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(54) IMPROVED ONE CORD BLINDS

VERBESSERTE JALOUSIEN MIT NUR EINER ZUGSCHNUR
STORES VÉNITIENS AMÉLIORÉS À UN SEUL CORDON

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KR-Y1- 200 219 402 KR-Y1- 200 420 162
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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates, in general, to an improved single-cord type blind and, more particularly, to an improved single-cord type blind which has less parts than in a conventional product and in which a stopper and a rotor are compressed and released with friction force of a spring so that a screen can be safely and accurately raised and lowered.

Description of the Related Art

[0002] Generally, a roller blind is used, instead of a curtain, in an office, home, a restaurant, etc. The roller blind blocks light incident through a window or the like with the action of drawing, in one direction, a ball chain engaged with a sprocket, which is mounted on one side of a bracket, so that a screen is unwound and lowered from a rotary shaft with a spring force of a spring and then is fixed at a certain position.

[0003] As shown in FIG. 1, a conventional roll blind 10 is configured such that a rotary member 5 and a speed-reduction member 8 are respectively mounted on both brackets 9, and a winding shaft on which the screen is wound is mounted to surround the members.

[0004] The rotary member 5 is configured such that a connecting shaft 3 having a rotary ring 2 is connected to a rotary body 1, and a spring 4 is fixedly mounted between the rotary body 1 and the rotary ring 2 to surround the connecting shaft 3 so that the rotary body 2 laterally moves the connecting shaft 3 with spring force of the spring 4.

[0005] The speed-reduction member 8 is configured such that a reducer 6 is mounted at the front of another rotary body 1 having an adjuster and a stationary shaft 7 having a reduction nut 7a is coupled to the reducer.

[0006] A rotary shaft on which a screen is wound is coupled to the outside of both the rotary bodies 1, and the brackets 9 are fastened to a window frame or a wall around a window using screws or the like.

[0007] The screen is raised or lowered by drawing a ball chain cord which is engaged around and hangs down in two strings from a sprocket. Specifically, when one string of the ball chain cord is drawn, the screen is lowered to block light, and when the other string of the ball chain cord is drawn, the screen is raised to make the window clear.

[0008] However, according to the conventional roller blind, since the ball chain cord hangs down in two strings so that the screen can be raised or lowered using the two strings, the operation of the screen is carried out inconveniently. Further, such a long dangling cord is likely to be a target with which children play, so that a safety accident such as the cord being coiled around the neck

of a child may occur.

[0009] To solve the above problems, a single-cord type blind has been proposed in Korean Patent No. 875633 assigned by the applicant.

5 **[0010]** As shown in FIG. 2, the single-cord type blind includes a fixing body 10, a gear unit 50, an operating plate 60, a blocking plate 70, a transfer member 80, and a cover 90.

10 **[0011]** The fixing body 10 includes a fixing plate 15, which is provided on one side with a central raised fixing section 12 having a fixing groove 11 into which a coiled spring 19 is coupled. The raised section has a fixing shaft 13 protruding from the center thereof and a plurality of fixing protrusions 14 around the fixing shaft.

15 **[0012]** The gear unit 50 includes a central gear 20, which is mounted around the outer surface of the fixing shaft 13 and has symmetrically-arranged reinforcing steps 21 on an inner surface thereof and an outer threaded part 22, circumferential small-gears 30, which are coupled to the fixing protrusions 14 and each have threaded parts 31 in such a way as to be engaged with the central gear 20, and a fixing ring 40 which is connected with the central gear and has symmetrically-arranged outer fixing steps 42 each having a cut groove 41 into which an engaging step 45 of a spring 44 is fastened.

20 **[0013]** The operating plate 60 includes a rotary gear 65 which has internal and external threads 64 and is coupled in a coupling groove at the front of the operating plate in such a manner as to internally engage with the circumferential small-gears 30, wherein a rotary cord 62 having a grip 61 on its lower portion is wound around an outer circumference thereof.

25 **[0014]** The blocking plate 70 has a central through opening 71 and is fixedly mounted at the front of the operating plate 60 so as to prevent the gear unit 50 and the rotary cord 62 from being getting out of their positions.

30 **[0015]** The transfer member 80 is mounted through the through opening 71 of the blocking plate 70 such that it abuts against the reinforcing steps 21 of the central gear 20, and has a central opening 81, into which the fixing shaft 13 is inserted, and has a front threaded end 84 and a rear coupling groove 83 having opposite side walls, one of which has an inclined surface 82.

35 **[0016]** The cover 90 is provided, in one side thereof, with a rotary part 93 which has a central opening 92 and a threaded end 91 to be engaged and coupled with the front threaded end 84 of the transfer member 80.

40 **[0017]** However, such a conventional structure has a drawback in that the raising operation of the screen performed by separation of the cover and the rotary part is carried out in a different manner for different users, being inconvenient in operation.

45 **[0018]** Another conventional blind is disclosed in US2012/222828A1.

SUMMARY OF THE INVENTION

50 **[0019]** Accordingly, the present invention has been

made keeping in mind the above problems occurring in the related art, and the present invention is intended to propose a single-cord type blind in which the operation of a screen is performed by compression and release between a stopper and a rotary part using a spring force of a spring, instead of a conventional gear mechanism, thereby facilitating an accurate operation of the screen irrespective of different users.

