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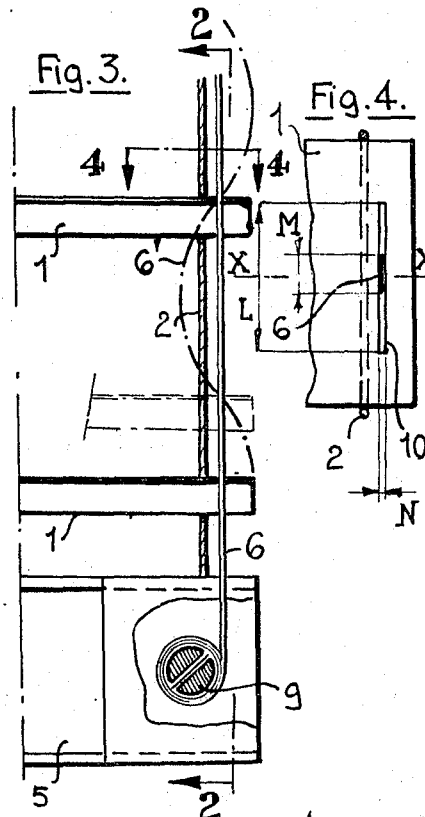
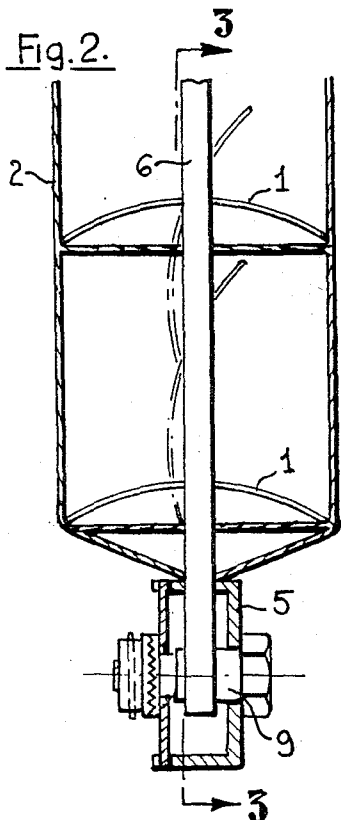
