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J. M. GAMBON ET AL.

3,180,401

SHADE

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2 Sheets-Sheet 1

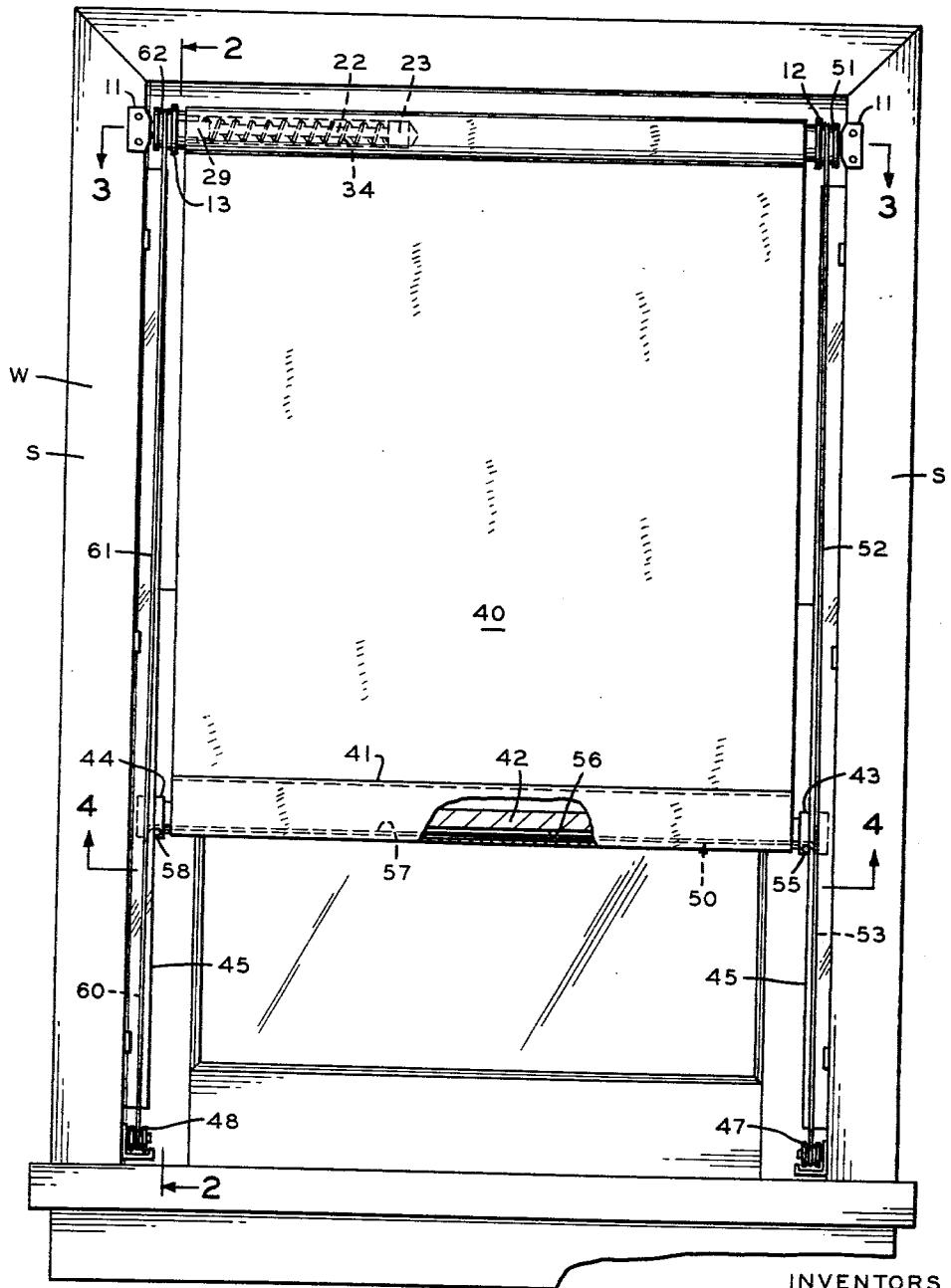


FIG. II

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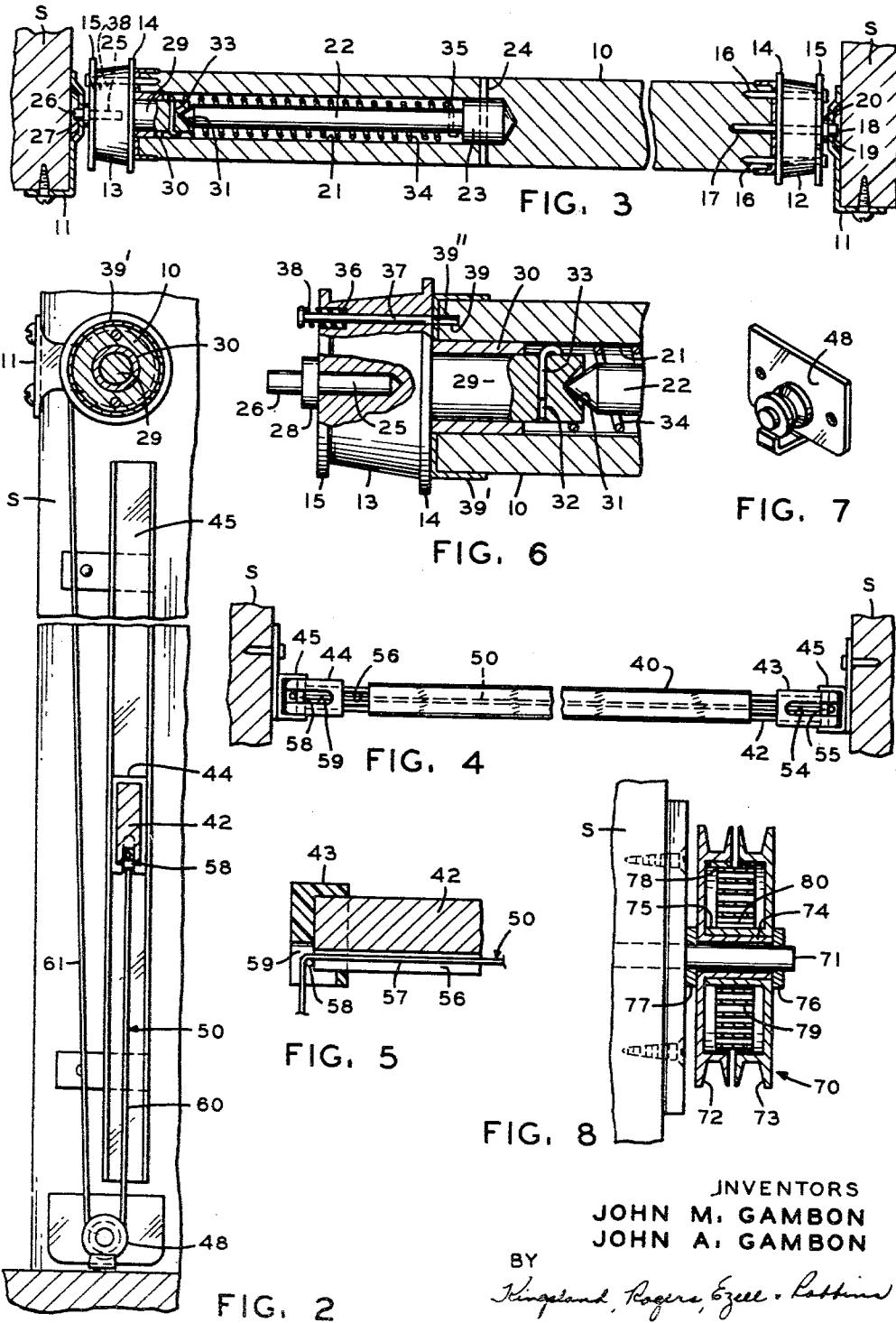
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SHADE

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This invention relates to a shade, and especially to a shade that can be rolled or unrolled to any position where it is then held by a tension element.

This shade comprises a drum or rod about which a flexible shade is rolled or unrolled as the drum is rotated. The ends of the drum are journaled in brackets that are mounted on opposite sides of an opening, such as a window or cabinet opening or the like. The ends of a cord are attached to opposite ends of the drum. In intermediate portion of the cord is supported by a rod carried by the trailing end of the shade. The cord extends in parallel lengths from its end connections to the drum around pulleys at the end of the opening opposite the drum and then to the opposite ends of the rod. The ends of the cord are wound about the drum in the opposite direction in which the shade rolls. Therefore, as the shade unrolls, tending to shorten the cord, the cord rolls onto the drum in compensation.