[0020] In order to achieve the above object the present invention proposes a single-cord type blind according to the present claim 1, furthermore, according to one aspect of the present invention, there is provided a single-cord type blind including: a stationary body, in which a fixing plate having a fixing shaft is disposed at the front side thereof and a torsion spring is mounted, wherein the stationary body has a rotary plate having a rotary cylinder with engaging parts and coupling grooves formed on an inner surface and a distal end thereof, respectively, the fixing shaft being provided on an outer surface thereof with a washer groove and being fixedly mounted in the rotary cylinder; a gear unit having a plurality of gears, an operating plate having a gripped operating cord and configured to rotate in cooperation with the plurality of gears; a blocking plate preventing the gear unit and the operating cord from getting out of their positions; and a transfer member screw-coupled with a rotary part of a cover so as to couple and decouple the cover, the single-cord type blind further including:

a stopper which is inserted around the fixing shaft of the stationary body and is fastened to the engaging parts of the stationary body and which has a through-opening, a front coupling part and a rear fixing part; a rotary section which is mounted into the through-opening of the stopper and which has front coupling grooves and a pair of symmetrically-arranged fastening protrusions each having an upper flange; a spring which is mounted around the coupling part of the stopper; a protective tube which is fixedly engaged with the coupling grooves provided in the rotary cylinder of the stationary body and which has a hollow cylindrical body having a front opening and rear-side multiple coupling pins, wherein the cylindrical body is provided, on a front end thereof, with an inner fixing ring against which the spring is seated; a rotary tube which is coupled around the protective tube and which is provided therein with a plurality of inner protrusions to be coupled into the coupling grooves of the rotary section; and a washer which is fastened to the washer groove of the fixing shaft.

[0021] The present invention has following effects.

[0022] First, the number of parts is reduced so as to simplify the structure, thereby providing the effect of reducing the manufacturing cost and improving price competitiveness.

[0023] Second, a stopper and a rotary part are compressed against and released from each other by means

of friction force of a spring, thereby providing the effect of a screen being safely operated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a conventional roller blind;

FIG. 2 is an exploded perspective view of a conventional single-cord type blind disclosed in Korean Patent No. 875633 assigned by the applicant;

FIG. 3 is an exploded perspective view of the entire construction of a single-cord type blind according to an embodiment of the present invention;

FIG. 4 is a sectional view showing the entire construction of the single-cord type blind of the present invention;

FIG. 5 is a sectional view showing the entire construction of the assembled blind of the present invention;

FIG. 6 is a perspective view showing an assembled state of a spring;

FIG. 7 is a perspective view showing an assembled state of the blind;

FIG. 8 is a sectional view showing the operation of a ball according to the related art; and

FIG. 9 is a sectional view showing the operation of the blind of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

[0026] FIG. 3 is an exploded perspective view of the entire construction of a single-cord type blind according to an embodiment of the present invention, FIG. 4 is a sectional view showing the entire construction of the single-cord type blind of the present invention, FIG. 5 is a sectional view showing the entire construction of the assembled blind of the present invention, FIG. 6 is a perspective view showing an assembled state of a spring, FIG. 7 is a perspective view showing an assembled state of the blind, and FIG. 9 is a sectional view showing the operation of the blind of the present invention.

[0027] Reference numeral 200 denotes a main body of the single-cord type blind according to the present invention.

[0028] The main body 200 includes a stationary body 210 which has a rotary cylinder 212 having engaging

parts 213 therein, a stopper 220 which is fastened to the engaging parts of the stationary body 210 and which has a front coupling part 221 and a rear fixing part 223, a rotary section 230 which has front coupling grooves 231 and a pair of symmetrically-arranged fastening protrusions 234 each having an upper flange 232, a spring 240 which is mounted around the coupling part 221 of the stopper 220, a protective tube 250 which has a hollow cylindrical body having a front opening 251 and rear-side multiple coupling pins 253, wherein the cylindrical body is provided, on a front end thereof, with an inner fixing ring 252 against which the spring 240 is seated, a rotary tube 260 which is coupled around the protective tube 250 and which is provided therein with a plurality of inner protrusions 261 to be coupled into the coupling grooves 231 of the rotary section 230, and a washer 270 which is fastened to a washer groove 216 of a fixing shaft 215.

[0029] The stationary body 210 has a rotary plate 211 which is rotated in a disc-type casing by means of elastic force of a torsion spring.

[0030] The rotary plate 211 has the rotary cylinder 212 which is provided on its inner surface and upper end with the engaging parts 213 and coupling grooves 214, respectively.

[0031] A length of the fixing shaft 215 is fixedly mounted into the rotary cylinder at one end thereof, and has the washer groove 216 on a front-side outer surface thereof.

[0032] An operating cord 280 that connects in a single line is connected with the torsion spring which is connected with the rotary plate 211 disposed in the stationary body 210 such that the torsion spring is operated by externally drawing the operating cord 280.

[0033] The operating cord 280 is provided on a distal end thereof with a loop-type grip 281 to facilitate a vertical motion of the operating cord.

[0034] The stopper 220 has a through-hole 225, the front coupling part 221 having an engaging flange 222, and the rear fixing part 224 having a plurality of grooves 223 on an end thereof.

[0035] The stopper 220 is inserted around the fixing shaft through the through-hole 225 such that the grooves 223 of the fixing part 224 are meshed with the engaging parts 213 of the rotary cylinder 212 so that the stopper 220 and the rotary plate 211 can rotate together.

[0036] The stopper 220 may be formed of a metal material to enhance friction force with respect to the spring 240.

[0037] The rotary section 230 has front coupling grooves 231 and the pair of symmetrically-arranged fastening protrusions 234 each having an upper flange 232 with cut grooves 233 formed on opposite sides thereof.

[0038] The rotary section also has a through-hole 235 through which the rotary section is inserted around the fixing shaft 215.

[0039] The fastening protrusions 234 of the rotary section 230 are elastically flexible toward each other by means of the cut grooves 233.

[0040] The rotary section 230 is coupled with the stopper 220 so as to act as a single-piece unit. The assembly is carried out by insertion of fastening protrusions 234 of the rotary section 230 into the through-hole 225 of the stopper 220.

[0041] The rotary section 230 can freely rotate in the through-hole 225 of the stopper 220.

[0042] Here, as shown in FIG. 5, the coupling part 21 has a diameter that is larger than a diameter of the rotary section 230, thereby forming a step part at a connection therebetween.

[0043] The spring 240 is mounted around the rotary section 230 and the coupling part 221 of the stopper 220, which are coupled together.

