Title: LIFT CORD FOR WINDOW BLIND

Abstract: A lift cord in a window blind, with the blind having a headrail, a drive actuator, a bottom rail and a window covering material coupled to the headrail and the bottom rail. The lift cord comprises a cord composed of strands of high abrasion resistant material; and a coupler configured to attach the cord to each of the headrail and the bottom rail. Additional embodiments of the lift cord provide that the strands are braided together or woven together. The diameters of the strands can be different.
LIFT CORD FOR WINDOW BLIND

BACKGROUND OF THE INVENTION

[0001] This invention relates to a window furnishing and more particularly to a lift cord for a window blind.

[0002] Venetian blinds are well known and typically include a head rail, a bottom rail, and a plurality of slats arranged between the headrail and the bottom rail. The slats are typically made from a variety of materials, such as metal, wood, plastic or other materials and supported by ladders.

[0003] Such blinds also typically include a tilt mechanism to enable the slats to move from a horizontal position to a nearly vertical position to open and close the blinds to affect the passage of light. As is also conventional with such systems, flexible line members or lift cords are coupled to the bottom rail, pass through the slats or adjacent the edges of the slats and into mechanisms within an upper headrail. The cords are employed to raise the bottom rail, accumulating individual slats as the bottom rail is raised. Because of gravity, the natural tenancy of the bottom rail and accumulated slat weight is to free fall. In many instances in the prior art, cord lock mechanisms are employed to lock the cord, thereby setting bottom rail, and the slats stacked thereon at a height determined by the user. Pleated and other types of shades also include a bottom rail and include similar raising and lowering lift cord members and a cord lock mechanism.

[0004] Blinds and shades that use a cord lock mechanism typically include a portion of the lift cord that extends from the cord lock and is external to the blind or shade. This external portion of the lift cord...
may pose a danger to small children or pets. A cordless blind, such as
the one disclosed in U.S. Patent No. 5,482,100 to Otto Kuhar eliminates
the need for a cord lock and the resulting external portion of the lift cord.
The cordless blind may employ a spring motor to assist in the balance of
the bottom rail and accumulated window covering material.

[0005] Spring motors used in cordless blinds may comprise a flat
ribbon of spring metal which is pre-stressed and coiled so as to have a
natural or relaxed state in which the spring forms a tightly wound coil
disposed on or in a spring storage or take up drum. The extended free
end of the coil is attached to the hub of an output or spring drive drum
onto which the spring is backwound by rotating the output drum in a
direction to back or reverse wind the spring thereon. When the load to
which the output drum is connected is released, the curling property of
the spring causes it to rewind onto or into the storage drum toward its
natural or relaxed state. Such spring motors as described above can be of
constant or variable force, depending upon the intended use of the motor.
Other type of spring motors or other lifting means may also be used.

[0006] In connection with the use of such a spring motor and a
venetian blind, as an example, a control drum or spool is coupled to one
of the storage or output drum for rotation therewith. Depending on the
number and location of the lift cords, the lift cords may be attached to a
single spool or to two or more spools. The flexible member or lift cords
are wound onto the spool in a direction which provides for the unwinding
of the cords to rotate the spring output drum in the direction for winding
the spring member thereon from the spring storage drum.

[0007] When the bottom rail is lowered, the cords unwind from
the spool or spools thus driving the spring output drum to wind the spring
member thereon. Upward displacement of the bottom rail toward the
head rail from a lowered position results in the spring member rewinding
on the spring storage drum to rotate the spring output drum and thus the spools in the direction to rewind the cords. In elevating and lowering a suspended load of the foregoing example type, which is too heavy to provide desire displacement characteristics in connection with the upward and downward movement of the bottom rail, and using a single spring motor, many times it is necessary to provide a larger spring motor or couple two or more spring motors.

[0008] If the spring motor has a spring force that varies such that the force increases as the bottom rail is moved toward the head rail, the spring force may balance the increased weight of the window covering that accumulates on the bottom rail as it is raised. However, if the spring force is a constant force then the spring force and weight of the bottom rail and accumulated window covering may not be in balance for the full range of positions of the bottom rail relative to the head rail.

[0009] If a spring motor is selected with a spring having a spring force sufficient to maintain the bottom rail and accumulated window covering in the raised position, the spring force may be excessive when the bottom rail is in the lowered position. As a result the bottom rail may creep upward until the cordless blind system is in balance. Creep being the movement of the bottom rail relative to the head rail away from the desired position as set by an operator of the blind.