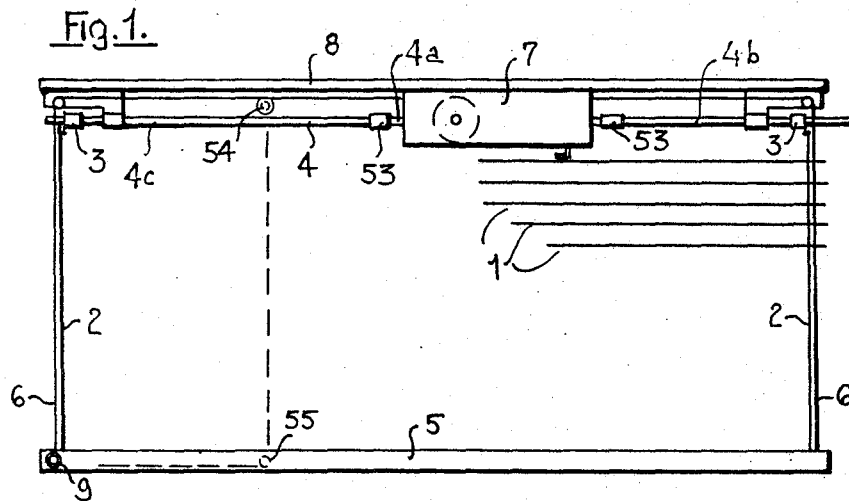
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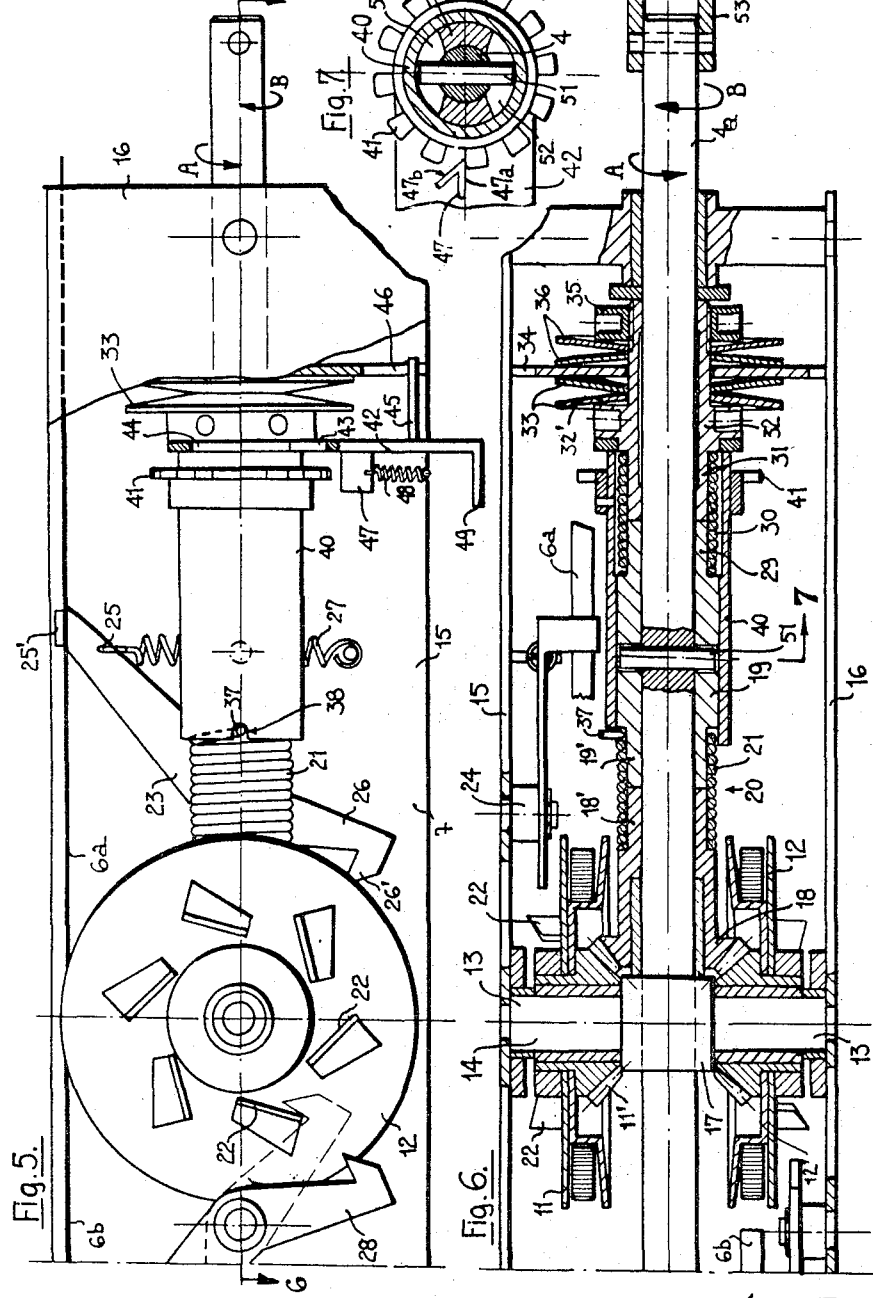
VENETIAN BLINDS