[0044] As shown in FIG. 6, the spring 240 contacts the outer surface of the coupling part 221 and fixedly abuts against the engaging flange 222 at its end, while being slightly spaced apart from the outer surface of the rotary section 230.

[0045] The protective tube 250 is a cylindrical tube which has the front circular opening 251, through which the fixing shaft 215 is inserted, and which has the circular engaging ring 252 that has a smaller diameter than the spring.

[0046] The protective tube is provided with the coupling pins 253 on the rear side thereof.

[0047] The coupling pins 253 of the protective tube 250 are engaged and laser-welded with the coupling grooves 214 of the rotary plate 211, forming a combined piece of the protective tube and the rotary plate.

[0048] Here, the spring 240 is compressed and fixed, at one side thereof, to the engaging ring 252.

[0049] That is, the spring 240 is rubbing on the outer surface of the rotary section 230 while being fixed to the engaging ring 252.

[0050] The rotary tube 260 is provided therein with the plurality of inner protrusions 261 and an opening 262 through which the rotary tube is inserted around the fixing shaft 215.

[0051] When the rotary tube 260 is coupled around the rotary section 230, which is inserted around the fixing shaft 215, through the opening 162, the inner protrusions 261 of the rotary tube 260 are fixedly meshed with the coupling grooves 231.

[0052] In this state, as shown in FIG. 6, the washer 270 is engaged with the washer groove 216 of the fixing shaft 215 so as to fix the rotary tube 260.

[0053] When the rotary plate 211 of the stationary body 210 is rotated, the stopper 220, the rotary section 230, and the rotary tube 260, which are connected with the rotary plate 211, are rotated together.

[0054] Then, a conventional blind bracket is coupled to the rear side of the stationary body 210.

[0055] Next, a stopper member 220 is mounted at the front side of the fixing shaft 215 of the stationary body 210, and a shaft 121 having a speed-reducer 120 is coupled to the front side of the stopper member 110.

[0056] Further, on the opposite side, a rotary body 5

to which a winding shaft 1, around which a roll screen is wound, is mounted at the front side of the bracket 9, wherein the rotary body 5 is connected with a connecting shaft 3 having, on its front end, a rotary ring 2. A spring 4 is mounted around the connecting shaft 3. Then, the roll screen is fixedly mounted to the outer surfaces of the winding shaft 1 and the rotary tube 270.

[0057] In this state, in order to lower the roll screen, as shown in FIGS. 5 and 9, when the grip 281 of the operating cord 280 is drawn downwards, the rotary plate 211 is rotated together with the stopper 220 coupled to the engaging parts 213.

[0058] At the same time, the spring 240 engaged with the coupling part 221 of the stopper 220 is forced to come into contact with the outer surface of the rotary section 230, which had been spaced apart from the spring by the step part, thereby allowing the rotary section 230 to rotate together with the stopper 220.

[0059] Here, the spring 240 is rubbing on the outer surface of the coupling part 221 to rotate forwards rather than rearwards.

[0060] Further, the rotary tube 260, which has been engaged with the coupling grooves 231 of the rotary section 230, rotates in the same direction as the rotary section 230 so as to lower the roll screen to a certain length.

[0061] As shown in FIG. 8, in the stopper member 110, a ball 111 rolls along a ball groove 112 and then turns towards an inclined groove 114 due to an upper protrusion 113a of a guide section 113 and rolls therealong.

[0062] This is because the center of the upper protrusion 113a is located on the right side from the center of a carrying groove 115 located upward, so that the ball 111 rolls in the direction of arrow shown in the figure and then arrives at a vertical groove 116 through the inclined groove 114.

[0063] Then, when the drawing action of the grip 281 of the operating cord 280 is stopped, the ball 111 rolls and moves to a recessed step 117 through the vertical groove 116 and enters standby mode. Here, the torsion spring 280 connected to the operating cord 280 becomes compressed and is applied with restoring force.

[0064] In this state, when the grip 281 of the operating cord 280 is drawn downwards, the above-mentioned process is repeated so that the roll screen can be lowered to a desired position.

[0065] Further, the rotary tube 260 is prevented from being returned to its initial state due to the position of the ball 111 in the stopper member 110, so that the roller screen is lowered while the torsion spring is repeatedly compressed and released.

[0066] Further, in order to raise the roll screen, when the grip 281 of the operating cord 280, which was in a stopped state, is slightly drawn down, the ball 111 in the stopper member 110 rolls and moves to a groove 118 through the inclined groove 114, and at the same time, the compressed spring 121 is released, entering a free state.

[0067] At the same time, the stopper 220 rotates in the

opposite direction, so that the spring 240, which is pressing the outer surface of the rotary section 230, rotates in the opposite direction, releasing the pressing against the rotary section 230, thereby allowing the rotary section 230 to rotate in the opposite direction.

[0068] Further, the rotary tube 260, which has been engaged with the coupling grooves 231 of the rotary section 230, also rotates in the same direction as that of the rotary section 230, thereby raising the roll screen.

[0069] At the same time, the opposite rotary body 5 also rotates in the same direction as that of the rotary tube 260 while the compressed spring 4 is released.

[0070] Although a preferred embodiment of the present invention has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope of the invention as disclosed in the accompanying claims.

