May 26, 1964 E. LANDENBERGER 3,134,427

VENETIAN BLIND

Filed Dec. 4, 1959

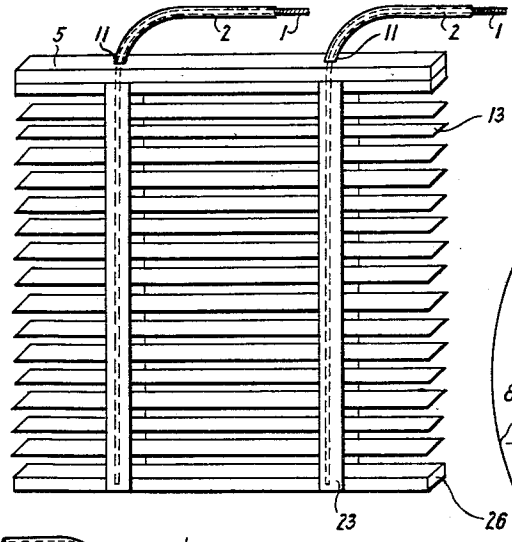


Fig. 1

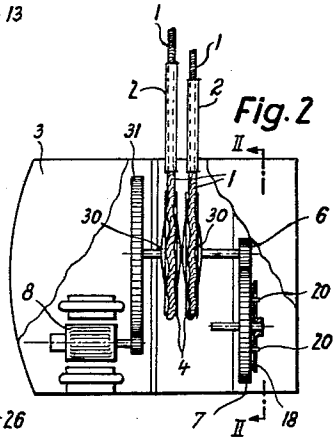


Fig. 2

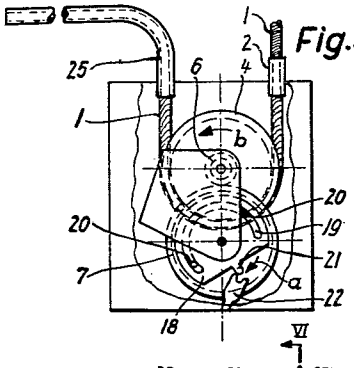


Fig. 3

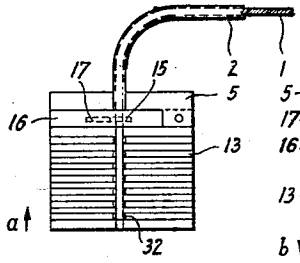


Fig. 4

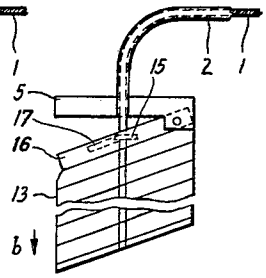


Fig. 5

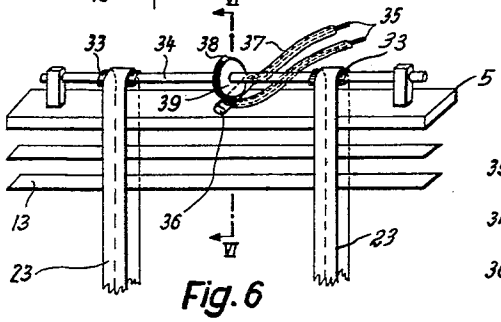


Fig. 6

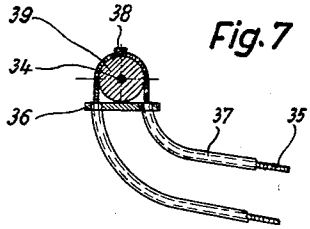


Fig. 7

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VENETIAN BLIND

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The present invention relates to a device for operating freely suspended Venetian blinds, and the principal objects of the invention are to provide a device which is of a very simple construction and easily operated for raising and lowering the slats of the blind and to permit the slats to be adjusted to any desired angle when the slats are lowered.

These objects are attained according to the invention by means of at least one cordlike push-pull element, one end of which is connected to the lowest slat of the blind and is guided within a cable covering leading to an operating mechanism which may be mounted at any suitable point remote from the blind. This operating mechanism comprises a rope pulley over which the push-pull element is looped and which may be rotated in either direction by a suitable source of power to open or close the blind. Each rope pulley is preferably provided with corrugated inner walls so as to engage more firmly the cordlike push-pull element to prevent the latter from slipping on the pulley.

The invention further provides that, for adjusting the slats of the blind to different angles, the straps carrying the slats are secured to a shaft which may be rotated in either direction about an angle of approximately 180° by means of a further cordlike push-pull element which is driven by another rope pulley.

According to another embodiment of the invention, the adjustment of the angle of the blind slats may also be attained by pivotably mounting a bar on the upper supporting bar of the blind and by passing the push-pull element through this pivotable bar and frictionally engaging the same thereto so that, when the push-pull element is actuated to lower the slats, the mentioned bar, and thus also all of the slats underneath the same, may be pivoted downwardly to the desired angle.

Another feature of the invention consists in making the corrugated walls of each pulley of a resilient material, and in providing a conical plate spring at the outside of each pulley wall to press the same slightly inwardly and into engagement with the push-pull element.

