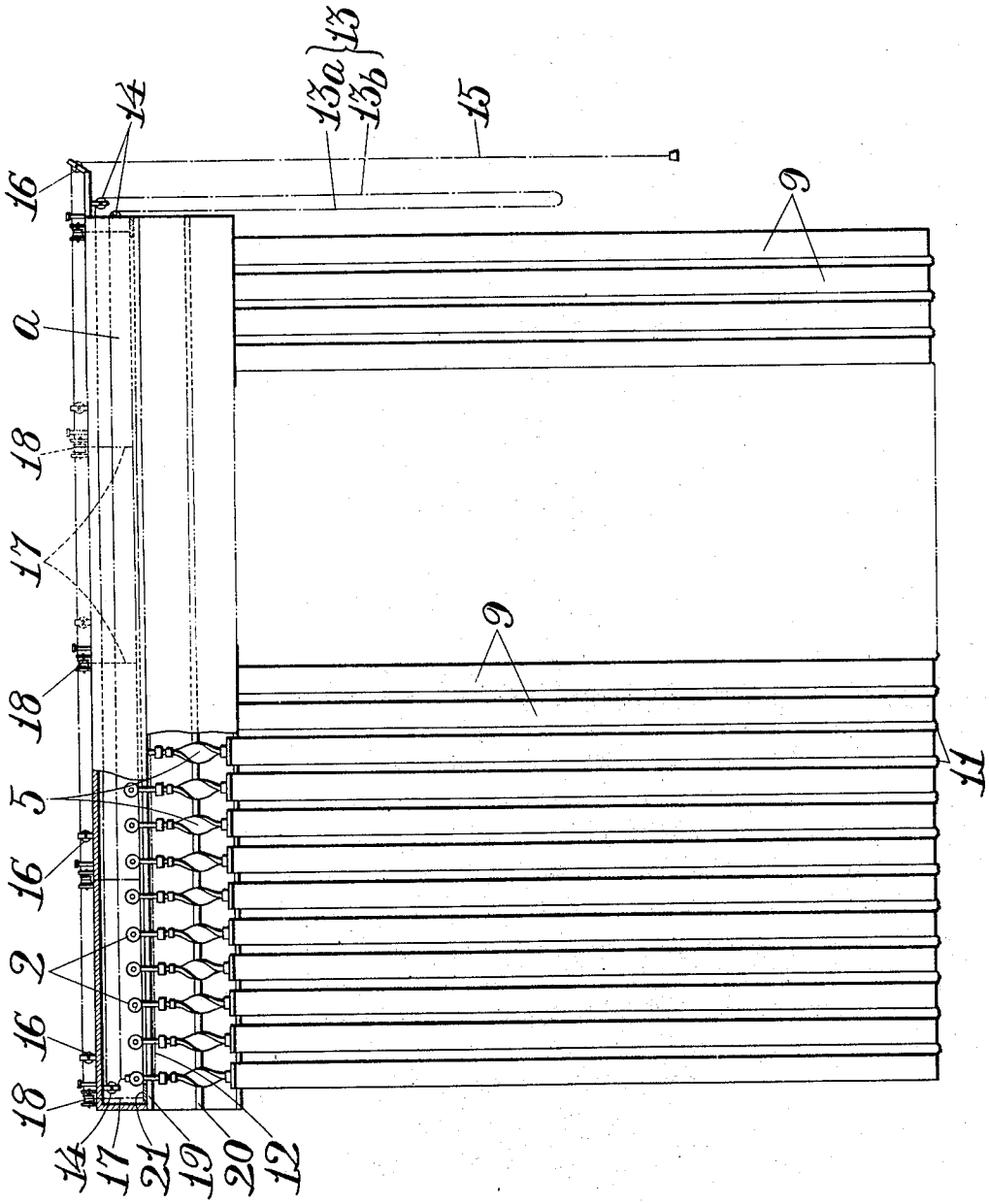


Fig. 2

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March 10, 1970 TAKASHI NIWA 3,499,477

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Filed March 18, 1968 5 Sheets-Sheet 3