Claims

1. Single-cord type blind comprising:

- a stationary body (210) having a fixing shaft (215) and rotary plate (211) having a rotary cylinder (212) with engaging parts (213) formed on an inner surface and a distal end thereof, respectively, the fixing shaft (215) being provided on an outer surface thereof with a washer groove (216) and being fixedly mounted in the rotary cylinder (212);
- a stopper (220) which is inserted around the fixing shaft (215) of the stationary body (210) and is fastened to the engaging parts (213) of the stationary body (210) and which has a through-opening, a front coupling part (221) and a rear fixing part (223);
- a protective tube (250) which is fixedly engaged with the coupling grooves (231) provided in the rotary cylinder (212) of the stationary body (210) and which has a hollow cylindrical body having a front opening (251) and rear-side multiple coupling pins (253), wherein the cylindrical body is provided, on a front end thereof, with an inner fixing ring (252) against which a spring (240) is seated;
- a rotary tube (260) which is coupled around the protective tube (250); and
- a washer (270) which is fastened to the washer groove (216) of the fixing shaft (215);

characterized in that:

- the rotary cylinder (212) comprises coupling grooves (231) formed on an inner surface and a distal end thereof;
- a rotary section (230) is mounted into the

through-opening of the stopper (220) and has front coupling grooves (231) and a pair of symmetrically-arranged fastening protrusions (234) each having an upper flange (232);

- the spring (240) is mounted around the coupling part of the stopper (220);

- the protective tube (250) is fixedly engaged with the coupling grooves (231) provided in the rotary cylinder (212) of the stationary body (210);

- the rotary tube (260) is provided with a plurality of inner protrusions (261) to be coupled into the coupling grooves (231) of the rotary section (230).

2. Single-cord type blind according to claim 1, wherein the coupling pins (253) of the protective tube (250) are engaged and laser-welded with the coupling grooves (231) of the rotary plate (211).

3. Single-cord type blind according to claim 1, wherein a leading end of the spring (240) is inserted into the protective tube (250) and is fixedly mounted against the inner fixing ring (252) of the protective tube (250).

Patentansprüche

1. Jalousie mit einer Schnur, die Folgendes enthält:

- einen feststehenden Körper (210), der eine Befestigungswelle (215) und eine Drehscheibe (211) hat, die einen Drehzylinder (212) mit Einspannteilen (213) hat, welche an seiner Innenfläche und seinem jeweiligen distalen Ende gebildet werden, die Befestigungswelle (215) ist an ihrer Außenfläche mit einer gerillten Scheibe (216) ausgestattet und fest am Drehzylinder (212) montiert;

- eine Feststellvorrichtung (220), die um die Befestigungswelle (215) des feststehenden Körpers (210) herum eingesetzt wird und an den Einspannteilen (213) des feststehenden Körpers (210) befestigt wird und eine durchgehende Öffnung, einen vorderen Verbindungsteil (221) und einen hinteren Befestigungsteil (223) hat;

- ein Schutzrohr (250), das fest an den Verbindungsrillen (231) eingespannt wird, die im Drehzylinder (212) des feststehenden Körpers (210) vorgesehen sind, und das einen zylinderförmigen Hohlkörper hat, der eine vordere Öffnung (251) und zahlreiche Verbindungsbolzen (253) auf der Rückseite hat, auf der der zylinderförmige Körper an seinem vorderen Ende mit einem internen Befestigungsring (252) ausgestattet ist, an dem eine Feder (240) angebracht ist;

- ein Drehrohr (260), das um das Schutzrohr (250) herum verbunden ist; und

- eine Scheibe (270), die an der gerillten Scheibe (216) der Befestigungswelle (215) befestigt ist;

und dadurch gekennzeichnet ist, dass:

- der Drehzylinder (212) Verbindungsrillen (231) enthält, die an seiner Innenfläche und seinem distalen Ende gebildet werden;

- ein Drehabschnitt (230) in der durchgehenden Öffnung der Feststellvorrichtung (220) montiert ist und vordere Verbindungsrillen (231) und ein Paar Befestigungsvorsprünge (234) hat, die symmetrisch angeordnet sind und jeweils einen oberen Flansch (232) haben;

- die Feder (240) um den Verbindungsteil der Feststellvorrichtung (220) herum montiert ist;

- das Schutzrohr (250) fest mit den Verbindungsrillen (231) eingespannt ist, die im Drehzylinder (212) des feststehenden Körpers (210) vorgesehen sind;

- das Drehrohr (260) mit zahlreichen internen Vorsprüngen (261) ausgestattet ist, die in den Verbindungsrillen (231) des Drehabschnitts (230) verbunden werden.

2. Jalousie mit einer Schnur gemäß Patentanspruch 1, in der die Verbindungsbolzen (253) des Schutzrohrs (250) mit den Verbindungsrillen (231) der Drehscheibe (211) eingespannt und lasergeschweißt werden.

3. Jalousie mit einer Schnur gemäß Patentanspruch 1, in der ein vorderes Ende der Feder (240) in das Schutzrohr (250) eingeführt und fest am internen Befestigungsring (252) des Schutzrohrs (250) montiert wird.

Revendications

1. Volet à un seul câble comprenant :

- un corps stationnaire (210) composé d'un arbre de fixation (215) et d'une plaque tournante (211) dotée d'un cylindre pivotant (212) avec des parties d'engagement (213) formées sur une surface interne et l'une de ses extrémités distales ; sur la surface externe de l'arbre de fixation (215) se trouve une rainure pour rondelle (216), ce dernier est fixé dans le cylindre pivotant (212) ;

- une butée (220), qui est insérée autour de l'arbre de fixation (215) du corps stationnaire (210), est fixée aux parties d'engagement (213) du corps stationnaire (210) et est dotée d'une ouverture traversante, d'une partie d'accouplement avant (221) et d'une partie de fixation arrière (223) ;

- un tube de protection (250) qui est engagé fixe dans les rainures d'accouplement (231) prévues

dans le cylindre pivotant (212) du corps stationnaire (210) qui a un corps cylindrique creux doté d'une ouverture frontale (251) et de plusieurs goupilles d'accouplement (253) à l'arrière ; dont le corps cylindrique est doté, à l'extrémité avant, d'une bague de fixation interne (252) contre laquelle est placé un ressort (240) ;
 - un tube tournant (260) qui est accouplé autour du tube de protection (250) ; et
 - une rondelle (270) qui est fixée à la rainure pour rondelle (216) de l'arbre de fixation (215) ;

caractérisé en ce que :