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VENETIAN BLINDS

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The present invention relates to a slatted blind comprising a flexible pull member to which a bottom cross-member of the blind is suspended and which is wound around a drum rotatable to either hand to raise and lower the blind.

As a rule, blinds of this kind have metal or plastics slats which are mounted parallel with one another on flexible ladders, for instance, of textile material, the ladders being suspended on a tilting mechanism for varying slat orientation. The pull members, at least two of which are normally provided, are metal or plastics cables or tapes. The pull members of the known blinds slacken if an obstacle prevents the blind from being lowered, possibly with the result that the pull members may be accidentally twisted so that the blind becomes unserviceable.

It is one object of the present invention to provide a blind free from this disadvantage.

It is another object of the present invention to provide a raising and lowering mechanism for a blind and including a brake which operates to brake the rate of descent of the blind, so that it can be lowered in a controlled manner, but which is automatically released during raising of the blind so that raising can be performed with the minimum of effort.

It is a further object of the present invention to prevent overloading of the pull-tapes for raising the blind, when the blind is fully raised.

It is yet a further object of the present invention to prevent surplus lengths of the pull-tapes being released if lowering of the blind is obstructed.

It is also an object of the present invention to prevent uneven lowering of the blind whereby one lower end of the blind can drop its full distance when the descent of the other lower end of the blind is obstructed.

It is still another object of the present invention to prevent overloading of the pull-tapes, should raising of the blind be obstructed.

It is yet a further object of the present invention to provide a universal mechanism for winding and unwinding the pull-tapes of the blind and which can be incorporated into any blind irrespective of its slat length.

It is still a further object of the present invention to provide a blind wherein twisting of the pull-tapes during raising and lowering is minimised, and the opacity of the blind when in the "closed" state is improved.

With these and other objects in view which will become apparent from the following detailed description, the present invention will become apparent in conjunction with the accompanying drawings in which:

FIG. 1 is a diagrammatic view of a blind in elevation;

FIG. 2 is a section through the lower left-hand portion of the blind of FIG. 1, taken from the left and along the lines 2—2 in FIG. 3;

FIG. 3 is a section through FIG. 2 taken along the lines 3—3 of FIG. 2;

FIG. 4 is a section along the lines 4—4 of FIG. 3;

FIG. 5 is a partial elevation view of a blind-raising mechanism, to a larger scale than that shown in FIG. 1;

FIG. 6 is a section taken along the lines 6—6 of

FIG. 7 is a section taken along the lines 7—7 in FIG. 6.

The blind shown in FIG. 1 comprises a number of parallel slats 1 which are shown only in part; the slats 1 are borne by two flexible ladders 2 suspended on a tilting mechanism adapted to vary slat inclination. This mechanism comprises in known manner rockers 3 disposed on an operating shaft 4, the rockers 3 altering their inclination in accordance with the hand to which the shaft 4 is rotated. In FIG. 2, the solid lines show a midway angular position of the slats 1 and the chain-dotted lines show the slats in an upright position corresponding to closure of the blind.

A bottom cross-member 5 of the blind is retained by two pull-tapes 6 which serve to raise the blind. The tapes are wound around the two drums disposed in a raising mechanism received in a box 7 secured to a plate 8 disposed at the top of the window opening. The tapes 6 are secured to the cross member or cross-piece 5 by adjustable connecting means 9 and extend through transverse slots 10 in the slats 1, as can be gathered from FIG. 4.

The slots 10 are perpendicular to the slat longitudinal axis X—X; slot length L transversely of the slat is greater than the width M of the tapes 6, in order that the slats may be inclinable. On the other hand, slot width N lengthwise of the slat is little greater than tape thickness, so that the slots 10 form narrow guides which help to reduce twisting of the tapes. The tapes 6 are therefore guided angularly at close intervals and cannot therefore twist themselves when slackened; instead, they just take up a sinuous shape as indicated by the reference 6' in FIG. 3.

The raising mechanism shown in FIGS. 5 and 6 comprises two drums 11, 12 rotatable on cylindrical bearing surfaces 13 of a cross-spindle 14 disposed between two side uprights 15 and 16. The spindle 14 has a central part 17 formed with an aperture acting as a bearing for the shaft 4, and the drums 11, 12 are rigidly connected to face or bevel gears 11', 12' meshing with a bevel gear 18 freely rotatable on the shaft 4. The bevel gear 18 is connected to a drive sleeve 19 via a coupling comprising a helical spring 21, half of which engages over a cylindrical bearing surface 18' of the gear 18 while half engages over a cylindrical bearing surface 19', of the sleeve 19. The hand of winding of the spring 21 is such that the same tightens and clamps the sleeve 19 and gear 18 when the sleeve 19 rotates to the hand corresponding to a raising of the blind, as indicated by an arrow A (FIGS. 5 and 6), each tape 6 being wound on its respective drum; when the spring 21 opens, it can slip as the sleeve 19 is driven in the opposite direction (arrow B) corresponding to a lowering of the blind.