Fig. 3

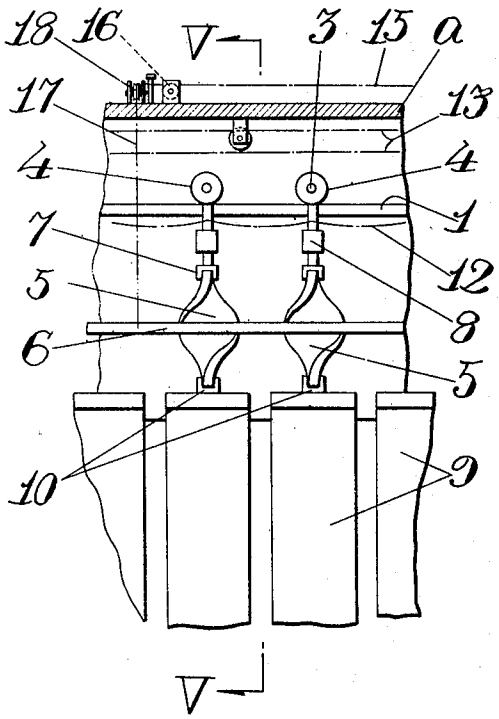


Fig. 5

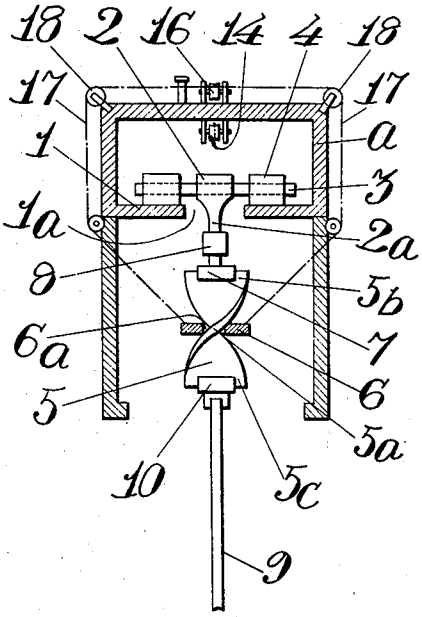


Fig. 7

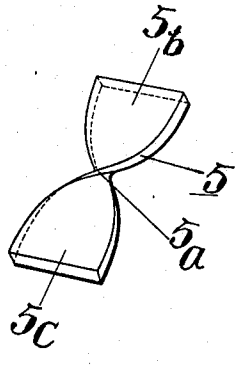
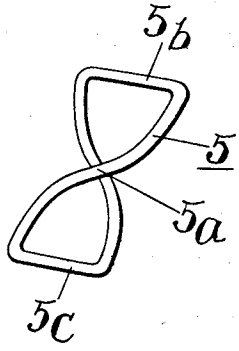


Fig. 8



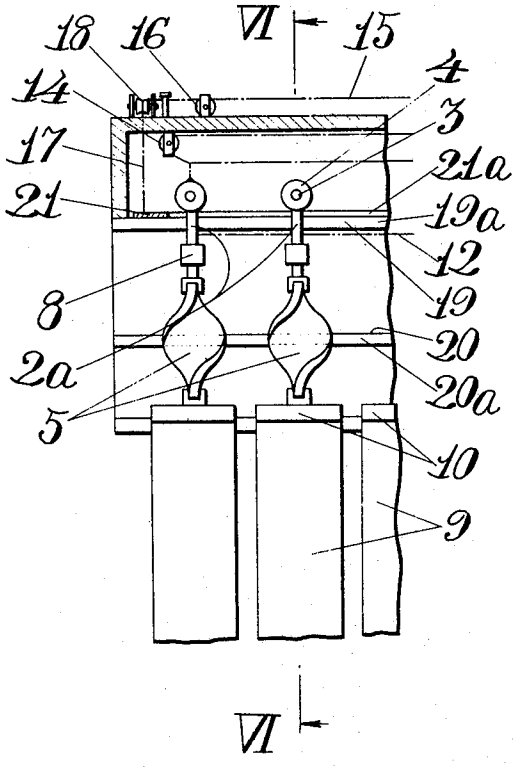
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March 10, 1970 TAKASHI NIWA 3,499,477