[0010] Because of the difference in materials of the slats, the size of the blind, the number of slats in the blind, the weight of the parts plus the weight of the bottom rail, etc., the motor must have different characteristics and be designed for different loads. To avoid having to design a separate motor for each type or combination of blind components, a balance of forces, typically in friction forces, within the blind system is desired. Where the spring force is sufficient to maintain the bottom rail and accumulated window covering in the raised position,
but strong to allow the bottom rail to maintain its position in the lowered position, additional friction is required. However, the additional friction is only required in a single direction to avoid upward creep. It should be understood that the above described mechanism and procedure could be reversed such that the bottom rail contains the spring motor and related apparatus and the additional friction is required to avoid "droop." Droop being the downward movement of the bottom rail from a position set by the operator of the window covering.

[0011] The window blind lift cord typically is a thin cord, especially in a cordless blind system. The thin cord is susceptible to cutting and fraying. Cord damage can occur for example during assembly, shipping, installation and extended or improper use.

[0012] One approach to the damage problem has been the use of a high density polyethylene cord, for example Spectra® or Kevlar®. Such cords are abrasion resistant. However, such cords are not readily receptive of dye colors. In the window blind market numerous different colors are required to meet consumer demand.

[0013] Thus there is a need for a window blind that will provide a balance of forces to avoid creep of the bottom rail. There is a further need for a friction applying system that will provide a cord that exerts a resistant frictional force in a blind system. There is a further need for a lift cord used in a window blind that can be dyed to a selected color.

[0014] It would be desirable to provide a blind with or providing any one or more of these or other advantageous features

SUMMARY OF THE INVENTION

[0015] There is provided a lift cord in a window blind, with the blind having a headrail, a drive actuator, a bottom rail and a window covering coupled to the headrail and the bottom rail. The lift cord
comprises a cord composed of strands of high abrasion resistant material; and a coupler configured to attach the cord to each of the headrail and the bottom rail. Additional embodiments of the lift cord provide that the high abrasion resistant strands are braided together and woven together. The strands can be dyed. The diameters of the strands can be different.

[0016] There is also provided a window covering material comprising a headrail, a bottom rail, a window covering material disposed between the headrail and the bottom rail, and at least one lift cord operatively coupled to the headrail and the bottom rail. The lift cord is composed of strands of high abrasion resistant material. The high abrasion resistant material can be braided together or woven together and the strands can be dyed. Another embodiment of the window blind provides that the diameter of one strand is greater than the diameter of the other strand of the lift cords.

[0017] There is also provided a method of providing a resistant force in a window blind, with the window blind including a headrail, a bottom rail and a window covering material disposed between the headrail and the bottom rail. The method comprises providing a lift cord, with the lift cord composed of high abrasion resistant material. Then coupling the lift cord to the headrail and the bottom rail, wherein the lift cord exerts a selected amount of frictional resistant force to avoid creep of the bottom rail. The method can also include the step of weaving the strands together or the step of braiding the strands together. The method can also include the step of dying one or more of the strands.

[0018] There is also provided a lift cord in a window blind, with the window blind having a headrail, a bottom rail and a window covering coupled to the headrail and bottom rail. The lift cord comprises a cord composed of a plurality of strands, with each strand composed of one of a high density polyethylene strand and one aramid fiber, and a coupler
configured to attach the cord to each of the headrail and the bottom rail. The strands can be woven together or braided together.

[0019] There is also provided a lift cord and a window covering, with the window covering having a head rail with a drive actuator, a bottom rail and a window covering material coupled to the head rail and bottom rail. The lift cord is comprised of a cord composed of the first strand of material and a separate second strand of a second material, with the second material having a higher abrasion resistance than the first strand of the material. The cord is coupled to each of the head rail and the bottom rail with a coupler. The lift cord can be configured as a ribbon and the first and second strands of material can be braided together or woven together.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Fig. 1 is a perspective view of an exemplary embodiment of a cordless blind.

[0021] Fig. 2 is a fragmentary top view of the top rail of the cordless blind illustrated in Fig. 1 along the line 2-2, including a one-way tensioning mechanism and exemplary embodiment of a lift cord composed of high density polyethylene and polyester.

[0022] Fig. 3 is a sectional view of the one-way tensioning mechanism in the head rail of the cordless blind illustrated in Fig. 2 along the line 7-7, with the pulley of the one-way tensioning mechanism in the stopped position and the bottom rail in a stopped position.

[0023] Fig. 4 is a sectional view of the one-way tensioning mechanism illustrated in Fig. 3 with the pulley in the stopped position and bottom rail moving up with the lift cord winding on a spool and sliding around the stationary pulley cylinder.
[0024] Fig. 5 is a sectional view of the one-way tensioning mechanism illustrated in Fig. 3 with the pulley in the free-wheeling position and the bottom rail moving down.