On the outside surface of each drum 11, 12 are six abutments 22 in the form of raised feet in the drum wall, the feet being uniformly distributed around the axis of rotation of each drum. Disposed opposite the drum 11 is a locking lever 23 rotatable on a pivot 24 rigidly connected to the upright 15. A rear arm 25 of the lever 23 has a lateral lug 25' which bears against the horizontal run of the tape 6a which winds around the drum 11. A front arm 26 of the lever 23 has a projection 26' adapted to co-operate with the abutments 22 to prevent the drum 11 from rotating. While the horizontal tape portion 6a stays pulled, the locking lever 23 is retained in an angular position in which it is away from the range of the abutments 22. When the tape 6a slackens due to the presence of an obstacle on the path of the bottom cross-member 5 of the blind as the same descends, a spring 27 moves the lever 23 clockwise in FIG. 5, the projecting part 26' on the lever then engaging below one of the abutments

coupling 20, which slips when the sleeve 19 rotates to the hand, indicated by the arrow B, corresponding to a lowering of the blind, means that immobilisation of the drum 11 by the lever 23 does not prevent rotation of the sleeve 19, the same slipping inside the spring 21 which tends to open. A second locking lever 28 devised similarly to the lever 23 locks the drum 12 when the tape portion 6b thereon slackens. Consequently, a slackening of either tape 6 automatically causes a locking of the two drums 11, 12 which are coupled together via the gear 18.

At its right-hand end (FIGS. 5 and 6) the sleeve 19 has a cylindrical bearing surface 29 which is engaged in a helical spring 30 engaging over a cylindrical bearing surface 31 of a sleeve 32 freely rotatable on the shaft 4. The sleeve 32 has a shoulder 32' and two conical washers or the like 33 are axially clamped between the shoulder 32' and the left-hand surface of a transverse wall 34 disposed between the uprights 15 and 16 (FIG. 6). A screwthreaded ring 35 screwed on the sleeve 32 forms a shoulder for two conical washers or the like 36 which are clamped axially between the ring 35 and the right-hand surface of the wall 34. The ring 35 is so screwed on the sleeve 32 as to considerably compress the conical washers 33, 36 forming a friction brake between the stationary wall 34 and the rotatable sleeve 32. The spring 30 forms a one-way coupling between the sleeves 19 and 32 and is wound in a sense such that there is a rigid connection between the sleeves 32 and 19 when the sleeve 19 rotates in the direction indicated by the arrow B, corresponding to a lowering of the blind, whereas the coupling slips when the sleeve 19 rotates to the hand indicated by the arrow A, corresponding to the blind being raised. The brake therefore operates only during the descent of the blind and is automatically cut out of operation during the raising of the blind.

The raising mechanism also comprises provision for interrupting the rotation of the drums 11 and 12 in the sense of a winding-up of the tapes 6 when the blind reaches a predetermined top position. Accordingly, the free end of the spring 21 is bent to form a finger 37 engaged in a recess 39 in the left-hand end (FIGS. 5 and 6) of a sheath 40 engaging over the sleeve 19. The sheath 40 has a castellated ring 41 (FIG. 7). The sheath 40 is normally free to rotate with the sleeve 19 and can be prevented from rotating in the direction A, corresponding to the blind being raised, by a vertically movable bolt 42 which is operated automatically when the blind has reached its top position. The bolt 42 is formed with an oblong aperture 43 for engagement on a bearing surface 44 of the sleeve 32, is guided by a pin 45 sliding in a slot 46 in the wall 34, and has a lateral projection 47 engageable in the teeth 41. The projection 47 (FIG. 7) has a front abutment surface 47a which is disposed radially in relation to the axis of rotation of the sheath 40, the projection 47 also having a rear inclined surface 47b which forms an inclined cam. The bolt 42, normally retained by a spring 48 in the bottom position shown in FIG. 5, is adapted to be raised by the blind slats when the blind is moved to its raised position. Accordingly, the bottom part 49 of the bolt 42 extends below the raising mechanism casing on the path of the top slat of the blind.

When the bolt 42 rises because the slats have reached the top position, surface 47a of the projection 47 engages in the teeth 41 to prevent the sheath 40 from continuing to rotate in the direction indicated by the arrow A (FIG. 7). The spring 21, being retained by its finger 37, cannot continue to follow the rotation of the sleeve 19 in the direction of the arrow A (blind rising). The spring 21 therefore slips on the surface 19' so that, although the sleeve 19 continues to rotate, the drive to the drums 11, 12 is interrupted automatically. At the start of the next descent, however, the inclination of rearward surface 47b of the projection 47 enables the sheath 40 to rotate backwards (arrow B, blind descending); during the descent the bolt 42 is thrust back into its bottom position.

of the teeth 43 passes by. The bolt 42 then resumes its bottom position, releasing the sheath 40 and allowing the blind to descend normally.