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Fig. 4



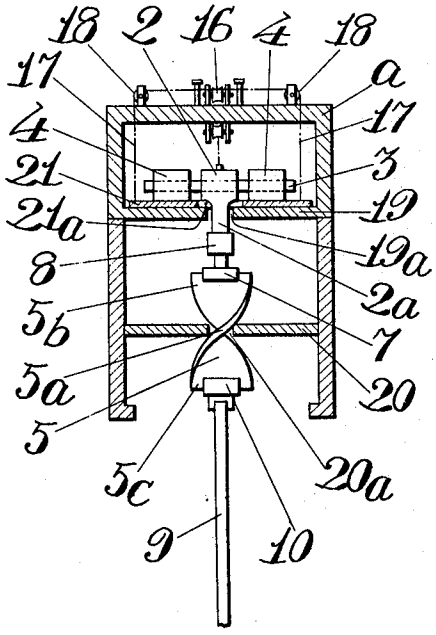


Fig. 6

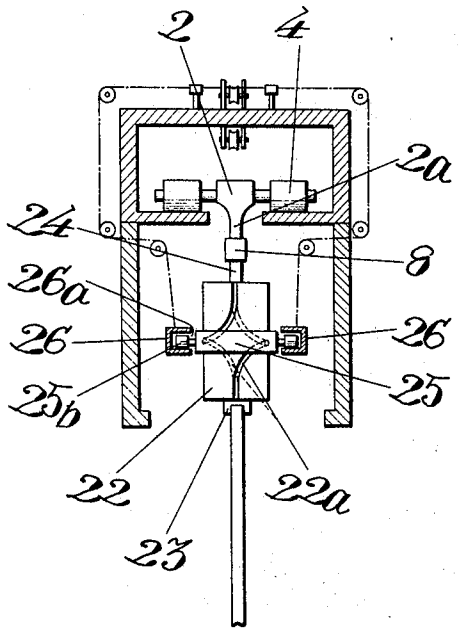
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March 10, 1970 TAKASHI NIWA 3,499,477

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Filed March 18, 1968 5 Sheets-Sheet 5

Fig. 10



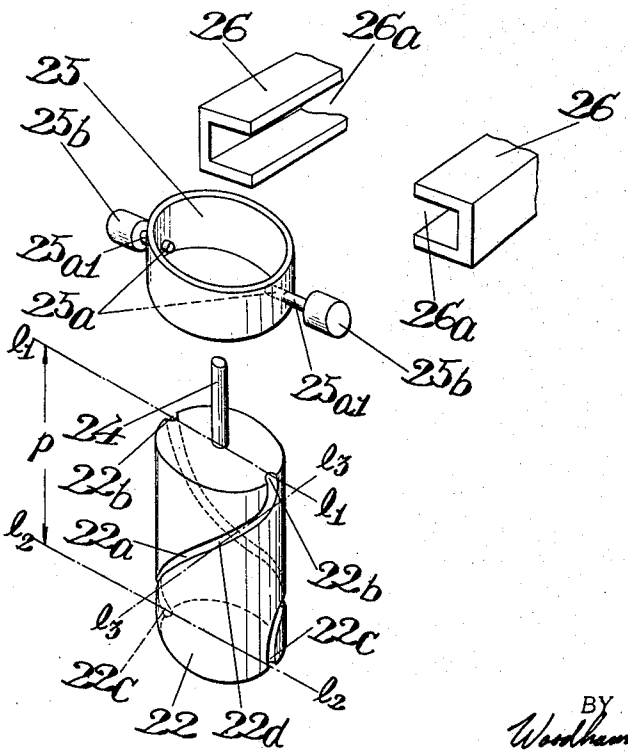


Fig. 9

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United States Patent Office 3,499,477
Patented Mar. 10, 1970

3,499,477

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Claims priority, application Japan, Mar. 23, 1967, 42/17,687; Apr. 7, 1967, 42/28,668, 42/28,669; Apr. 12, 1967, 42/29,943; Jan. 31, 1968, 43/5,374
Int. Cl. E06b 9/36
U.S. Cl. 160—166 4 Claims

ABSTRACT OF THE DISCLOSURE

The present invention discloses a blind comprising a number of vertically extending louver boards suspended through rotary members to rollers travelling on a rail, said rotary members being rotatably fitted to the rollers at their upper parts and fixedly fitted to the upper ends of the louver boards at their lower parts, and characterizing in that the opening and closing directions of the louver boards are decided by rotating the rotary members to a desired amount by a single actuating bar which engages the rotary members at a right angle.

The present invention relates to a device for operating shading strips in a vertical type of blind having vertically elongated shading strips or screen strips.