The cord is always kept taut by spring tension means. In the preferred embodiment of the invention, there are short, conical spools at each end of the drum about which the ends of the cord are wound, and one of these spools is biased by a torsion spring to rotate in a direction tending to wind the cord upon it. This tension force is opposed by the tension of the cord between the ends which are wound about the conical spools and the intermediate section which is supported by the rod carried by the trailing end of the shade. Therefore, the ends of the cord tend to rotate the drum to roll the shade whereas the intermediate section of the cord pulls upon the rod and tends to unroll the shade. This tension force is made greater than the normal gravitational force tending to unroll the shade and is, therefore, sufficiently great to hold the shade in any position.

An object of this invention is to provide a shade which is mounted to roll and unroll upon a drum with cord means attached between the ends of the drum and the trailing edge of the shade and with means to maintain a tension in the cord means so that the shade will be held in any position without additional catches or locks.

Another object of the invention is to provide a shade that is controlled by tension cord means which provide an automatic self-alignment for the shade.

Another object of the invention is to provide a shade with cord means connected between the drum upon which the shade is supported and the trailing edge of the shade, with means for maintaining tension in the cord means and means for maintaining the tension uniform on opposite sides of the shade.

Other objects and advantages will be apparent from the description to follow.

In the drawings:

FIGURE 1 is a front elevation view of the invention with certain parts shown in section;

FIGURE 2 is a fragmentary section view on an enlarged scale taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a view in section on an enlarged scale taken along the line 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary view in section taken along the line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged end section view of the shade rod and the shade rod guide together with a portion of the cord;

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FIGURE 6 is a fragmentary elevation view of a conical spool and an end of the drum;

FIGURE 7 is an isometric view of a pulley and its supporting bracket; and

FIGURE 8 is a side elevation view in section of a modified means for maintaining tension on the cord.

The shade is illustrated as being supported by the sides S of a window frame W. This environment is probably the most common for the shade, but it has a number of other uses as will be apparent when the shade has been described. In any event, the general structural features and operating principles of the shade remain the same, regardless of the use to which it is put.

This shade comprises a drum 10 supported between brackets 11 which are fastened to opposite sides and near one end of an opening, such as the opening in the window frame W. The drum 10 may be made of various materials, but it is preferably and most economically made of wood.

Two conical spools 12 and 13 are fastened to the ends of the drum 10. Each spool has a frusto-conical surface between inner and outer stop rims 14 and 15, respectively. The smaller end of each frusto-conical spool is toward the outer rim 15. Different fastening means, however, are used to attach each of the spools 12 and 13 to the drum 10. The spool 12 is simply fastened by nails or screws 16 or other suitable known fasteners. A pin 17 is driven axially through the spool 12 and into the end of the drum 10. This pin 17 has a head 18 which projects beyond the end of the spool 12 and which is received within a hole 19 in the bracket 11. The pin 17 also has a bearing shoulder 20 that spaces the spool 12 from the bracket 11.

There is an entirely different fastening means at the other end of the drum 10. As shown in FIGURE 3, a bore or recess 21 extends from the left end of the drum 10 a substantial distance axially into the drum. There is a long, pointed rod 22 of smaller diameter than the diameter of the bore 21. The rod 22, however, has a larger cylindrical head 23 on its end which keeps the rod 22 substantially axially aligned within the bore 21. The head 23 also has a hole through it which receives a pin 24 that is driven through a diameter of the drum 10 to lock the rod 22 in place.

The spool 13 has a rod 25 extending axially from it, which is similar to but shorter than the rod 17 on the other spool 12. The projecting end 26 of the rod 25 extends within a hole 27 in the bracket 11 and an annular shoulder 28 separates the spool 13 from the bracket 11.

The spool 13 has a dowel 29 that extends inwardly from its center in the bore 21. The dowel 29 is of smaller diameter than the bore 21, but there is a bushing 30 between the dowel 29 and the inner surface of the bore 21. The bushing 30 keeps the dowel 29 axially aligned within the bore 21 while permitting rotation of the spool 13 and its dowel 29. There is a conical recess 31 in the end of the dowel which receives the pointed end of the rod 22 and centers the rod 22 within the bore 21.