- le cylindre pivotant (212) est doté de rainures d'accouplement (231) formées sur l'une de ses surfaces internes et l'une de ses extrémités distales ;
 - une section tournante (230) est montée dans l'ouverture traversante de la butée (220) ; elle est dotée de rainures d'accouplement avant (231) et d'un couple de saillies de fixation (234) placées symétriquement ayant chacun une bride supérieure (232) ;
 - le ressort (240) est monté autour de la partie d'accouplement de la butée (220) ;
 - le tube de protection (250) est engagé fixe dans les rainures d'accouplement (231) prévues dans le cylindre pivotant (212) du corps stationnaire (210) ;
 - le tube tournant (260) est doté d'une pluralité de saillies internes (261) à accoupler aux rainures d'accouplement (231) de la section tournante (230).
2. Volet à un seul câble, selon la revendication 1, où les goupilles d'accouplement (253) du tube de protection (250) sont engagées et soudées au laser avec les rainures d'accouplement (231) de la plaque tournante (211).
3. Volet à un seul câble, selon la revendication 1, où l'extrémité avant du ressort (240) est insérée dans le tube de protection (250) et est montée fixe contre la bague de fixation interne (252) du tube de protection (250).

FIG. 1

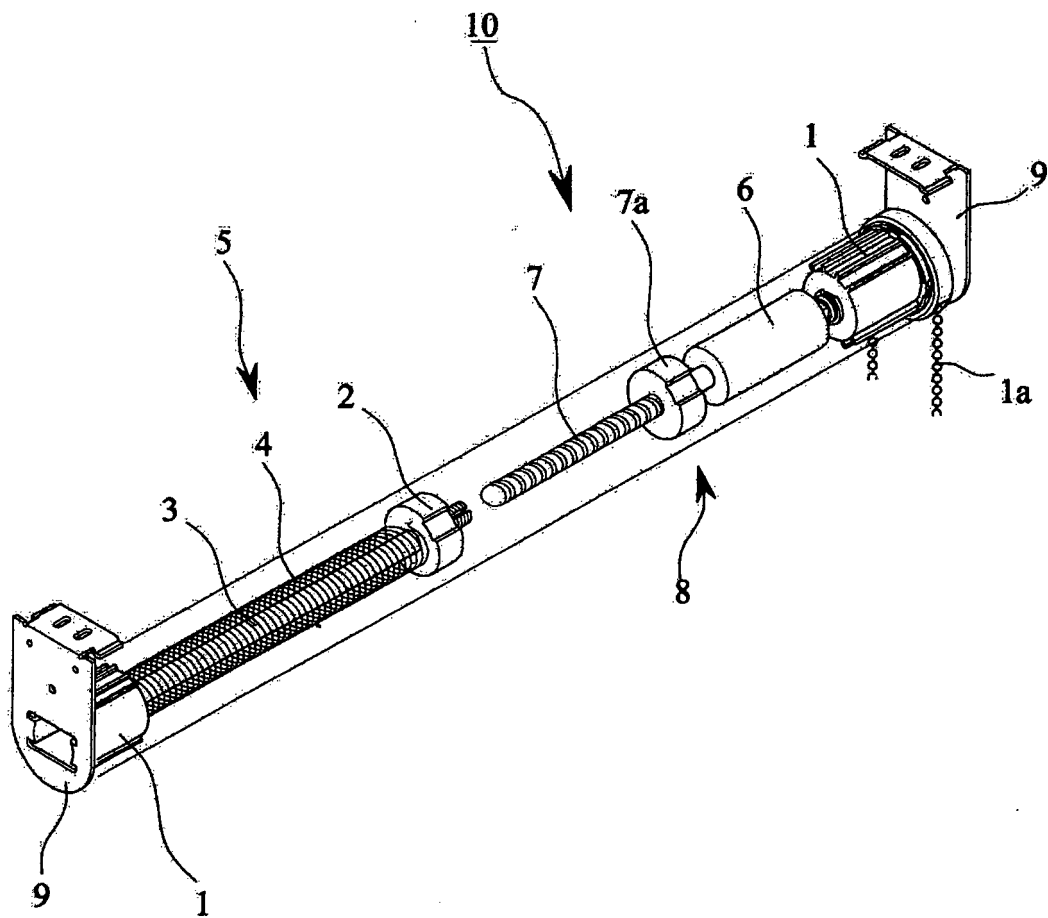


FIG. 2

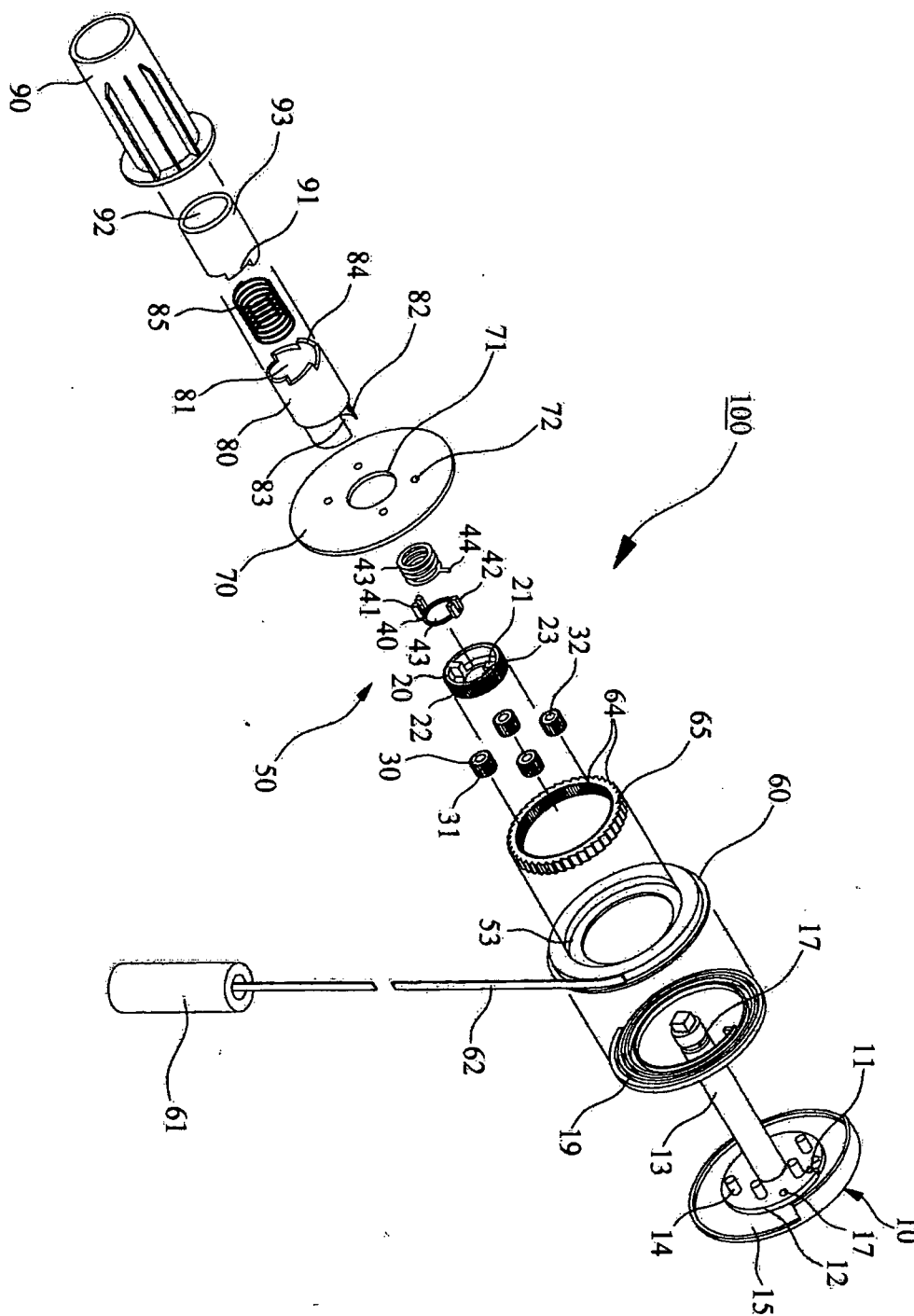