The vertical type of blind specifically mentioned herein refers to one which is so constituted that a number of vertically arranged, elongated screen strips are arranged in parallel with each other. Each strip is suspended at one end thereof by a pulley which is mounted on a guide rail. The screen strips can be gathered or drawn to either of the right and left ends of the rail and they can be spread apart and returned to the initial position thereof by reciprocable movement of said pulleys along the guide rail by pulling a cord or the like connected to said pulleys. Further, said screen strips can be readily and smoothly turned about a vertical axis to direct their surfaces to any angles or directions by pulling another cord or the like.

In the conventional vertical type of blind the screen strips are turned to any desired direction by rotation of threaded vertically short rods, each of which is secured to an upper end of one screen strip and is meshed with a threaded horizontal long rod which rod can be rotated through grooved wheels by pulling a cord. This type of construction has many defects such as the structural complexity due to the essential requirement for arrangement of a large number of threaded short rods so that they can be reciprocably moved and also attached to every screen strip for turning said strips, laborious work in the manufacture of the blind which leads to high manufacturing cost, and short durability due to damage or trouble occasioned during its use.

An object of the present invention, for the purpose of eliminating these defects as mentioned hereinabove, is to provide a device for operating the screen strips in a vertical type of blind, which device is so constituted that the screen strips can be smoothly turned whereby their surfaces can face in any desired direction by means of an extremely simplified mechanism.

Another object of the present invention is to provide a device for operating screen strips in a vertical type of blind, which device is so constructed that the causes of trouble or damage are reduced to a minimum so that the blind will be durable.

A further object of the present invention is to provide a device for operating screen strips in a vertical type of

blind so constituted that the blind can be manufactured more easily and at a lower cost in comparison with the conventional type of vertical blind.

A further object of the present invention is to provide a device for operating screen strips in a vertical type of blind so constituted that each of a series of twistably movable pieces is connected at one end thereof through a universal joint to a lower end of one of a number of pulleys rotatably mounted on a guide rail and the pieces are fixed at the other end thereof to respective screen strips, and which are movable guide plates are provided movably in a vertical direction for turning said twistably movable pieces to smoothly direct their surfaces to any desired direction.

A further object of the present invention is to provide a device for operating screen strips in a vertical type of blind so constituted that each of the twistably movable pieces is connected at one end thereof to the lower end of a pulley through a universal joint and is fixed at the lower end thereof to the upper end of individual screen strips, said twistably movable pieces being mounted for vertical movement, and fixed guide plates are provided for rotating or turning said twistably movable pieces, thereby enabling said screen strips to turn smoothly and readily to any desired direction.

Further objects of the present invention will be apparent from the following description given with reference to accompanying drawings showing preferred embodiments of device for operating screen strips in a vertical type of blind according to the present invention. In the accompanying drawings:

FIGS. 1 and 2 are front views of two different embodiments of a vertical type of blind;

FIGS. 3 and 4 are partly enlarged front views of fragments of FIGURES 1 and 2, respectively;

FIGS. 5 and 6 are sectional views, taken along the line V—V of FIG. 3 and the line VI—VI of FIG. 4, respectively;

FIGS. 7 and 8 are perspective views of two forms of a twistably movable piece;

FIG. 9 is an exploded perspective view of a modified twistably movable piece and related mechanism thereof; and

FIG. 10 is a longitudinal sectional view showing the assembly of the twistably movable piece and the related mechanism thereof shown in FIG. 9.

Referring to FIGS. 1, 3 and 5 of the accompanying drawings, *a* is a frame member, which is mounted on an upper frame portion of a window or other structure defined between two pillars. The frame *a* includes guide plates **1** extending horizontally and confronting each other and defining a guide space **1***a* therebetween.

2 is a bearing into which an axle **3** is inserted. Mounted at both ends of said axle **3** are pulleys or rollers **4** which can move along said guide plates **1**.

5 is a twistably movable piece being formed either by an elongated or square plate as shown in FIG. 7 or by a twisted frame member as shown in FIG. 8. In both cases, the piece **5** is twisted through the angle of 90° of both above and below the longitudinal median portion **5***a* thereat so that the lower end **5***c* thereof is displaced through an angle of 180° in relation to the upper end **5***b*.

Said twistably movable piece **5** extends through a guide groove **6***a* in a movable guide plate **6** and is connected at the upper end thereof to a pendent portion **2***a* through an attaching piece **7** and a universal joint **8**. The pendent portion **2***a* is connected to the bearing **2** and extends through and is reciprocably movable along the guide space **1***a*.