[0025] Fig. 6 is an illustration of a cross-section of an exemplary embodiment of a lift cord having a high density polyethylene strands and polyester strands defining a tube structure.

[0026] Fig. 7 is an illustration of a cross-section of an exemplary embodiment of a lift cord having high density polyethylene strands and polyester strands constructed about a core.

[0027] Fig. 8 is an illustration of a cross-section of an exemplary embodiment of a lift cord having a plurality of high density polyethylene strands constructed about a polyester strand core.

[0028] Fig. 9 is an illustration of a cross-section of an exemplary embodiment of a lift cord having a plurality of high density polyethylene strands and a plurality of polyester strands, with the high density polyethylene strands having a diameter larger than the diameter of the polyester strands.

[0029] Fig. 10 is an illustration of a cross-section of an exemplary embodiment of a lift cord having a plurality of high density polyethylene strands constructed about a single polyester strand core, with the polyester strand having a larger diameter than the high density polyethylene.

[0030] Fig. 11 is an illustration of a cross-section of an exemplary embodiment of a lift cord having a plurality of bundles, with each bundle comprising a plurality of high density polyethylene strands and polyester strands.

[0031] Fig. 12 is an illustration of a cross-section of an exemplary embodiment of a lift cord having a plurality of high density polyethylene strands and polyester strands in a flat ribbon configuration.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] The exemplary embodiments shown in the Figures relate generally to the art of a frictional, resistant force exerting lift cords, including window coverings such as cordless blinds, venetian blinds and window shades. More specifically, the present exemplary embodiments relate to a lift cord to attain one or more desired performance characteristics.

[0033] Performance characteristics of a blind may include the effort necessary to raise or lower the bottom rail, the speed of which the bottom rail may be raised or lowered, and whether the bottom rail remains in a static position relative to the head rail when released (i.e., "balanced"). Movement of the bottom rail upward after it is released is referred to as "creep," and movement of the bottom rail downward after it is released is referred to as "droop." The performance characteristics of the blinds and drive actuators shown in the Figures may depend on the customers preferences, and may be variable, selectable, and adjustable by a retail sales associate, the installer, and/or the customer.

[0034] As shown in the Figures, the blind is configured to be balanced at any of a variety of times (e.g., after a test operation at a retail sales location, after customization which may be done at the point of sale or prior to installation or the like after installation, periodically during its life, etc). A balanced blind is one that maintains the position of the bottom rail at any position or location between a fully lowered (wherein the window is covered) and fully raised position (where the window is uncovered) relative to the headrail when released by the operator. Movement of the bottom rail toward or away from the headrail after the bottom rail has been released by the operator is referred to as creep and droop.
[0036] The performance characteristics, particularly whether a blind is "balanced," depends on a number of variables including weight of the bottom rail plus any accumulated window covering (\(\Sigma W\)), force of the spring motor ("Fs"), and frictional forces in the system collectively referred to as \(f\). A blind is balanced when the friction force is greater than the absolute value of the difference of the weight and the spring motor force (i.e., \(f > |\Sigma W - Fs|\)).

[0036] Referring to FIGURE 1, blind 12 provides spring motor 26 mounted in a horizontal configuration and located in head rail 14. Such a horizontal configuration is intended to decrease the overall height of head rail 14. The spring motor 26 can also be mounted in the bottom rail 16. When bottom rail 16 is in a lowered position, slats 18 are independently supported from head rail 14 by a flexible ladder and are evenly vertically spaced from one another. Bottom rail 16 may be connected to terminal ends of the flexible ladder. As bottom rail 16 is raised, slats 18 stack upon one another and are supported by bottom rail 16. Bottom rail 16 and the stacked slats 18 are supported by first and second cords 30, 32 on each end of the bottom rail. The first and second cords 30, 32 on each end are located proximate the longitudinal edges of the slats. Depending on the type of slats and size of the blind, other cord configurations may also be employed. As illustrated in Fig. 1 first and second cords 30, 32 of each end of the blind 12 are coupled to the spring motor 26 mounted in head rail 14 via a respective cord spool 28. It should be understood that the spring motor 26 and associated hardware can also be mounted in the bottom rail 16.

[0037] Each cord spool 28 is coupled to the spring motor such that rotation of the cord spool results in rotation of the spring motor. As shown in Figure 1, drive actuator 20 includes two spring motors 26, with one cord spool 28 attached to a respective spring motor 26. However, a
single spring motor could also be employed, with the cord spools being coupled to either end of the spring motor. As shown in Fig. 2 cords 30, 32 are wound about a single spool, with each cord being wound on the spool separated by a flange.

