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(71) Applicant: **KABUSHIKI KAISHA NICHIBEI**
3-15-4, Nihonbashi
Chuo-ku Tokyo(JP)

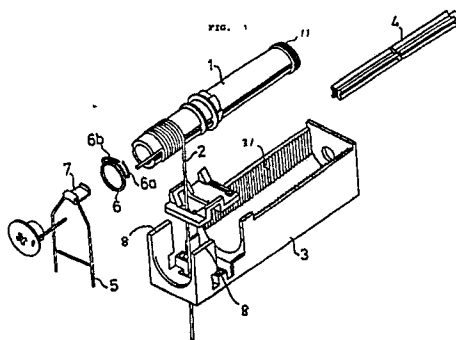
(72) Inventor: **Daizen, Masaaki, c/o Kabushiki**
Kaisha Nichibei
3-15-4 Nihonbashi
Chuo-ku, Tokyo(JP)

(74) Representative: **Beresford, Keith Denis Lewis**
et al
BERESFORD & Co. 2-5 Warwick Court High
Holborn
London WC1R 5DJ(GB)

(54) **Slat raising/lowering and rotating apparatus for horizontal type venetian blind.**

(57) In a slat raising/lowering and rotating apparatus for a horizontal type venetian blind, a raising/lowering cord (2) is wound onto a spindle (1) to raise the slats. In order to wind the raising/lowering cord (2) helically, the spindle (1) moves axially as it rotates. This is achieved by a screw thread (11) on the spindle (1) which co-acts with a rack (31) of a spindle bearing member (3). A spring (6) makes frictional contact with the spindle (1) and end projections (6a, 6b) capture a support (7), to which a ladder cord (5) for rotating the slats is attached. Rotation of the spindle (1) rotates the spring (6), driving the support (7) by abutment against one of the end projections (6a, 6b), and thus

drives the ladder cord (5) to rotate the slats. Resistance by the ladder cord (5) and support (7) tend to tighten the spring (6), tightening its grip on the spindle (1). When the spring (6) has rotated enough, it contacts a stop (8), which resists further rotation and tends to loosen the spring (6), loosening its grip on the spindle (1) so as to reduce its frictional resistance to further rotation of the spindle (1). Because the ladder cord (5) is joined at the support (7), to form a loop, tension in the ladder cord (5) due to the weight of the slats is passed through the spring (6), and so does not tend to tighten the spring (6) and increase its frictional resistance to further rotation of the spindle (1).



SLAT RAISING/LOWERING AND ROTATING APPARATUS FOR HORIZONTAL TYPE VENETIAN BLIND

Background of the Invention:

The present invention relates to a slat raising/lowering and rotating apparatus for a horizontal type venetian blind and, more particularly, a slat raising/lowering and rotating apparatus including pull cords for raising and lowering horizontal slats and ladder cords for supporting the horizontal slats and for controlling rotation of them in which each pull cord is arranged to be wound onto or unwound from a winding drum to raise or lower the slats, and each ladder cord is mounted at its upper end on said winding drum, whereby raising and lowering of the slats and rotation of them can be controlled by operating a single rotating shaft for driving the winding drums.

Heretofore, a horizontal type venetian blind having a slat raising and lowering mechanism in which horizontal slats are raised or lowered under the action of pull cords which are arranged to be wound onto or unwound from winding drums driven by a single driving shaft to raise or lower the horizontal slats has been widely used. The slat raising and lowering mechanism of the above kind has several disadvantages. Firstly, if the pull cord is collectively wound onto a particular position of the winding drum, a diameter of the cord wound onto the winding drum is gradually increased and a speed of winding the pull cord is gradually increased as an amount of the wound pull cord is increased. secondly, if the pull cord becomes caught between the previously wound turns of the pull cord, the pull cord cannot be smoothly unwound from the winding drum when the slats are lowered.

Heretofore, the horizontal type venetian blind in which the slat raising/lowering operation and the slat rotating operation are effected by rotation of the single driving shaft usually comprises a slat raising/lowering and rotating mechanism including winding drums for winding pull cords for raising and lowering the slats and rotating drums supporting upper ends of ladder cords.