The dowel 29 has a transverse bore 32 through it which receives an end 33 of a coil spring 34. The other end 35 of the coil spring is locked within a similar bore in the rod 22. As shown in FIGURE 3, the coil spring 34 is wrapped loosely around the rod 22. The coil spring permits the conical spool 13 to be "wound up" about the end of the drum 10.

There is a small countersunk bore 36 through the conical spool 13 which receives a small pin 37. A light coil spring 38 biases the pin 37 outwardly from the spool 13. There is a small recess 39 in the end of the drum 10 within which the pin 37 can be projected if the spool 13 is positioned properly. To prevent the pin from wearing an excessively large hole in the wood drum 10, a metal

wear plate 39' is press-fitted or riveted to the end of the drum 10. There is a hole 39" through the plate 39' in line with the hole 39. This allows the spool 13 to be locked in place after it has been wound against the torsional force of the spring 34. When the spool 13 is so wound, the force of the spring 34 is sufficiently great to hold the pin 37 by friction within the recess 39 and prevent the spool from unwinding. However, the pin 37 is readily released upon manual rotation of the spool 13 far enough to move the pin 37 away from the wall of the recess 39, at which time the light compression spring 38 is sufficient to retract the pin 37. The pin 37 is useful in installing the shade and preparing it for use as will be described hereinafter.

The leading edge of a flexible shade 40 is attached to the drum 10 in any conventional manner, such as by stapling or the like. The lower or trailing end 41 of the shade 40 is doubled over and sewed in a loop within which is supported a rod 42. The rod 42 extends lengthwise of the loop end 41, and, in a preferred embodiment of the invention, a pair of block guide members 43 and 44 are fastened to the ends of the rod 42. The block guide members 43 and 44 extend within channel members 45 which are attached to the sides S of the window frame W.

A pair of pulleys 47 and 48 are fastened to the lower ends of the sides S. Each of the pulleys 47 and 48 is opposite a conical spool 12 or 13.

A flexible cord 50 has an end 51 fastened to the spool 12 adjacent the outer side 15 thereof. The cord is wound about the spool 12 in a sufficient number of turns so that there is at least part of a turn when the shade 40 is completely rolled. The direction in which the cord is wound about the spool 12 is opposite to the direction in which the shade rolls about the drum 10. Therefore, as the shade 40 unrolls, the cord rolls upon the spool 12.

The cord has a length 52 which extends downwardly from the spool 12 to the pulley 47 and then has a length 53 which extends upwardly from the pulley 47 into a recess 54 in the lower side of the guide block 43. The cord 50 is positioned within the recess 54 in the guide block 43 by a pin 55 past which the cord is turned. The rod 42 has a groove 56 in its lower side, and the cord 50 has a length 57 which passes through the groove from pin 55 and extends to a similar pin 58 that is within a recess 59 in the guide block 44. Then the cord 50 has a length 60 from the pin 58 to the pulley 48 and a length 61 that extends from the pulley 48 to the other conical spool 13. The cord has approximately the same number of turns around the spool 13 as it does around the spool 12 and the turns are in the same direction as on the spool 12. Finally, the cord 50 has an end 62 fastened to the outer side 15 of the spool 13.

The spring biased spool 13 maintains the cord 50 in tension because the direction in which the cord is wound around the spool is such that the pull of the cord tends to "wind up" the spool about the end of the drum 10. This pull of the cord 50 is opposed by the force of the torsion spring 34 which tends to "unwind" the spool. The force of the spring 34 can be adjusted by the amount of prewinding given to the spool 13 before its position is fixed by the cord 50.

After the cord 50 is installed in position and wound around the spools 12 and 13, the pulleys 47 and 48, and passed through the slot, it is constantly kept in tension by the spring biased spool 13. Hence, the ends 51 and 62 of the cord 50 pull upon the spools 12 and 13 in a direction tending to roll up the shade 40, but there is an equal and opposite pull exerted upon the rod 42 by the cord lengths 53 and 60 tending to unroll the shade 40. These forces are maintained regardless of the position of the shade because as the shade rolls up, the cord 50 unrolls from the spools 12 and 13, tending to maintain the lengths of cord between the rod 42 and the spools constant. Furthermore, the conical shape of the spools 12 and 13 com-

pensates for the changing diameter of that part of the shade which is rolled around the drum 10 as the shade rolls and unrolls. However, any small changes in the length of the unrolled cord are immediately taken up by the spring wound spool 13 which will readily "unwind" if the cord gets longer and which will "wind" if the cord gets shorter.