[0038] In FIGURE 1, spring motor 26 and the cord spools 28 are mounted such that their axes are in a vertical position. Such a configuration gives an overall appearance of the drive actuator 20 as a horizontal spring mount configuration located in head rail 14. To adjust blind 12, the user grasps bottom rail 16 and raises or lowers it to the desired position. (See Figs. 4 and 5) Raising bottom rail 16 allows spring tension in spring member to wind or collect spring member about the storage drum so that first and second cord 30, 32 may be collected by their respective cord spools 28.

[0039] The blind 12 may be provided with a tilt mechanism 22 as shown in Figs. 1 and 2. The tilt mechanism 22 includes a tilt drum 38 mounted on a tilt drum bracket 42. A ladder cord 40 is coupled to each of the slats on the window covering 18 and terminates by engaging the bottom rail 16. The ladder cord 40 is coupled to the tilt drum 38. A tilt rod 36 couples the tilt drum 38 to the tilt actuator 33 which is also mounted in the headrail 14. A tilt wand 34 is coupled to the tilt actuator 33. When an operator rotates the tilt wand 34 in one direction, the tilt actuator 33 moves which in turn rotates the tilt rod 36 and moves the tilt drum 38. Such action either winds or unwinds the ladder cord 40 around the tilt drum 38 which in turn moves the slats of the window covering 18 from one position to another position, typically a horizontal to almost vertical position. Such action adjusts the amount of light allowed to ingress or egress the window. An additional tilt drum 38 and tilt drum bracket 42 may be mounted in the headrail 14 and coupled to the tilt mechanism 22 by an appropriately sized tilt rod 36. (See Fig. 1)
[0040] Friction can be provided to the cords 30, 32 coupled to the bottom rail 16 in the window covering slats 18 by use of a one-way tensioning mechanism 24. The tensioning mechanism 24 is configured to provide a resistant force on movement of one of the first and second cords 30, 32 in one direction. As shown in Fig. 1, an additional set of cords 30, 32 are coupled to the bottom rail 16. It is also contemplated that one cord is coupled to a one-way tensioning mechanism.

[0041] Referring to Figures 4 and 5, Fig. 4 illustrates a one-way tensioning mechanism 24 having the pulley 62 in the stopped position. As the bottom rail is moved upward, the pulley 62 is forced to move laterally within the aperture 52, 58 in the one-way tensioning mechanism 24 until one of the ratchet teeth 76 engages the pawl 60 on each of the uprights 48, 54 of the mechanism bracket 44. With the pulley 62 engaged with the pawl 60, the pulley cannot rotate within the apertures 52, 58 and the pulley 62 is in a stopped position. The cord 30 slides around the cylinder 64 of the pulley 62. Such sliding movement produces a frictional force that acts to balance the forces within the blind 12 and prevent creep. The frictional force can be modified by varying the combination of cord material and pulley composition. As the cord 30 slides around the pulley 62, the cord 30 is collected on the cord spool 28 which is coupled to the spring motor 26.

[0042] Referring to Fig. 5, when the bottom rail 16 is pulled down, the cord 30 is unwound from the cord spool 28. As the cord 30 moves down, it forces the pulley 52 to move laterally within the apertures 52, 58 in the one-way tensioning mechanism 24 which disengages the ratchet teeth 76 from the pawl 60 on each of the uprights 48, 54 of the mechanism bracket 44, thereby allowing the pulley 62 to free-wheel about an axle 68.
[0043] The one-way tensioning mechanism can be conventionally mounted in the headrail or bottom rail by the use of fasteners such as screws or rivets or can be coupled to the headrail 14 or bottom rail 16 by a suitable adhesive such as epoxy or glue.

[0044] Although the one-way tensioning mechanism 24 has been shown mounted in the headrail 14 of the cordless blind 12, it is also contemplated that the one-way tensioning mechanism 24 can be mounted in a suitable bottom rail 16 with the appropriate drive actuator 20 and related mechanisms. In some instances, a second one-way tensioning mechanism 24 configured to provide a resistant force on movement in one direction of the other cord in the cordless blind 12 can be mounted in either the headrail 14 or the bottom rail 16 of the cordless blind 12. It should be noted that a typical cordless blind 12 does have two cords and one cord would be mounted on each one-way tensioning mechanism 24 as described above. The one-way tensioning mechanism can be mounted in the headrail of the cordless blind or can be mounted in the bottom rail 16 of the cordless blind 12.

[0045] Referring to Figs. 6-12, there are illustrated several exemplary embodiments of a lift cord 30. It should be understood that reference is made to lift cord 30 however, it is contemplated that all the lift cords 30, 32 in the window blind 12 are configured similarly. Therefore, reference to lift cord 30 is applicable to all lift cords.