In such slat raising/lowering and rotating mechanism, in view of decreasing the size of the blind body and parts thereof and improving the appearance of the blind it is required to dispose the pull cord and the ladder cord so that these cords depend from closed positions of a blind headbox. Accordingly, it has been a usual practice to arrange the rotating drum around the periphery of the winding drum, while holding frictional engagement between these drums.

In the case of this mechanism, if the diameter of the winding drum is decreased, the slat raising

and lowering speed is decreased. On the other hand, if the diameter is increased, the size of the headbox containing the drums is necessarily increased and the diameter of the rotating drum is increased, with the result that the slat rotating characteristic is deteriorated.

In order to overcome the above-described problems, it has been proposed to provide a cord winding apparatus in which a winding drum for winding a slat raising and lowering cord is constructed to be moved in axial direction, depending upon rotation of said winding drum, and said cord is fixed at its upper end to the winding drum, so that the cord is successively wound in helical form around the winding drum. (See Japanese Patent Publication No. 23035/1981. Japanese Utility Model Publication No. 44797/1983).

In such construction, it is required to form a male thread on the winding drum along the whole length thereof and to form a female thread on one end of a drum bearing member, so that the winding drum is moved in axial direction owing to the meshing engagement of said male thread and said female thread, when the drum is rotated. However, it requires considerably troublesome work to form such female thread portion at an end of the drum bearing member. Furthermore, in view of the fact that in order to improve the appearance of the blind narrower width of slat becomes widely used in the blind and, in practice, 15 mm width of slat is usually used at present, while 35 mm width of slat has been usually used in the conventional blind and, consequently, a headbox which supports the blind becomes smaller, so that it is necessary to decrease the size of the drum bearing member contained in the headbox. Therefore, it becomes very difficult to form the female thread portion on the drum bearing member.

Furthermore, if the diameter of the winding drum is decreased, the slat raising and lowering speed is also decreased, while if the diameter of the winding drum is increased, the size of the headbox must be increased and the diameter of the winding drum is necessarily increased, with the result that the slat rotating characteristic is deteriorated, as described above.

In order to overcome such problem, it has been proposed to provide an apparatus including guide members which serve to narrower the horizontal width of the upper portion of the ladder cord near the position where the ladder cord is introduced into the headbox.

According to such apparatus, the torque required to rotate the slats is necessarily increased and in the conventional construction in which the

upper portion of the ladder cord is frictionally engaged on the winding drum, the larger friction is required, so that more heavy force is required to effect slat raising/lowering operation or the slat rotating characteristic is deteriorated.

It has been also proposed to provide an apparatus in which a clutch spring having a diameter slightly smaller than an outer diameter of the winding drum is mounted on the periphery of said winding drum, said clutch spring having both ends projected outwardly of the winding drum, and the ladder cord is connected, at upper ends of its front and rear sides, to said outwardly projecting end portions of the clutch spring, so that at the time of rotating the slats, the upper end portions of the ladder cord tend to decrease the inner diameter of the clutch spring. Furthermore, actuating pieces are arranged to come into engagement with the outwardly projecting end portions of the clutch spring when the rotation of the slats has been completed. Such actuating pieces act to loosen the clutch spring after completion of the slat rotating operation, so that the rotation of the slats can be smoothly effected. If the above-mentioned ladder cord narrowing construction is applied to this apparatus, the upper end portions of the ladder cord are directly connected to the outwardly projecting end portions of the clutch spring, so that the ladder cord constantly acts to decrease the diameter of the clutch spring, with the result that the operating force is increased.

Summary of the Invention:

It is an object of the present invention to eliminate the above-mentioned problems in a slat raising/lowering cord winding apparatus for a horizontal type venetian blind and to provide an apparatus of this kind in which a cord winding drum is arranged to be moved in axial direction, depending upon rotation thereof, and it is not required to form a female thread for meshing engagement with the winding drum, which has been required in the conventional constructions.