The sleeve 19 is rotated by the shaft 4 via a pin 51 secured therein. As can be gathered from FIG. 7, the pin 51 is received in recesses 52 in the sleeve 19 so that the coupling thus formed has an idle travel of approximately one right-angle, an amount corresponding to the operation of the rockers which are also disposed on the shaft 4.

The shaft 4 can be driven either by a crank or by a motor. It has a central portion 4a which extends through the raising mechanism box, and two lateral portions 4b, 4c which are disposed on either side of such box and which are connected to the central portion 4a by readily demountable sleeves 53 (FIGS. 1 and 6). After the latter sleeves have been dismantled the raising mechanism casing can be removed for inspection or repair without any need to dismantle the two shaft lateral portions on which the blind is suspended.

The raising mechanism in the casing 7 can be used for blinds of various widths, the length of the shaft lateral portions being modified correspondingly. For very wide or very heavy blinds, the pull tapes can be arranged to run over guide pulleys placed on the bottom cross-member 5 or to the plate 8, so that a pulley block is provided between these items. The chain line in the left-hand part of FIG. 1 shows how such a pulley block can be constructed; the tape connection place is shifted to 54 and an extra guide pulley is mounted on the bottom cross-member 5 at 55.

The blind shown has the following advantages:

The brake 32 is "off" for ascent, so that relatively little torque is required.

At the end of ascent the coupling 20 disengages automatically, so that the pull tapes cannot be overloaded.

During descent the drums 11, 12 stop automatically if the pull tapes slacken. The operating shaft can still continue to rotate without difficulty and the stop devices operate at the end of descent, when the blind is fully extended, as well as if an accidental obstacle is placed on the path of the blind.

The raising mechanism received in the central casing 7 can readily be used to operate blinds of various sizes. Inter alia a number of pull tapes can be provided on each of the two drums of the system, in which event the tapes on any one drum wind up simultaneously thereon one upon another.

The slots with which the slats are formed for the tapes, in the form of thin transverse slots, guide the tapes satisfactorily and also reduce the perforate surface of the slat, so that the darkening effect provided by the blind is improved.

The features hereinbefore described and shown in the drawings obviate any risk of the pull tapes being overloaded and ensure that the pull tapes are always kept in tension and are guided satisfactorily.

While we have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

We claim:

1. A venetian blind comprising a horizontal top member, flexible support means depending from said top member, horizontal spaced parallel slats carried by said support means, flexible pull means depending from said top member, a horizontal bottom member disposed beneath the lowermost slat and connected to the lower portions of said support means and said pull means, a blind raising and lowering mechanism mounted on said top member, drum means disposed in said mechanism and around which the upper end-portions of said flexible pull means are wound, drive means for rotating said drum means selectively in opposite directions to raise and lower the blind respec-

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and operatively movable between a first position at which rotation of said drum means by the drive means is permitted and a second position at which it interrupts the transmission of drive from said drive means to said drum means, a bias element urging said blocking means to its first position, and a bolt member on said blocking means and disposed in the path of terminal movement of the bottom member to its highest position whereby said terminal movement shifts the bolt member against the bias element to move the blocking means from its first position to its second position so that further rotation of the drum means is prevented.

2. The blind set forth in claim 1, in which said drive means includes a shaft and clutch means operatively connecting the shaft to the drum means, and said bolt member is operatively connected to the clutch means and drum means and holds the clutch means disengaged and the drum means in its final position as long as the bottom member is in said highest position.

3. The blind set forth in claim 1, in which said drive means includes a shaft, clutch means operatively connecting the shaft to the drum means, a drive part of said clutch means movable with the shaft, a driven part of said clutch means movable with said drum means, an elongated coil spring frictionally engaging said drive part and said driven part and rotatable to transmit drive therebetween during blind raising, a sleeve rotatable on said shaft and formed with an anchorage, a finger on said spring and held in said anchorage so that the spring and sleeve move together, and a castellated peripheral surface on said sleeve providing abutments selectively engaged by the bolt member when the bottom member is in said highest position to prevent further rotation of the spring.