[0046] In a cordless blind, the lift cord 30 wraps up on a spool 28. When designing a blind system, the larger the diameter the cord becomes, results in the spool being correspondingly larger to accommodate such larger cord. As the diameter of the spool increases, the spool starts to affect the torque required to turn the larger spool with the accumulating cord. Such affect on the torque, particularly in a cordless blind system, may not be advantageous. As a result, the
diameter of the cord, in a cordless system tends to be small in comparison to other lift cords, tilt cords or the like in a blind system.

[0047] In a window blind system, the lift cord typically can be between about 0.7 mm to 1.4 mm in diameter. In a cordless blind system, the lift cord typically is about 0.9 mm in diameter. With a cord diameter so small, it is susceptible to abrasion and abrading on sharp metal edges, over tensioning or even jostling during shipping and handling of the blind. To avoid or minimize such cord damage, cords composed of strands of high abrasion resistant material can be used. One example of a high abrasion resistant material is Spectra®, which is composed of high density polyethylene. Another example is Kevlar®, which is composed of aramid fibers. Such high density polyethylene tends to be very "slippery" which in turn affects the frictional force balance in a window blind system, particularly in a cordless window blind system. By "slippery" it is meant that there is less friction between the cord and the various surfaces over which the cord moves during operation of the blind system. Another problem with using high density polyethylene alone is that it does not take a color dye very readily. The ability to color dye the lift cord in a blind system is important for consumer and user acceptance and aesthetic compatibility with typical home furnishings.

[0048] A solution to the above identified problems with the high density polyethylene lift cord is to provide a cord composed of a first strand of material and a separate second strand of a second material with the second material having a higher abrasion resistance than the first strand of material. Strands of high density polyethylene or high molecular weight polyethylene or aramid fibers and strands of polyester can be woven or braided together to form a lift cord. Such construction can take several different shapes and forms and still maintain a nominal 0.9 mm overall diameter of the lift cord. The strand having the higher abrasion
resistance provides the abrasion resistance needed for the size of lift cord and the polyester readily takes color dye to provide the decorative ability for the lift cord 30. In other words, the first strand of material, such as polyester 88, has a different dye receiving characteristic than the second strand of second material, such as high density polyethylene 86. Therefore, the first strand of material is dyed differently than the several strands of second material, resulting in an overall suitable color for the lift cord 30.

[0049] An additional benefit from the combination of the two types of strands and polyester strand is that the lift cord constructed of such strands is "less slippery" than the high density polyethylene or aramid fiber lift cord alone. In other words, the construction of the lift cord 30 can be tuned by varying the combination of strands to achieve a certain frictional characteristic of the lift cord that can be utilized to balance the frictional forces within the window blind system 12. The high abrasion resistant material can be composed of at least two strand types selected from a group including high density polyethylene, aramid fiber and polyester. The more advantageous configuration of a lift cord 30 provides for the strand having the higher abrasion resistance to be the outer-most strand of the cord. Such configuration can be accomplished by sizing the strand appropriately as illustrated in Figure 9 or placement of the strands, as illustrated specifically in Figures 8, 10 and 12.

[0050] As mentioned above, the construction of the lift cord 30 can be accomplished by braiding or weaving the various strands combinations to achieve a desired result. It is understood that braiding is accomplished by interweaving three or more strands of a material and weaving is accomplished by interlacing the strands of material.

[0051] A typical lift cord is braided and can be composed of nylon and polyester strands. The strands in a braided construction form
diamond shapes in the cord. Such diamond shapes are not rigid, especially in the longitudinal direction of the lift cord. When such braided cord stretches, it breaks down the construction and the strands separate or delaminate. Residual tension in the strand tends to pull back and knots can form in the lift cord. For a woven lift cord, the problems identified above for a braided lift cord are avoided. A woven lift cord is constructed with strands (called warp yarns) configured parallel to the length of the lift cord and strands (called weft yarns) configured perpendicular to the parallel strands. The warp and weft strands are woven together to form the lift cord. Longitudinal forces are carried by the parallel strands or warp yarns and there is considerably less stretch than in the braided construction. It has been observed that for the same size cord that the woven configuration exhibits half the elongation as the braided configuration and twice the tensile strength as the braided configuration.

The woven cord can be configured to have different cross-sections. For example, the cord can be configured as a ribbon or the strands can be of different diameter or the strands can be assembled to define a tube structure.