Each push-pull element according to the invention consists of a highly polymerized synthetic material and is preferably passed behind the holding straps of the blind and through suitable aligned apertures in the blind slats to the bottom slat.

The operating mechanism of the Venetian blind according to the invention is preferably driven by an electric motor which is controlled by a gear wheel which is connected to a pinion on the driven shaft of a speed-reduction gear which also carries the drive pulley of the push-pull element. This gear wheel is provided with a pair of pins which project into an arcuate slot in a disk which is rotatably mounted on the shaft of the gear wheel. These pins are disposed in the slot at a short distance from the opposite ends thereof so as to permit a certain amount of free play between the disk and the gear wheel before the latter will take along the disk in one or the other direction. This disk is provided with a camlike projection which is adapted to engage with the bifurcated end of a pivotable switch lever which is adapted to interrupt the motor circuit and at the same time to reverse the circuit connection so that, when the motor is again switched on, it will run in the opposite direction.

If several parallel push-pull elements are to be used simultaneously, they should be prevented from shifting relative to each other. It is therefore advisable to connect the free parallel ends of these elements rigidly to each other after they emerge from the rope pulleys, for example, by passing them through a common cable covering.

These and other objects, features, and advantages of the present invention will become further apparent from the following detailed description thereof, particularly when the same is read with reference to the accompanying drawings, in which:

FIGURE 1 shows a perspective front view of a Venetian blind which is operated by two push-pull elements;

FIGURE 2 shows a side view of the operating mechanism of the Venetian blind according to FIGURE 1 in partly broken away housing;

FIGURE 3 shows an end view of the control device of the operating mechanism as seen in the direction of arrows II—II in FIGURE 2;

FIGURE 4 shows a side view of the Venetian blind according to FIGURE 1, but in the raised position with the slats extending horizontally;

FIGURE 5 shows a side view similar to FIGURE 4, but with the blind in the closed or lowered position in which the slats extend at an inclined angle;

FIGURE 6 shows a view similar to FIGURE 1 with a modification of the control device for adjusting the angular position of the slats; while

FIGURE 7 shows a cross section taken along line VI—VI of FIGURE 6.

Referring to the drawings, the Venetian blind according to the invention is operated by two stiff but flexible cordlike push-pull elements **1**, each consisting of a highly polymerized synthetic material, for example, polyamide, which is guided in a cable covering **2**. These push-pull cables **1** lead from a supporting bar **5** to an operating mechanism **3** which may be mounted in a suitable housing at any desired point remote from the blind. This operating mechanism comprises a pair of rope pulleys **4**, each of which has one push-pull element **1** looped around it with free ends **1***a* of the push-pull elements extending from the other sides of the pulleys. The inner surfaces of rope pulleys **4** are corrugated so as to exert a gripping action upon the push-pull elements **1**. In order to increase this gripping action so that the driving force will be securely transmitted to the push-pull elements **1**, the side walls of each rope pulley **4** are preferably resilient and compressed toward each other by conical plate springs **30**.

The operating mechanism **3** further comprises an electric motor **8** which is connected through a speed-reduction gear **31** to rope pulleys **4** to drive the same. The cable covering **2** of each push-pull element **1** is secured at one end in a fixed position in the housing of the operating mechanism **3** and at the other end at **11** to the supporting bar **5**.

The two push-pull elements **1** leading within their cable

coverings 2 from their respective rope pulleys 4 to the supporting bar 5 extend through the latter and then pass freely through apertures 32 in the slats 13 of the Venetian blind to a bar 26 which forms the lowest slat of the blind and to which the ends of elements 1 are secured. In order to prevent the free parallel ends of the two push-pull elements 1 coming from rope pulleys 4 from shifting relative to each other when the blind is raised or lowered and to enable the cables 1 to act together, the free ends of the cables may be firmly connected to each other by passing through a common cable covering 25.

The individual blind slats 13 are connected to each other in the conventional manner by straps or cords 23, the ends of which are secured to an additional bar 16, seen in FIGURES 4 and 5, and the lower bar 26.

In order to incline slats 13 when the slats are lowered, the upper supporting bar 5 is provided with the additional bar 16, as shown particularly in FIGURES 4 and 5, which is connected thereto so as to be pivotable downwardly to the desired angle of inclination of slats 13. The two push-pull elements 1 passing through bar 16 are frictionally engaged in a slot 17 thereto by means of a clamping spring 15 in a slot 17 which permits the slats 13 to be pivoted from the horizontal position of FIGURE 4 to a nearly vertical position as in FIGURE 5 when the slats are being raised.

A further modification for adjusting the angular position of slats 13 is illustrated in FIGURES 6 and 7 according to which the straps 23 which extend along both sides of slats 13 are ends secured at their upper ends to bushings 33 so that, when a shaft 34 supporting the bushings is turned, the front and rear parts of the straps will be moved in opposite directions and thereby permit slats 13 to be pivoted to any desired angle within a range of nearly 180°. In order to turn shaft 34 about such an angle, a further push-pull element 35 may be provided which runs over a third rope pulley, not shown, which is similar to pulleys 4. This push-pull element 35 extends in cable coverings 37 between the housing of the operating mechanism 3 and a holding member 36 which is provided underneath shaft 34, and the free ends of element 35 are secured by a clamp 38 to a pulley 39 which is rigidly connected on shaft 34. This clamp 38 also serves as a stop member to limit the rotary movement of shaft 34 by engaging with holding member 36 when turned about an angle of nearly 180° from its central position as shown in FIGURE 7.