In accordance with the present invention, there is provided a slat raising/lowering and rotating apparatus for a horizontal venetian blind including a cord winding drum for winding a slat raising/lowering cord thereon, said cord winding drum being arranged in a headbox of the blind so that said winding drum is moved in axial direction, depending upon a rotation thereof, and a slat raising/lowering cord connected, at its upper end, to an end of said cord winding drum so that the cord is successively wound in a helical form around the winding drum, said apparatus comprising a male thread portion integrally formed near an end

of said winding drum opposite to the end thereof to which the slat raising/lowering cord is connected and a drum bearing member for rotatably supporting said cord winding drum, said drum bearing member having an upwardly opened side and inner side walls having racks arranged to make meshing engagement with said male thread portion of the winding drum.

Further in accordance with the present invention there is provided a slat raising/lowering and rotating apparatus for a horizontal venetian blind including a cord winding drum for winding a slat raising/lowering cord thereon, said apparatus comprising a clutch spring having a diameter slightly smaller than an outer diameter of said winding drum and mounted thereon, said clutch spring being projected, at its both ends, outwardly of the winding drum, a support piece horizontally arranged and connected to an upper end of a ladder cord for supporting blind slats, said support piece being mounted on a peripheral surface of said winding drum at a position between the outwardly projected ends of said clutch spring, an actuating portion formed on a drum bearing member for supporting said winding drum, said actuating portion being arranged at a position where said clutch spring comes into contact with said actuating portion, and a narrowing portion for narrowing a horizontal width of said ladder cord to a width smaller than an outer diameter of said winding drum.

Brief Description of the Drawings:

Fig. 1 is an exploded perspective view of an embodiment of the present invention.

Fig. 2 is a side view, partly broken, of the embodiment shown in Fig. 1.

Figs. 3A, 3B and 3C are sectional views for explaining the operation of the embodiment shown in Fig. 1.

Detailed Description of the Invention:

Now, the details of the invention will be explained with reference to the drawings which illustrate a preferred embodiment of the present invention.

Fig. 1 is an exploded perspective view of the apparatus according to the embodiment of the present invention and Fig. 2 is a side view, partly broken, of the apparatus shown in Fig. 1.

The apparatus shown in Figs. 1 and 2 includes a cord winding drum 1 for winding and unwinding a slat raising/lowering cord 2 for raising and lowering blind slats. Said cord winding drum 1 is supported in a drum bearing member 3. A rotating shaft 4 for

driving said winding drum 1 is passed through the winding drum, so that said drum 1 is rotated by said rotating shaft 4 but it is freely slidable along its axial direction. A ladder cord 5 is provided to support blind slats and to control rotation of the blind slats.

The slat raising/lowering and rotating apparatus according to the present invention is so constructed that slat raising/lowering operation and slat rotating operation can be controlled by rotating the single driving shaft in one direction or the other.

A male thread portion 11 is formed at one end of said winding drum 1. The drum bearing member 3 for supporting the winding drum 1 is formed as an upwardly opened case, and rack portions 31 are formed on inside walls of said drum bearing member so that said male thread portion 11 is in meshing engagement with said rack portions 31.

In the apparatus as described above, when the rotating shaft 4 is rotated in one direction, the winding drum 1 is moved in an axial direction, so that the cord 2 is successively wound in a helical form around the winding drum 1, thereby raising the slats. When the rotating shaft 4 is rotated in the other direction, the winding drum 1 is moved in the opposite axial direction, so that the cord 2 is successively unwound from the winding drum 1, thereby lowering the slats.

A clutch spring 6 having an inner diameter slightly smaller than an outer diameter of the winding drum 1 is mounted on said winding drum 1. The clutch spring 6 has projected portions 6a and 6b, at its both ends, which project outwardly of the winding drum 1. The ladder cord 5 has a support piece 7 which is disposed in the horizontal direction at the upper end of said ladder cord. This support piece 7 is mounted on an outer surface of the winding drum 1 at a position between said outwardly projected end portions 6a and 6b of the clutch spring 6. Actuating portions 8 are formed on the drum bearing member 3 for supporting the winding drum 1 and said actuating portions are arranged to receive the end portion 6a or 6b of the clutch spring 6.

Guide portions 9 are formed on the drum casing at positions where the ladder cord 5 passes into the drum bearing member. Said guide portions 9 serve to narrow a horizontal width of the ladder cord to a size smaller than the outer diameter of the winding drum 1.

The operation of the slat raising/lowering and rotating apparatus for the horizontal type blind will be explained, with reference to Figs. 3A, 3B and 3C.