4. A venetian blind comprising a top member, flexible support means depending from said top member, horizontal vertically-spaced parallel slats carried by said support means, first and second flexible pull means depending from opposite end-portions respectively of said top member, a horizontal bottom member disposed beneath the lowermost slat and connected to the lower portions of said support means and said first and second pull means, a blind raising and lowering mechanism mounted on said top member, two drums disposed in said mechanism and around which the upper end-portions of said first and second flexible pull means are respectively wound, a face gear formed on each drum, a drive shaft extending through said mechanism between the drums and lying in a plane parallel to the hanging plane of the blind, a hub freely-rotatable on said drive shaft, a third face gear formed on said hub about the shaft axis and meshing with the two drum face gears, and a coil spring frictionally engaging the hub and providing a coupling for transmitting drive thereto from the drive shaft.

5. A venetian blind comprising a top member, flexible ladders depending from said top member, vertically spaced rungs on said ladders, horizontal spaced parallel slats engaging between the rungs of said ladders, slots formed in said slats and extending perpendicularly of the longitudinal axes of the slats, pull-tapes extending downwardly through said slots which are longer than the pull-tape widths but are only marginally wider than the pull-tape thicknesses, a bottom member connected to the lower ends of said pull-tapes and said ladders, rocker means connected to the upper ends of said ladders, means controlling said rocker means to adjust the tilt angle of the slats about said axes, a blind raising and lowering mechanism mounted on said top member, drum means disposed in said mechanism and around which the upper end-portions of said pull-tapes are wound, drive means for rotating the drum means selectively in opposite directions to raise and lower the blind, respectively, means resiliently engaging the pull-tapes, stop means operatively connected between said resiliently engaging means and said drum means, bias

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the drum means in the event of the pull-tapes becoming slack, blocking means mounted on said top member and operatively movable between a first position at which rotation of said drum means by said drive means is permitted and a second position at which it interrupts the transmission of drive from said drive means to said drum means, a bias element urging said blocking means to its first position, and a bolt member on said blocking means and disposed in the path of terminal movement of the bottom member to its highest position whereby said terminal movement shifts the bolt member against the bias element to move the blocking means from its first position to its second position, so that further rotation of the drum means is prevented.

6. A venetian blind comprising a top member, flexible ladders depending from said top member, vertically spaced rungs on said ladders, horizontal spaced parallel slats engaging between the rungs of said ladders, slots formed in said slats and extending perpendicularly of the longitudinal axes of the slats, pull-tapes extending downwardly through said slots which are longer than the pull-tape widths but are only marginally wider than the pull-tape thicknesses, a bottom member connected to the lower ends of said pull-tapes and said ladders, rocker means connected to the upper ends of said ladders, means controlling said rocker means to adjust the tilt angle of the slats about said axes, a blind raising and lowering mechanism mounted on said top member, drum means disposed in said mechanism and around which the upper end-portions of said pull-tapes are wound, drive means for rotating the drum means selectively in opposite directions to raise and lower the blind, respectively, means resiliently engaging the pull-tapes, stop means operatively connected between said resiliently engaging means and said drum means, bias means resisted by the tension of the pull-tapes and acting to force said stop means into stopping engagement with the drum means in the event of the pull-tapes becoming slack, blocking means mounted on said top member and operatively movable between a first position at which rotation of said drum means by said drive means is permitted and a second position at which it interrupts the transmission of drive from said drive means to said drum means, a bias element urging said blocking means to its first position and a bolt member on said blocking means disposed in the path of terminal movement of the bottom member to its highest position whereby said terminal movement shifts the bolt member against the bias element to move the blocking means from its first position to its second position so that further rotation of the drum means is prevented, friction brake means disposed on said top member, and a unidirectional coupling connecting the friction brake means to brake the drum during blind lowering while disconnecting said friction brake means from the drum means and drive means during blind raising.

7. A venetian blind comprising a top member, flexible ladder depending from said top member, vertically spaced rungs on said ladders, horizontal spaced parallel slats engaging between the rungs of said ladders, slots formed in said slats and extending perpendicularly of the longitudinal axes of the slats, pull-tapes extending downwardly through said slots which are longer than the pull-tape widths but are only marginally wider than the pull-tape thicknesses, a bottom member connected to the lower ends of said pull-tapes and said ladders, rocker means connected to the upper ends of said ladders, means controlling said rocker means to adjust the tilt angle of the slats about said axes, a blind raising and lowering mechanism mounted on said top member, drum means disposed in said mechanism and around which the upper end-portions of said pull-tapes are wound, drive means for rotating the drum means selectively in opposite directions to raise and lower the blind, respectively, means resiliently engaging the pull-tapes, stop means operatively connected

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