[0052] Figures 6-12 illustrate several exemplary embodiments of lift cord 30 with various configurations and combinations of the first strand of material, such as polyester 88, a separate second strand of a second material, such as high density polyethylene, for example, Spectra® or aramid fiber, for example, Kevlar® strands. The cross-sectional view depicted in each Figure is similar for the woven or braided construction technique. It should be understood that the illustrated and identified strand types in the figures are exemplary embodiments and that similar constructs of a lift cord 30 can be accomplished with strands of the same type, for example all strands being polyester or all strands being a high density polyethylene or the like. It is also contemplated that any of the
strand materials identified heretofore can be used to achieve the desired abrasion resistance characteristic, dye receiving characteristic, and friction characteristic.

[0053] Figure 6 illustrates a lift cord 30 having a plurality of high density polyethylene strands 86 and a plurality of polyester strands 88 assembled to define a tube structure. In other words, a central void is formed by the high density polyethylene 86 and polyester 88 strands.

[0054] Figure 7 illustrates a lift cord 30 composed of high density polyethylene 86 and polyester 88 strands constructed about a core 89. The core can be fashioned from any convenient and suitable material and typically will be either high density polyethylene or polyester.

[0055] Figure 8 illustrates a lift cord 30 composed of a plurality of high density polyethylene strands 86 constructed about a single polyester strand 88.

[0056] Figure 9 illustrates a lift cord 30 having a plurality of high density polyethylene strands 86 and a plurality of polyester strands 88, with the high density polyethylene strands 86 having a diameter larger than the diameter of the polyester strands 88.

[0057] Figure 10 illustrates a lift cord 30 having a plurality of high density polyethylene strands 86 constructed about a single polyester strand cord, with the polyester strand 88 having a larger diameter than the high density polyethylene strands 86.

[0058] Figure 11 illustrates a lift cord 30 having a plurality of bundles 90 with each bundle 90 comprising a plurality of high density polyethylene strands 86 and polyester strands 88.

[0059] Figure 12 illustrates a lift cord 30 having a plurality of high density polyethylene strands 86 and polyester strands 88 in a flat ribbon configuration.
[0060] It should be understood that the various illustrations depicted in Figures 6-12 are not limited to the number of strands depicted in such illustrations but can be more or less of each of the various strands as desired by the designer and manufacturer of the window blind system 12. It should also be understood that the individual strands of the high density polyethylene, or aramid fibers, or the polyester can be composed of yarn components which can be twisted into a strand.

[0061] A lift cord 30 is installed in a window blind system, such as a cordless blind 12 by attaching the cord 30 to each of the headrail 14 and bottom rail 16 with a cord coupler 80. The cord coupler 80 can be a cord knot at the end of the cord 30 as illustrated in Figures 4 and 5 or it can be a cord fastener 84 as illustrated in Figure 3. The cord fastener, can be a rivet, pin, adhesive or the like.

[0062] The frictional force in the window covering system can also be tuned or adjusted by selecting and providing a friction bearing surface and installing that surface in the system. For example, a bracket having a plurality of slots can be installed and operatively couple the lift cord 30 to the bracket. The bracket will change the tension force on the lift cord 30 because of the angle change and it also creates friction between the cord 30 and the bracket surface material. Such a bracket is disclosed in U.S. Pat. No. 5,482,100 to Otto Kuhar, which is incorporated herein by this reference. Another example is a grommet composed of fish-scaled material which the lift cord 30 is contacting and passes over. Since the lift cord 30 is resistant to abrasion, the cord can be contacting various types of friction enhancing or diminishing materials and devices to tune the cordless window covering system.

[0063] Thus, the exemplary embodiment features lift cords that exert a selected amount of frictional resistant force to avoid creep and droop of the bottom rail in a window blind. It also features a window
blind or shade in which a spring motor is used to eliminate conventional pull cords and cord lock mechanisms and can employ one or more one-way tensioning mechanisms to provide a resistant force on movement of one of the first and second cords in the window blind.

[0064] The term “cordless blind” is not meant as a term of limitation insofar as any blind, shade or like apparatus having a decorative or functional use or application as a window covering or furnishing is intended to be within the scope of the term. The use of the term “cordless blind” is intended as a convenient reference for any blind, shade or structure that does not have cords (example, pull cords) hanging freely for manipulation by the user. It is also important to note that the use of the term “cordless” does not mean that no cords are used within the blind itself. The term “window covering” is intended to include any of the variety of blind arrangements, including horizontal vanes or slats, roller shades, cellular shades, pleated shades, etc.