Fig. 3A shows a state of the apparatus where the slats are not yet rotated. When the winding drum 1 is rotated in one direction, the cord 2 is unwound from the winding drum 1, whereby the

slats are lowered. At the same time, one vertical cord portion at one side of the ladder cord 5 moves in downward direction, while the other vertical cord portion at the outer side of the ladder cord moves in upward direction, whereby the slats are rotated in one direction. The horizontal width of the ladder cord 5 is narrowed at its upper portion by the guide portions 9, as described above, so that the slats are forcibly rotated toward their vertical positions and thus superior rotating characteristic can be attained.

The clutch spring 5 is connected with the ladder cord through the intermediary of the horizontal support piece 7, as described above. At the time of the slat raising and lowering operation, one of the outwardly projected end portions of the clutch spring comes into engagement with the corresponding actuating portion of the drum bearing member, so that the clutch spring becomes expanded. Accordingly, the clutch spring is relieved of the load of the ladder cord, so that the operating force required to raise or lower the slats becomes lighter. The support piece 7 attached to the upper end of the ladder cord 5 is slidable in circumferential direction around the winding drum 1 between the projected end portions 6a and 6b of the clutch spring, so that after the projected end portion of the clutch spring has come into engagement with the actuating portion 8, as shown in Fig. 3B, substantially whole load caused by the rotation of the winding drum and the weight of the slats is applied to the vertical cord portion at the right side of the ladder cord, so that the slats are further rotated in the rightward direction by light operating force until the slats reach to the completely closed state (Fig. 3C).

Thus it will be understood that the present invention provides a slat raising/lowering and rotating apparatus for a horizontal type blind in which a slat raising/lowering cord is wound on and unwound from a cord winding drum in a helical form, whereby the slat raising/lowering cord can be smoothly wound on and unwound from the winding drum, without causing gradual increasing of the wound diameter of the cord or without causing the cord to be caught between the previously wound turns of the slat raising/lowering cord.

Claims

1. A slat raising/lowering and rotating apparatus for a horizontal type venetian blind including a winding drum supported in a headbox of the blind, said winding drum being arranged to be moved in an axial direction, depending upon a rotation thereof, a slat raising/lowering cord connected, at its upper end, to said winding drum, so that the slat

raising/lowering cord is successively wound on the winding drum in a helical form therearound, and a ladder cord for supporting slats and for controlling rotation of the slats, said ladder cord being mounted, at its upper end, on said winding drum so that the slat raising/lowering operation and the slat rotating operation can be controlled by rotation of the winding drum, said apparatus comprising:

a clutch spring having a diameter slightly smaller than an outer diameter of said winding drum and mounted on said drum, said clutch spring being projected outwardly, at its both ends;

a support piece arranged in horizontal direction and connected to an upper end of the ladder cord for supporting blind slats, said support piece being mounted on an outer periphery of said winding drum at a position between the outwardly projected portions at the both ends of said clutch spring;

a drum bearing member for supporting the winding drum and having actuating portions arranged to receive an end of said clutch spring; and guide means for narrowing a horizontal width of the ladder cord to a width smaller than the outer diameter of the winding drum.

2. A slat raising/lowering and rotating apparatus for a horizontal type venetian blind including a headbox, a winding drum for winding a slat raising/lowering cord, said winding drum being supported in said headbox to be moved in axial direction, depending upon rotation thereof, a slat raising/lowering cord connected, at its upper end, to said winding drum so that said cord is successively wound on the winding drum in a helical form therearound, and a ladder cord for supporting blind slats and for controlling rotation thereof, said ladder cord being mounted, at its upper end, on said winding drum so that the slat raising/lowering operation and the slat rotating operation can be controlled by rotation of the winding drum, comprising: a male thread portion integrally formed near an end of the winding drum opposite to an end thereof to which the slat raising/lowering cord is connected; a drum bearing member for supporting the winding drum in the form of an upwardly opened case; and rack portions formed on inside walls of said drum bearing member and arranged to make meshing engagement with said male thread portion.