A number of screen strips **9** are each formed in an elongated shape and form a strong cloth woven from re-

fractory fibers or textiles. A thermohardening process can be carried out on said strips for increasing further the refractory and transformation resistance thereof. Each strip **9** is fixed at the upper end thereof by means of an attaching piece **10** to the lower end of a twistably movable piece **5**. The lower ends of the strips **9** are joined with each other by means of a cord **11** or the like. The pendent portions **2***a* of the bearings **2** are also joined with each other by means of a cord **12** or the like.

13 is an endless cord for actuating the pulleys **4**. The cord **13** is trained around several guide wheels **14** and includes portions **13***a* and **13***b* which are connected to the bearing **2** located at either of the right and left ends of the frame member **1** of the blind. Now, if one portion **13***a* of the endless or looped cord **13** is pulled, all pulleys **4** are moved in good order to the right in FIG. 1 to transfer all screen strips **9** to the right side. Screen strips **9** thus collected together at the right side can be moved leftwardly and spread apart by pulling another portion **13***b* of the endless cord **13**, thereby restoring said screen strips to their initial positions.

15 is another cord for varying the angle or direction in which the surfaces of the screen strips **9** face. Said cord **15** is trained around guide wheels **16** disposed at several spaced-apart positions inside the frame member *a* and said cord **15** is connected both at the ultimate end and at the several intermediate portions thereof to two other cords **17**. Said cords **17** are connected at the opposite ends thereof to the right and left sides (in FIG. 5) of the movable guide plate **6**. A pulling of the cord **15** downwardly causes the movable guide plate **6** to be lifted upwardly by means of the cords **17**. The twistably movable pieces **5** are thereby twistably turned in response to the upward movement of said movable guide plate **6**, thereby turning the surfaces of screen strips to face in other directions. The angle or direction in which the surfaces of screen strips face varies depending upon the position to which the cord **15** is pulled. The screen strips **9** are maintained in their desired position by any locking or fastening means to which the cord **15** is fastened or hooked. When the cord **15** is released, the movable guide plate **6** descends by gravity and causes the twistably movable piece **5** to turn during its descending movement.

By fastening the cord **15** to any suitable locking or latching means, the movable guide plate **6** and thereby the twistably movable pieces **5** are held against further movement so that the screen strips are held so that their surfaces face in the desired direction. If cord **15** is again released, the movable guide plate **6** descends to its original or initial position, thereby putting the screen strips in good parallel arrangement as they are.

In FIGS. 2, 4 and 6 showing another embodiment, *a* is a frame member, which is mounted on an upper frame of a window or the like structure defined between two pillars and includes at the upper portion thereinside a bearer plate **19** extending horizontally and having a horizontal guide groove **19***a*. The frame member *a* also has a lower guide plate **20** extending horizontally and having a horizontal guide groove **20***a*.

Located on said bearer plate **19** is a vertically movable guide rail **21**, which has a horizontally extending guide groove **21***a* therein.

On or above said vertically movable guide rail **21** there is provided an actuating unit consisting of a bearing **2** having a pendent portion **2***a*, an axle **3** inserted into said bearing **2**, and pulleys **4** mounted on both ends of the axle **3** and movable along the vertically movable guide rail **21**.

5 is a twistably movable piece, which is formed substantially similar to that set forth in FIGS. 7 and 8. Each of said plurality of twistably movable pieces extends through the groove **20***a* of the guide plate **20** in a manner as shown in FIGS. 4 and 6 and each piece is connected at the upper end thereof to the pendent portion **2***a* of said bearing **2** through an attaching piece **7** and a universal joint **8**. Said pendent portion **2***a* is arranged for either vertical or horizontal movement inside the guide groove **21***a* of the guide rail **21**.

A number of vertically elongated screen strips **9** are formed from a strong cloth woven with refractory fibers and a thermohardening process can be carried out thereon for increasing the heatproof property and resistance to transformation. Each of said screen strips **9** is connected at the upper end thereof to the lower end of the twistably movable piece **5** through an attaching piece **10**. The lower ends of the strips **9** are joined to each other by a cord **11**. The pendent portions **2***a* of the respective bearings **2** are also joined together by another cord **12**.

13 is an endless or looped cord for actuating the pulleys **4**. The cord **13** is trained over several numbers of guide wheels **14** and is connected at certain positions thereof to the bearing **2** positioned at both the right and left end or either of the two ends of the blind frame. Now, if the cord **13***a* is pulled, pulleys **4** are moved in good order from the left end to the right in FIG. 2 to move all of the screen strips **9** to the right end of the blind. When the cord **13***b* is pulled, the screen strips **9** thus gathered or collected at the right end are spread leftwards to be restored to their initial positions.