[0065] As a result of the lift cords composed of high abrasion resistant strands, there is increased friction in the system when the bottom rail is in a static position. This increased friction aids to prevent upward movement of the bottom rail toward the headrail thereby preventing upward creep. However, as the bottom rail is manually lifted by a user to raise the bottom rail toward the headrail, the tension in the cord is released allowing the cords to slide around the pulley or through a grommet. The lift cord can also be dyed to provide various color combinations suitable and attractive to users. The first strand of material can have a different dye receiving characteristic than the second strand of material. More specifically, the polyester strand portion of the lift cord is more susceptible to color dye than the high molecular weight polyethylene or aramid fibers strand.
The specific examples illustrated in the Figures, and the particular formulations given and to describe exemplary embodiments of the present invention, serve as the purpose of illustration only. The lift cords shown and described may differ depending on the chosen performance, characteristics and physical characteristics of the blinds. The systems shown and described are not limited to the precise details and conditions disclosed. For example, other types of one-way tensioning mechanisms may be used. A pulley that only rotates in one direction by use of an internal ratchet and pawl system may be used, or any type of pulley in which movement is inhibited in one direction greater than the opposite direction. Further a tensioning mechanism such as an engagement surface having increased frictional characteristics in one direction, such as a fish scale arrangement may also be employed. It is also contemplated that a flat ribbon configuration for the lift cords can be used. Furthermore, other substitutions, modifications, changes and omissions may be made in the design, operation, operating conditions and arrangements of the exemplary embodiments without departing from the scope of the invention as expressed in the appended claims.
WHAT IS CLAIMED IS:

1. A lift cord in a window blind, with the blind having a headrail with a drive actuator, a bottom rail and a window covering coupled to the headrail and bottom rail, the lift cord comprising:
   a cord composed of strands of high abrasion resistant material; and,
   a coupler configured to attach the cord to each of the headrail and the bottom rail.

2. The lift cord of claim 1, wherein the strands of high abrasion resistant material are braided together.

3. The lift cord of claim 1, wherein the strands of high abrasion resistant material are woven together.

4. The lift cord of claim 1, wherein the high abrasion resistant material is composed of at least two strand types selected from a group including high density polyethylene, aramid fiber, and polyester.

5. The lift cord of claim 4, wherein at least one strand type is one of Kevlar® and Spectra®.

6. The lift cord of claim 4, wherein the strand diameter of each strand type is equal.

7. The lift cord of claim 4, wherein the strand diameter of each strand type is different.

8. The lift cord of claim 4, wherein at least one strand is dyed.
9. The lift cord of claim 1, wherein the lift cord is coupled to a tensioning mechanism mounted in one of the headrail and bottom rail of the cordless blind.

10. The lift cord of claim 1, wherein the cord is in contact with a friction bearing surface.

11. The lift cord of claim 3, wherein the lift cord is configured as a ribbon.

12. A window covering comprising:
   a headrail;
   a bottom rail;
   a window covering material disposed between the headrail and the bottom rail; and,
   at least one lift cord operatively coupled to the headrail and the bottom rail, the lift cord being composed of strands of high abrasion resistant material.

13. The window covering of claim 12, wherein the strands of high abrasion resistant material are braided together.

14. The window covering of claim 12, wherein the strands of high abrasion resistant material are woven together.

15. The window covering of claim 12, wherein the high abrasion resistant material is composed of at least two strand types selected from a group including high density polyethylene, aramid fiber, and polyester.

16. The window covering of claim 15, wherein at least one strand type is one of Kevlar® and Spectra®.
17. The window covering of claim 15, wherein the strand diameter of each strand type is equal.

18. The window covering of claim 15, wherein the strand diameter of each strand type is different.

19. The window covering of claim 15, wherein at least one strand is dyed.

20. The window covering of claim 12, wherein the lift cord is coupled to a tensioning mechanism mounted in one of the headrail and bottom rail of the cordless blind.

21. The window covering of claim 12, wherein the cord is in contact with a friction bearing surface.

22. The window covering of claim 14, wherein the lift cord is configured as a ribbon.

23. The window covering of claim 12, including a drive actuator having a spring motor and a spool for accumulating the lift cords coupled to the spring motor.

24. A method of providing a resistant force in a window blind, with the window blind including a headrail, a bottom rail, and a window covering material disposed between the headrail and the bottom rail, the method comprising:

   providing a lift cord, with the lift cord composed of strands of high abrasion resistant material; and,

   coupling the lift cord to the headrail and the bottom rail, wherein the lift cord exerts a selected amount of frictional resistant force to avoid creep of the bottom rail.

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25. The method of claim 24, wherein the high abrasion resistant material is composed of at least two strand types selected from a group including high density polyethylene, aramid fiber, and polyester.

26. The method of claim 25, wherein at least one strand type is one of Kevlar® and Spectra®.

27. The method of claim 25, including the step of weaving the high abrasion resistant material strands together.

28. The method of claim 25, including the step of braiding high abrasion resistant material strands together.

29. The method of claim 27 or 28, including the step of dyeing at least one strand.

30. The method of claim 24, including the steps of providing a pulley and mounting the pulley in the headrail, and coupling the lift cord to the pulley.