FIG. 3

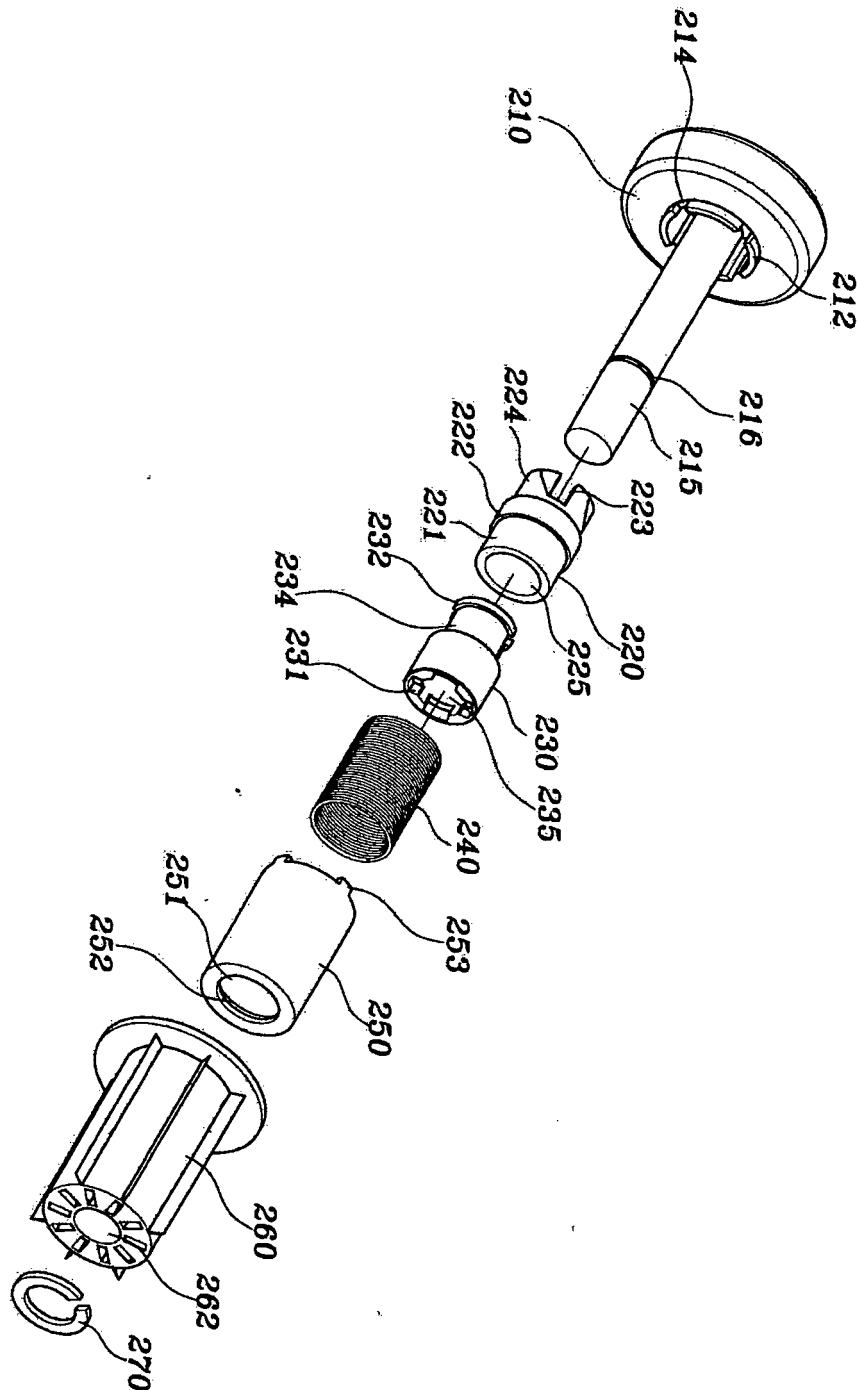


FIG. 4

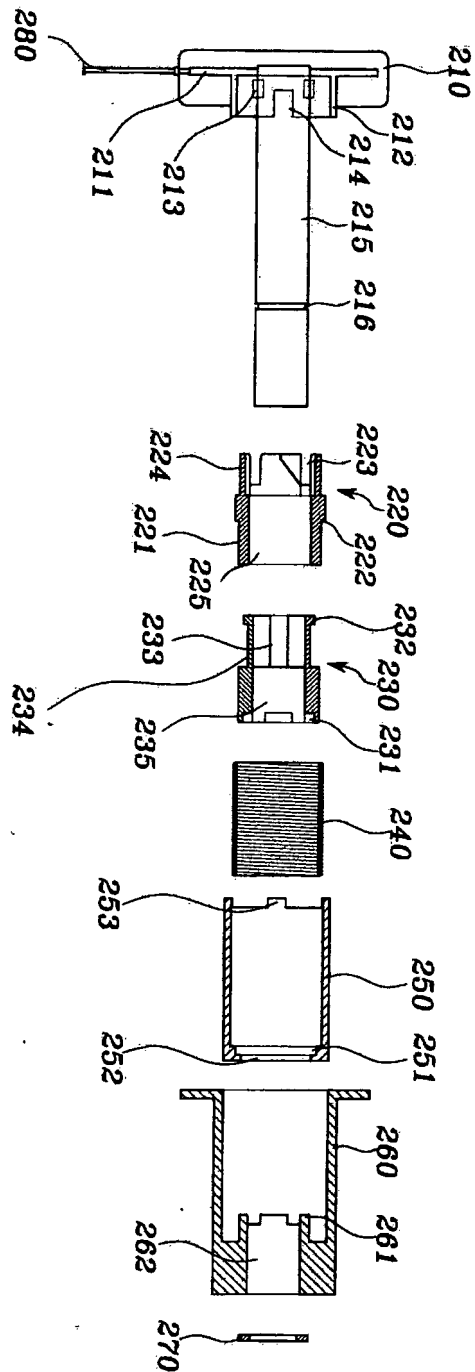


FIG. 5

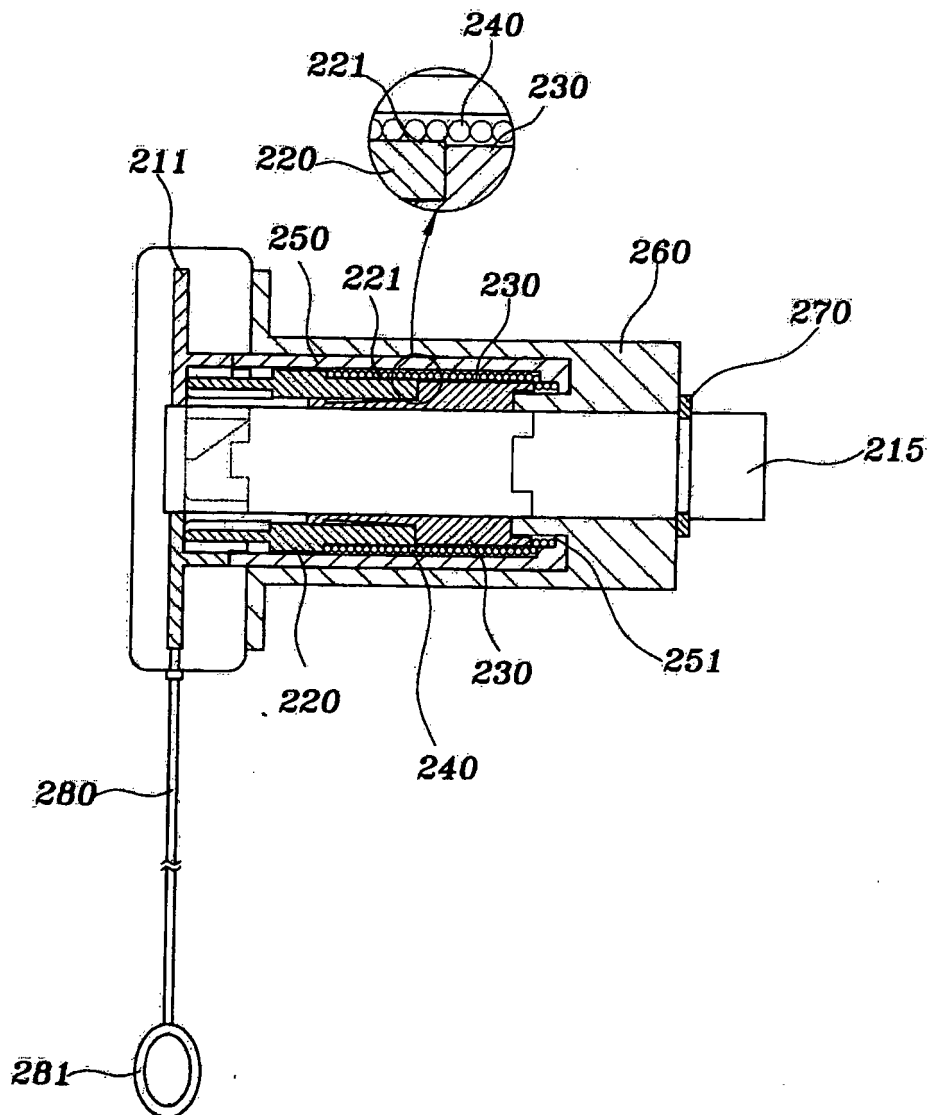


FIG. 6

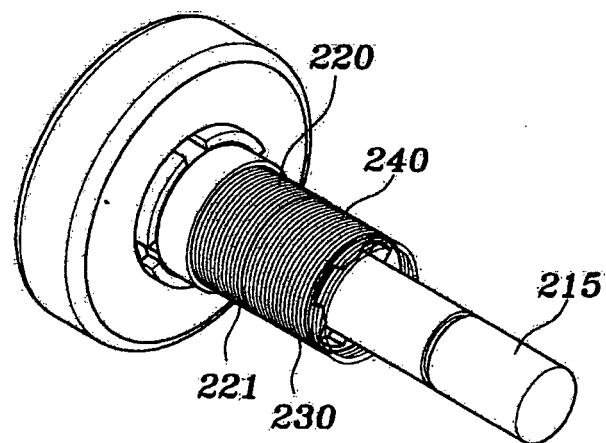


FIG. 7

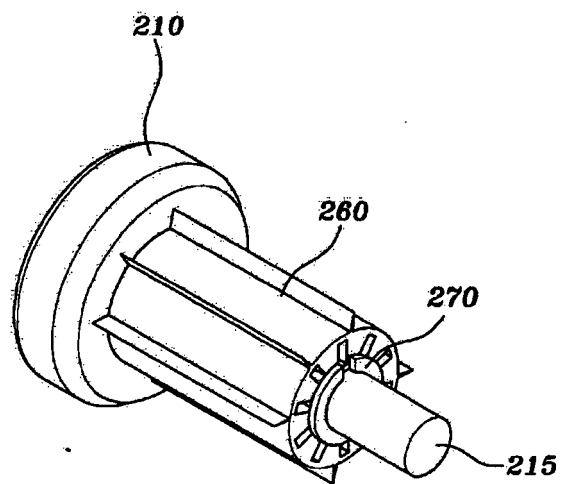


FIG. 8

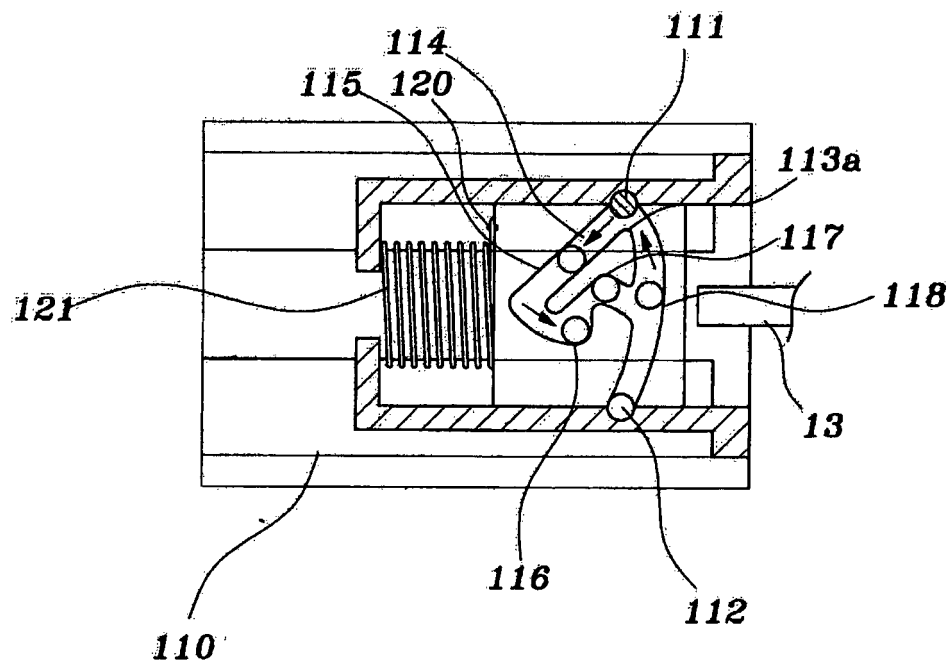
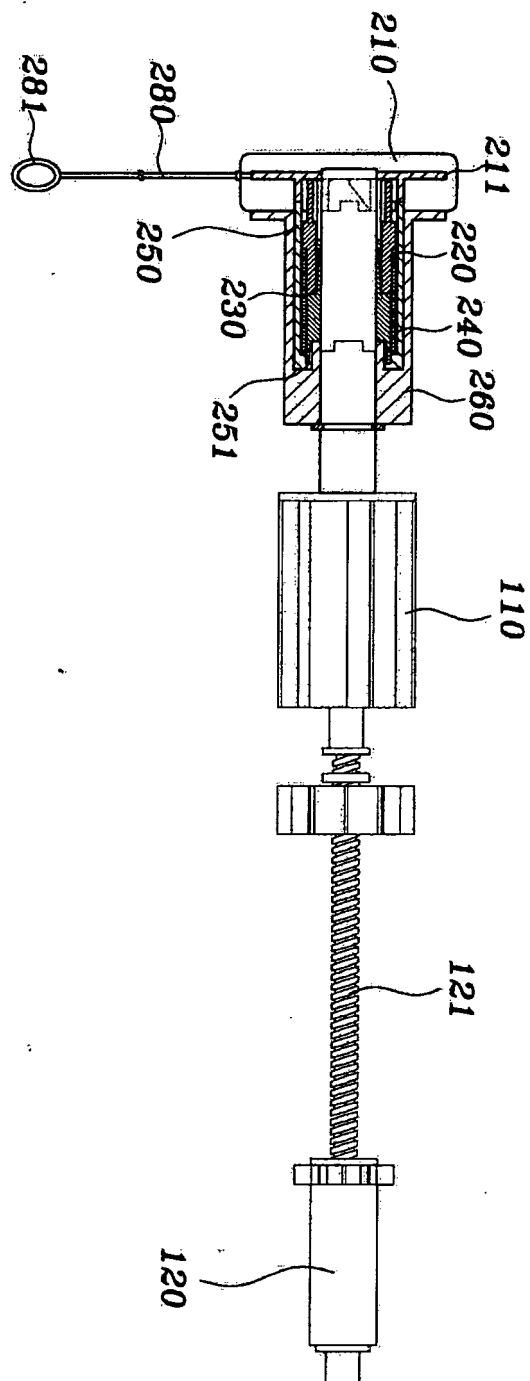


FIG. 9



REFERENCES CITED IN THE DESCRIPTION

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