The shaft which carries the rope pulleys 4 has on its free end a pinion 6 which engages with a gear wheel 7. The shaft of this gear wheel 7 rotatably supports a disk 18 which serves a control element for the operation of motor 8 and is provided with an arcuate slot 19 into which two pins 20 project which are secured to gear wheel 7 and are adapted to take along disk 18 with a certain amount of free play in either direction.

Disk 18 is further provided with a cam 21 which is adapted to cooperate with the bifurcated end of a switch lever 22 to interrupt the motor circuit and to change the direction of rotation of the motor.

The apparatus as above described may be controlled by one or more switches which may be mounted at any desired point. When these switches are operated, the electric motor will be started, whereby through gear 6, 7 the drive pulley 4 will be rotated, for example, in the direction as shown by arrow *b* in FIGURE 3, and the push-pull elements 1 will push apart the slats 13 and 26, thereby closing the blind. Before gear wheel 7 entirely completes the extent of its travel which is required for opening or closing the blind, one of its pins 20 takes along disk 18 and turns the same in the direction as shown by arrow *a* in FIGURE 3, whereby cam 21 actuates switch lever 22 which then interrupts the motor circuit and also reverses the circuit connections of the motor circuit so that, when the motor is again switched on, the latter will run in the opposite direction and operate the blind accordingly.

Although in the drawings each blind is operated by only one pair of push-pull elements 1 and the corresponding rope pulley 4, three or more such elements and pulleys may be provided in the same manner depending upon the width of the Venetian blind. However, the same operating mechanism may also be used for raising or lowering several blinds simultaneously.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof, I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. In a Venetian blind having an upper supporting bar, a plurality of superimposed slats, flexible straps connecting said slats to said upper supporting bar, a cord-like push-pull element having one end portion extending through said slats and attached to the lowermost slat, a cable covering enclosing and guiding said push-pull element, an operating mechanism mounted at a point remote from said blind and having a shaft, a rope pulley having corrugated sides mounted on said shaft, the other end portion of said push-pull element being hooked around said pulley, a source of power for rotating said rope pulley in either direction for opening and closing said blind, said source of power comprising an electric motor having a shaft, a speed reduction gear drivingly connecting said motor shaft and said pulley shaft, a pinion on said pulley shaft, a third shaft having a gear wheel with projections mounted thereon with said gear wheel engaging said pinion, a disc rotatably mounted on said third shaft and having an arcuate slot therein, said projections on said gear wheel engaging with the certain amount of end play into said arcuate slot, said disc also having a projection thereon, a pivotally mounted switch lever having a bifurcated end engageable with said projection on said disc, and means operated by said switch lever for interrupting the motor circuit and for simultaneously reversing the circuit connection so that when said motor is again switched on it will rotate in the opposite direction.

2. In a device for opening, closing and angularly positioning of a Venetian blind, the combination of a plurality of superimposed slats, a plurality of straps spacedly interconnecting said slats, a supporting bar, a lower bar under the lowermost of said slats with said straps being attached thereto, a second bar pivotally mounted on said supporting bar and pivotable downwardly therefrom to a predetermined angle to adjust said slats to an angle of inclination, said straps being attached to said second bar and said slats being suspended therefrom, a push-pull element having one end passing through said second bar and through said slats and attached to said lower bar, means on said second bar for frictionally engaging said push-pull element to said bar whereby said push-pull element is free to move through said second bar but will simultaneously move said second bar therewith through the angle of inclination, an operating mechanism having a motor, a rope pulley having corrugated inner surfaces and being driven by said motor, said push-pull element being firmly engaged between the walls of said rope pulley and said rope pulley being adapted to be driven in either direction for opening and closing of the Venetian blind.

3. In a device for opening and closing and angularly positioning of a Venetian blind, the combination of a supporting bar, a shaft mounted on said supporting bar, a plurality of straps secured to said shaft and extending downwardly past said supporting bar, a plurality of superimposed slats and a lower bar spacedly interconnected by said straps, a rope pulley driven by a source of power,

a push-pull element operatively connected between said pulley and said shaft for rotating said shaft through an angle of approximately 180° to tilt said slats, a second push-pull element having one end attached to said lower bar and extending through said slats, a second bar pivotally mounted on said supporting bar and pivotable downwardly therefrom to a predetermined angle for adjusting said slats to an angle of inclination, said second push-pull element passing through said second bar, means on said second bar for frictionally engaging said push-pull element to said bar whereby movement of the push-pull element will move the second bar therewith, a rope pulley having corrugated inner surfaces and driven by a motor, said second push-pull element being firmly engaged between

the walls of said rope pulley and said rope pulley being adapted to be driven by said motor in either direction for opening and closing of the Venetian blind.

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