31. The method of claim 24, including the steps of selecting a friction bearing surface, installing the friction bearing surface in the window blind, and operatively coupling the lift cord to the friction bearing surface.

32. The method of claim 24, including the steps of providing a friction bearing surface, and contacting the cord with the friction bearing surface.

33. A lift cord in a window blind, with the blind having a headrail, a bottom rail and a window covering coupled to the head rail and bottom rail, the lift cord comprising:
a cord composed of a plurality strands, with each strand composed of one of a high density polyethylene strand and an aramid fiber; and,

a coupler configured to attach the cord to each of the headrail and bottom rail.

34. The lift cord of claim 33, wherein the strands are woven together.

35. The lift cord of claim 33, wherein the strands are braided together.

36. The lift cord of claim 33, wherein the lift cord is coupled to a tensioning mechanism mounted in one of the headrail and bottom rail of the window blind.

37. The lift cord of claim 33, including a drive actuator mounted in one of the headrail and bottom rail, with the drive actuator having a spring motor and a spool for accumulating the lift cord coupled to the spring motor.

38. The lift cord of claim 33, wherein the cord is in contact with a friction bearing surface.

39. The lift cord of claim 33, wherein at least one strand type is one of Kevlar® and Spectra®.

40. The lift cord of claim 34, wherein the lift cord is configured as a ribbon.
41. A lift cord in a window covering, with the window covering having a headrail, a bottom rail and a window covering material coupled to the headrail and bottom rail, the lift cord comprising:

   a cord composed of a first strand of material and a separate second strand of a second material, with the second material having a higher abrasion resistance than the first strand of material, the cord being operatively coupled to the headrail and the bottom rail.

42. The lift cord of claim 41, wherein the first and second strands of material are braided together.

43. The lift cord of claim 41, wherein the first and second strands of material are woven together.

44. The lift cord of claim 43, wherein the lift cord is configured as a ribbon.

45. The lift cord of claim 41, wherein the second strand of material is composed of at least a strand selected from a group including high density polyethylene, ultra high molecular weight polyethylene and aramid fiber.

46. The lift cord of claim 45, wherein at least one strand type is one of Kevlar® and Spectra®.

47. The lift cord of claim 41, wherein the strand diameter of each strand type is equal.

48. The lift cord of claim 41, wherein the strand diameter of each strand type is different.
49. The lift cord of claim 41, wherein the first strand is polyester.

50. The lift cord of claim 41, wherein the first strand is dyed.

51. The lift cord of claim 41, wherein the lift cord is coupled to a tensioning mechanism mounted in one of the headrail and bottom rail of the cordless blind.

52. The lift cord of claim 41, wherein the cord is in contact with a friction bearing surface.

53. The lift cord of claim 52, wherein the first and second strands of material are configured so that the second strand of material is in contact with the friction bearing surface.

54. The lift cord of claim 41, wherein the window covering is a cordless blind.

55. The lift cord of claim 41, wherein the first strand of material is dyed differently than the second strand of second material.

56. The lift cord of claim 55, wherein the first strand of material has different dye receiving characteristics than the second strand of second material.
57. A lift cord in a window covering with the window covering having a headrail, a bottom rail and a window covering material coupled to the headrail and the bottom rail, the lift cord comprising:
   a cord composed of a first strand of material and a separate second strand of the material, with the first and second strands woven together, the cord being operatively coupled to the headrail and the bottom rail.

58. The lift cord of claim 57, wherein the lift cord is configured as a ribbon.

59. The lift cord of claim 57, wherein the first and second strands of material are composed of at least a strand selected from a group including high density polyethylene, ultra high molecular weight polyethylene, aramid fiber, nylon, and polyester.

60. The lift cord of claim 59, wherein the strand diameter of each strand type is equal.

61. The lift cord of claim 59, wherein the strand diameter of each strand type is different.

62. The lift cord of claim 57, wherein the cord is in contact with a friction bearing surface.

63. The lift cord of claim 57, wherein the window covering is a cordless blind.

64. The lift cord of claim 59, wherein the first strand of material has different dye receiving characteristics than the second strand of second material.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E06B/326

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E06B D02G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<td>GB 1 037 585 A (HUNTER DOUGLAS INTERNAT LTD) 27 July 1966 (1966-07-27)</td>
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X Patent family members are listed in annex.

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Date of the actual completion of the international search

13 February 2003

Date of mailing of the international search report

20/02/2003

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Gevaerts, D

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