It should be observed here that the cord 40 is freely slideable within the slot 56 in the shade rod 42. This permits changes in unwound cord lengths on either side of the shade 40 to be taken care of by the spool 13. The freedom of the cord to slide in the slot 56 also assures that even tension in the cord 50 will be maintained throughout its length on both sides of the shade 40. Therefore, the shade can be rolled or unrolled by moving the rod 42 up or down with forces applied at the center of the rod 42 or to either side of center. Also, if a side of the shade is whipped about in the wind or the shade is otherwise temporarily unaligned, the uniform cord tension will quickly realign the shade.

In addition to compensating for the changing shade diameter around the drum 10, the conical spools 12 and 13 cause the cord to wind in even rows without tangling. As the cord ends wind about the spools, the additional loops are wound progressively toward the larger ends 14 of the spools because the cord tends to fall across the smallest diameter available, which is always the space alongside the last loop wound on each spool.

The installation of the shade should now be apparent. The pulley 12 is nailed or screwed to one end of the drum 10. Then the end 35 of the coil spring 34 is connected into the bore in the rod 22 and the end 33 is connected into the bore 32 in the dowel 29. The rod 22 is inserted into the bore 21 and fixed in place by the pin 24 as the dowel is inserted within the bushing 30.

After the shade 40 is stapled or otherwise attached to the drum 10, it is completely rolled onto the drum to make attachment of the cord 50 to the spools 12 and 13 easier. Then the spool 13 is wound about the end of the drum 10 in the same direction as that in which the shade is rolled. Thus, the spool tends to "unwind" in the opposite direction to that in which the shade is rolled.

When the spool 13 has been wound sufficiently to attain a desired unwinding force on the spring 34, it is temporarily locked in place by depression of the pin 37 into the recess 39 in the end of the drum 10. Although the spring 38 biases the pin outwardly, when the spool 13 is released, the force of the spring 34 presses the end of the pin 37 against the side wall of the recess 39 and the pin is held in place by a binding friction force.

The cord 50 is now passed through the slot 56 in the underside of the rod 42 and is drawn through that slot until its center portion 57 is within the slot. Then the parts of the cord which extend beyond the ends of the rod 42 are passed around the pins 55 and 58 and around the pulleys 47 and 48. Then the ends of the cord 50 are wound at least part of a turn around smaller ends of the pulleys 12 and 13 in the opposite direction from that in which the shade 40 is wound around the drum 10, and the ends 51 and 62 are fastened to the pulleys 12 and 13. The pulley 13 is manually turned slightly to release the pin 37, and the shade is ready for use.

A modification of the invention is shown in FIGURE 8, which illustrates a different means for maintaining tension on the cord 50. If the device of FIGURE 8 is used, the assembly which provides the torsion spring 34 is eliminated and, instead, the spool 13 is nailed or screwed directly to the end of the drum 10 as is the spool 12.

The device of FIGURE 8 comprises a dual pulley assembly 70, including a shaft 71, that is mounted to a side S of the window frame W. Two pulleys 72 and 73 are separately rotative upon the shaft 71. One of

the pulleys has a central sleeve 74 that revolves around the shaft 71. The other pulley 73 has a central sleeve 75 that extends in the opposite direction from that of the sleeve 74 and revolves around the sleeve 74. Both of the sleeves are of about equal length to the combined width of the pulleys 72 and 73 to give stability to the pulleys and prevent wobbling. The pulleys are held on the shaft by a lock ring 76 and are spaced from the side S (or from a mounting plate) by a bushing 77. The outer end 78 of a torsion spring or clock spring 79 is connected to the outer side of the pulley 72, and the inner end 80 of the spring is connected to the sleeve 75 of the pulley 73. The pulleys 72 and 73 are wound relative to one another to build up an "unwinding" force in the torsion spring 79. Then the cord length 52 (or 61) is made much longer and is cut and the resulting upper and lower ends are fastened to different ones of the pulleys 72 and 73 and are wound many turns around these pulleys.

These cord ends 79 and 80 are wound around the pulleys 72 and 73 in a direction opposite to the unwinding force of the torsion spring 78. Hence, the spring 78 maintains a tension on the cord. The spring also compensates for changes in length of the cord 50 as the shade 40 is rolled and unrolled.