3. A slat raising/lowering and rotating apparatus for a horizontal type venetian blind, in which a slat raising/lowering cord (2) is wound onto and off from a spindle (1) to raise and lower the slats, and a resilient member (6) is mounted to be driven in rotation by the spindle (1) through a frictional contact made by the resilient member (6) by virtue of its resilience, at least one ladder cord (5) for supporting and rotating the slats being mounted to be driven by rotation of the resilient member (6) so as to rotate the slats and resistance by the ladder

cord (5) to being driven by rotation of the resilient member (6) tending to act on the resilient member so as to increase the grip of said frictional contact, and means (8) to resist rotation of the resilient member beyond a predetermined point, characterised in that:

a said ladder cord (5) is connected to either side of a driving member (7) and the ladder cord (5) is driven by rotation of the resilient member (6) through abutment between the driving member (7) and the resilient member (6).

4. Apparatus according to claim 3 in which the said means (8) to resist, when resisting rotation of the resilient member (6), tends to act on the resilient member (6) so as to reduce the grip of said frictional contact.

5. Apparatus according to claim 3 or claim 4 in which guide means (9) reduce the horizontal spacing of the ladder cord (5) on either side of the driving member (7) to less than the diameter of the spindle (1).

6. A slat raising/lowering apparatus for a horizontal type venetian blind in which a slat raising/lowering cord (2) is wound onto or off from a spindle (1) to raise and lower the slats, and the spindle (1) has a screw thread (11) to move it axially as it rotates whereby the slat raising/lowering cord (2) is wound on the spindle (1) helically,

characterised in that:

the apparatus comprises a rack (31) extending longitudinally of the spindle (1) with which its screw thread meshes to drive it in said axial movement.