15 is a cord for varying the direction or angle surfaces of screen strips **9**, face. The cord **15** is trained around other guide wheels **16** disposed at several places inside the frame member *a* of the blind. Said cord **15** is associated both at one side (at the left side in FIG. 2) and at several intermediate places inside of the frame member *a* with pairs of supplementary cords **17**. Each of said pairs of supplementary cords **17** is connected with the left and right edges (in FIG. 6) of the guide rail **21** through a corresponding guide wheel **18**. Now, when the cord **15** is pulled, the guide rail **21** is moved upwardly by means of the supplementary cords **17**. The bearings **2**, are also lifted by means of the pulleys **4**. This upward movement causes twistably movable pieces **5** to be moved upwards and due to their twisted shape and their engagement with the guide groove **20***a*, said pieces **5** are twisted or turned thereby changing direction in which the screen strips face. The angle or direction in which the surfaces of screen strips face is determined by the position of the cord **15**. A desired direction or angle of surfaces of screen strips can be obtained by varying the position of the cord **15**. The screen strips **9** thus directed so that their surfaces face in a desired direction are maintained in that position by any adequate locking or latching means with which the cord **15** is fastened or hooked. When the cord **15** is released, bearings **2**, pulleys **4** and screen strips **9** descend by gravity. The descending movements of the screen strips **9**, bearings **2** and pulleys **4** can be stopped at any desired point by fastening the cord to any hooked means, thereby keeping the screen strips **9** in any angle or direction as they are at the time of stopping.

FIG. 9 shows another twistably movable piece and a mechanism thereof different from the preceding ones, and FIG. 10 shows a longitudinal sectional view of this embodiment of the present invention with use of the twistably movable piece **22** shown in FIG. 9.

A twistably movable piece **22** in this figure is formed in a cylindrical shape and is provided in the outer peripheral surface thereof with two twisted or helical curved guide grooves **22***a* each extending in a vertical direction. The two grooves have two points confronting one another at the upper end of the cylinder and terminating at two points confronting each other at the lower end thereof. Said two guide grooves **22***a* have a point of inflection at the median point thereof. The line l_1 joining the two starting points **22***b*, **22***b* is parallel with the line l_2 joining the two terminating points **22***c*, **22***c* and said points lie in a common vertical plane. The line l_3 joining each point of inflection of the two grooves makes a right

angle to the plane containing both lines l_1 and l_2. The terminating points **22***c*, **22***c* are twisted through an angle of 180° relative to the corresponding points **22***b*, **22***b*. Said guide grooves are formed symmetrically in relation to the longitudinal axis passing the median point **22***d* of the line l_3 and the radial axis.

Said twistably movable piece **22** is connected at the lower end thereof to the upper end of the screen strip **9** through an attaching piece **23** in a manner such that the line l_2 thereof makes a right angle with the surface of the screen strip **9**, and is connected at the upper end thereof to the pendent portion **2***a* of the bearing **2** by a universal joint **8** through an attaching piece **24**.

25 is an annular guide ring, which has on the inside peripheral wall thereof a pair of bosses **25***a*, each being provided at confronting positions and which are received in the twisted grooves **22***a* of the twistably movable piece **22**. Said bosses have respectively outwardly extending portions **25***a***1**, to each of which a pulley **25***b* is mounted.

A pair of vertically movable frame pieces **26**, each having an inverted U-shaped groove in sectional view, are mounted with their grooves facing each other. The pulleys **25***b* are disposed in said grooves. Said pulleys **25***b* housed inside the vertically movable frame pieces **26** are movably horizontal along the pieces **26** in response to the actuating movement of main pulleys **4** and said pieces **26** are movable vertically by means of the cords **17** as in the case of FIGS. 1, 3 and 5. In further detail, the vertically movable frame pieces **26** are lifted by pulling the cord **17** by means of the cord **15**, and as they move upwardly, the twisted movable piece **22** is turned or rotates with respect to the annular guide ring **25**, thereby directing screen strips **9** to face in any desired direction. The other elements in FIG. 10 are similar to those in FIGS. 1, 3 and 5.

The blind in the present invention having a device for operating vertical shading strips so constituted as described hereinabove is much simplified in its structure, which creates many advantages such as reduction of manufacturing cost, reduced trouble, and smooth operation by easy handling.