The first embodiment described is preferred to that of FIGURE 8 because it hides the torsion spring 34 in the drum 10. In fact, the entire tension assembly of FIGURE 1, including the spools 12 and 13, the pulleys 47 and 48 and the cord 50 can be recessed within the sides S of the window frame, if desired.

This shade can be used over a window as illustrated, but it has many other possible uses, such as for cabinet fronts, motion picture screens, sliding doors, garage doors, and the like. In these various applications, the shade can be installed to move horizontally, as well as vertically. The shade also lends itself to a motorized operation whereby a motor rotates the drum 10 to roll and unroll the shade. The motorized operation is especially useful when the shade is out of reach as when it covers high gymnasium windows.

The shade (or sheet) 40 may be made of cloth or plastic, etc., but it can also be made of series of connected thin members which individually are rigid, such as aluminum, bamboo, or other slat material.

Various changes and modifications may be made within the process of this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A shade comprising a drum, a first frusto-conical spool fixed to one end of the drum, a second frusto-conical spool supported by the other end of the drum, means for mounting the spools for rotation on opposite sides of an opening adjacent an end thereof, an axial bore in the drum adjacent the second frusto-conical spool, a torsion spring in the bore having one end connected to the drum, the second spool having a dowel projecting into the bore, the other end of the spring being connected to the dowel whereby the second spool is rotatable relative to the drum and rotation of the second spool produces an opposing moment in the torsion spring, a cord having a first end attached to the first spool adjacent the smaller end thereof and a second end attached to the second spool adjacent the smaller end thereof, the cord being wound about the spools in a direction opposite to the direction of rotation in which the second spool is biased by the torsion spring, a flexible sheet having an edge attached to the drum, the sheet being rolled about the drum in a direction opposite to that in which the cord is wound about the spools, a rod supported by the edge of the sheet furthest from the drum, a groove in the rod, the cord having a central part received within the groove, means at opposite ends of the

rod to hold the cord in the groove while permitting the cord to slide in the groove, a projecting member on each side of the opening adjacent the end of the opening opposite the drum, the part of the cord depending from the first spool extending around the projecting member on the first spool side of the opening and then extending to the adjacent end of the rod, the part of the cord depending from the second spool extending around the projecting member on the second spool side of the opening and then extending to the adjacent end of the rod.

2. The shade of claim 1 wherein there are guide members along the sides of the opening and elements at each end of the rod for maintaining contact with the guide members.

3. The shade of claim 2 wherein the guide members comprise channels and the elements comprise blocks slideable within the channels.

4. The shade of claim 1 including a pin in the second spool, and a recess in the drum for receiving an end of the pin to lock the second spool against rotation relative to the drum, a compression spring for biasing the pin out of the recess, the force of the torsion spring being sufficiently great to retain the pin within the recess.

5. The shade of claim 1 including a rod within the bore about which the torsion spring is wound to prevent its entanglement.

6. The shade of claim 5 wherein the rod has a point on its end adjacent the dowel, the point being pressed into the dowel to center the rod.

7. A shade comprising a drum, a first spool fixed to one end of the drum, a second spool supported by the other end of the drum, means for mounting the spools for rotation on opposite sides of an opening adjacent an end thereof, an axial bore in the drum adjacent the second spool, a torsion spring in the bore having one end connected to the drum, the other end of the spring being connected to the second spool whereby the second spool is rotatable relative to the drum and rotation of the second spool produces an opposing movement in the torsion spring, a cord having a first end attached to the first spool and a second end attached to the second spool, the cord being wound about the spools in a direction opposite to the direction of rotation in which the second spool is biased by the torsion spring, flexible sheet means having an edge attached to the drum, the sheet means being rolled about the drum in a direction opposite to that in which the cord is wound about the spools, a rod supported by the edge of the sheet furthest from the drum, a groove in the rod, the cord having a central part received within the groove, means to hold the cord in the groove while permitting the cord to slide in the groove, a projecting member on each side of the opening adjacent the end of the opening opposite the drum, the part of the cord depending from the first spool extending around the projecting member on the first spool side of the opening and then extending to the adjacent end of the rod, the part of the cord depending from the second spool extending around the projecting member on the second spool side of the opening and then extending to the adjacent end of the rod.

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