What is claimed is:

1. A vertical blind construction, comprising:

an elongated generally horizontal frame having a track extending longitudinally thereof;

a plurality of vertically disposed strips extending downwardly from said frame, each strip having a member extending upwardly therefrom;

elongated guide means defining a slot extending longitudinally thereof, said slot being parallel with, disposed below and extending in the same direction as said track, said members extending upwardly through said slot, said members and said guide means having mutually engaging parts capable of effecting rotation of said members about vertical axes in response to relative vertical movement between said guide means and said members in order to effect rotation of said strips about vertical axes;

bearing elements mounted on and supported by said frame for lengthwise movement along said track, each said bearing element having a depending portion extending downwardly below said track and connection means including a swivel device for connecting said depending portion to the upper end of one of said members so that strips can rotate about vertical axes relative to the bearing elements to which they are connected;

means for effecting relative vertical movement between said guide means and said members;

means for moving said bearing elements lengthwise along said track;

said guide means being fixed to said frame and held against vertical movement with respect thereto, and means for effecting vertical movement of said bearing elements and thereby said strips with respect to said frame; and

said track being defined by a guide rail having opposed spaced-apart edges defining a slot therebetween, each said bearing element having rollers respectively positioned above and resting on said guide rail on opposite sides of the slot therein, and elongated flexible means connected to said guide rail for effecting vertical movement thereof relative to said frame.

2. A vertical blind construction, comprising:

an elongated generally horizontal frame having a track extending longitudinally thereof;

a plurality of vertically disposed strips extending downwardly from said frame, each strip having a member extending upwardly therefrom;

elongated guide means defining a slot extending longitudinally thereof, said slot being parallel with, disposed below and extending in the same direction as said track, said members extending upwardly through said slot, said members and said guide means having mutually engaging parts capable of effecting rotation of said members about vertical axes in response to relative vertical movement between said guide means and said members in order to effect rotation of said strips about vertical axes;

bearing elements mounted on and supported by said frame for lengthwise movement along said track, each said bearing element having a depending portion extending downwardly below said track and connection means including a swivel device for connecting said depending portion to the upper end of one of said members so that strips can rotate about vertical axes relative to the bearing elements to which they are connected;

means for effecting relative vertical movement between said guide means and said members;

means for moving said bearing elements lengthwise along said track;

said guide means being fixed to said frame and held against vertical movement with respect thereto, and means for effecting vertical movement of said bearing elements and thereby said strips with respect to said frame; and

said guide means is an elongated plate disposed below said guide rail and having a longitudinal slot therethrough, said members each comprising a flat piece which is twisted about a vertical axis to form a helix of at least about 180° in arcuate extent.

3. A vertical blind construction, comprising:

an elongated generally horizontal frame having a track extending longitudinally thereof;

a plurality of vertically disposed strips extending downwardly from said frame, each strip having a member extending upwardly therefrom;

elongated guide means defining a slot extending longitudinally thereof, said slot being parallel with, disposed below and extending in the same direction as said track, said members extending upwardly through said slot, said members and said guide means having mutually engaging parts capable of effecting rotation of said members about vertical axes in response to vertical movement between said guide means and said members in order to effect rotation of said strips about vertical axes;

bearing elements mounted on and supported by said frame for lengthwise movement along said track, each said bearing element having a depending portion extending downwardly below said track and connection means including a swivel device for connecting said depending portion to the upper end of one of said members so that said strips can rotate about vertical axes relative to the bearing elements to which they are connected;

means for effecting relative vertical movement between said guide means and said members;

means for moving said bearing elements lengthwise along said track;

said guide means being fixed to said frame and held against vertical movement with respect thereto, and means for effecting vertical movement of said bearing elements and thereby said strips with respect to said frame; and

each of said member is of cylindrical shape and is provided on the peripheral surface thereof with two upright helical grooves which are circumferentially spaced apart by an angle of about 180°, said guide means including portions projecting into said grooves for effecting rotation of said member on relative vertical movement between said member and said guide means.

4. A vertical blind construction according to claim 3, in which said guide means includes a ring encircling said member and having internal pins projecting into said

grooves, a pair of guide rails disposed outside said ring on diametrically opposite sides thereof, said ring having rollers mounted on said guide rails and means for moving said guide rails vertically.

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PETER M. CAUN, Primary Examiner

U.S. Cl. X.R.

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