7. Apparatus according to claim 6 in which the said rack (31) is a part of a member (3) which bears the spindle.

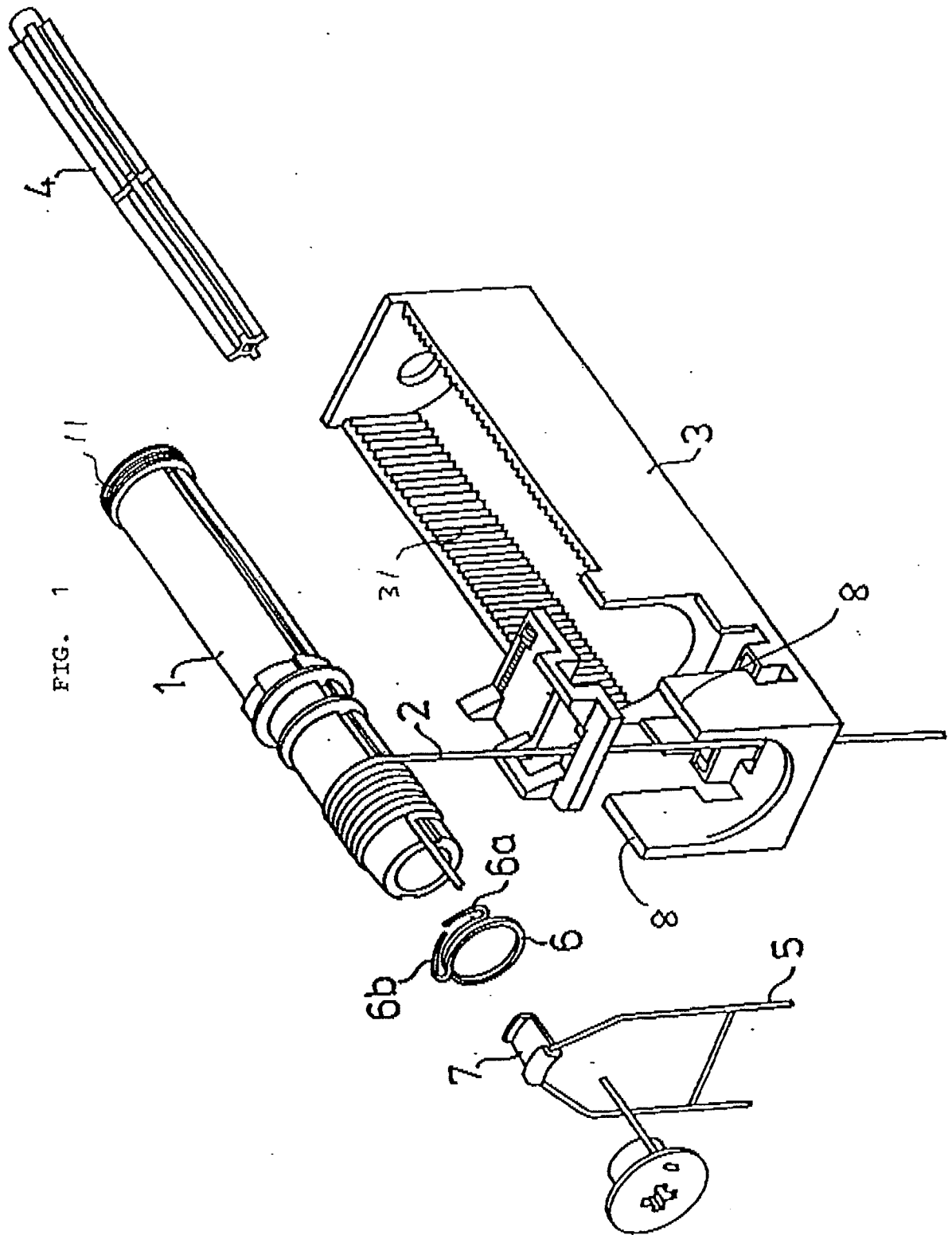


FIG. 2

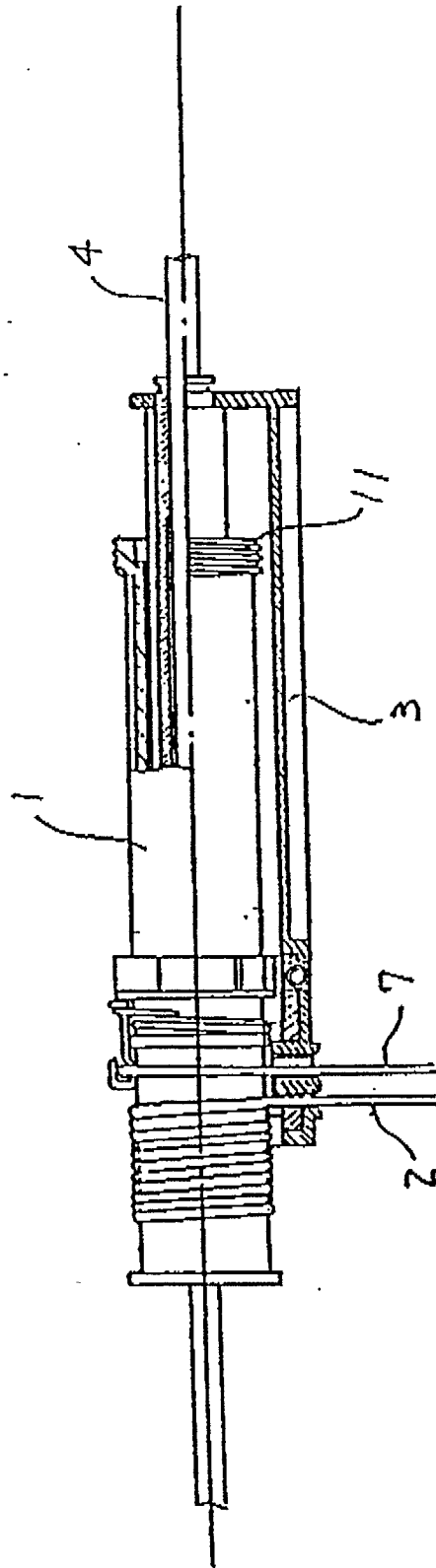


FIG. 3C

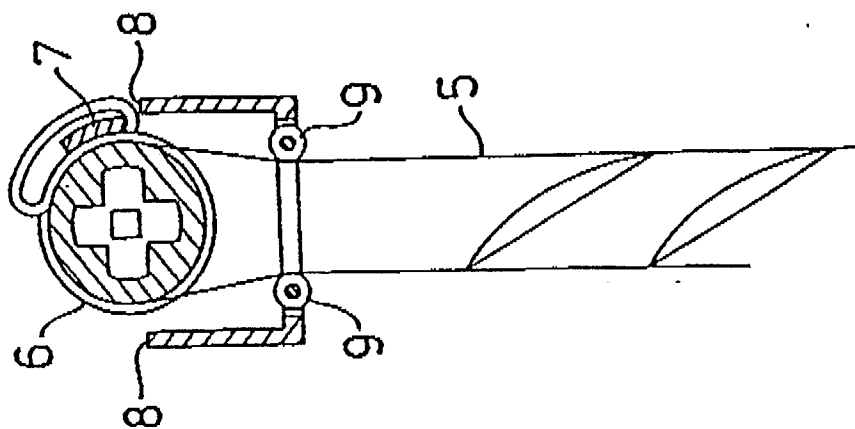


FIG. 3B

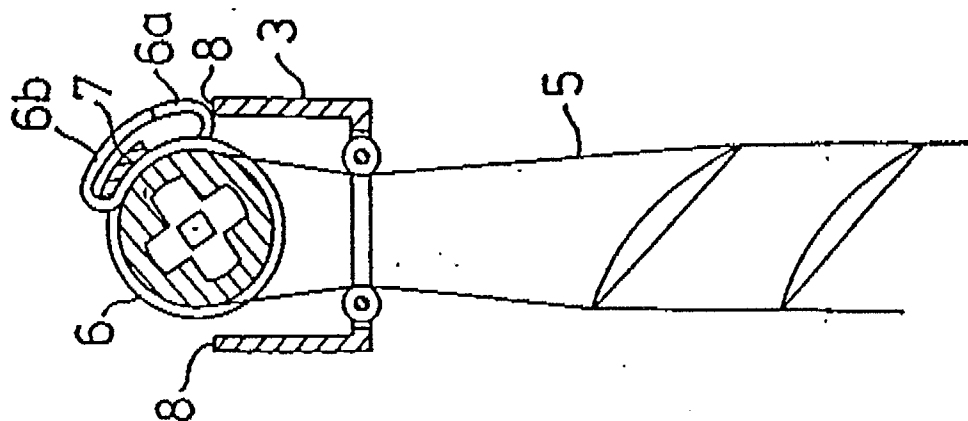
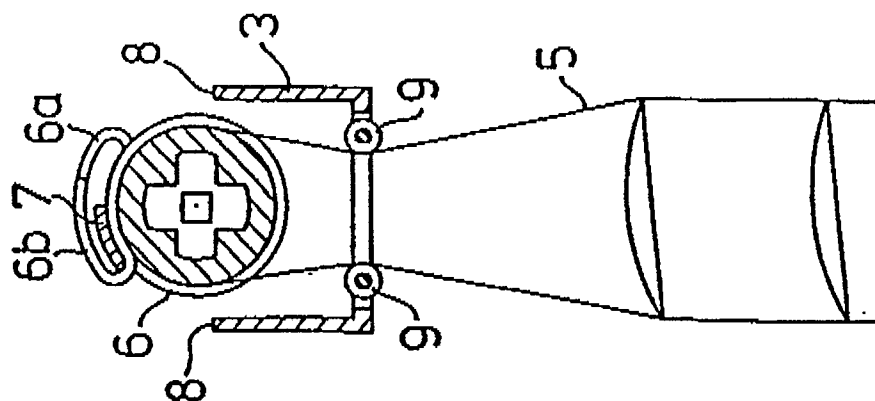


FIG. 3A





DOCUMENTS CONSIDERED TO BE RELEVANT					
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)		
A	US-A-3 310 099 (HUNTER & SWING) * Column 2, lines 59-63; column 4, lines 58-68; column 5, lines 50-65; column 6, lines 13-27; figures * ---	1-7	E 06 B 9/32		
A	DE-A-1 509 809 (RUSSO) * Page 4, paragraphs 2,4; page 5, paragraph 1; figures 1,4-6 * ---	1-7			
A	BE-A- 648 122 (GRIESSER AG) * Whole document * ---	1-7			
D,A	JP-B-5 623 035 (NICHIBET) ---				
D,A	JP-Y-5 844 797 (TACHKAWA BLIND CO.) -----				
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)		
			E 06 B		
The present search report has been drawn up for all claims					
Place of search THE HAGUE		Date of completion of the search 09-04-1990	Examiner KUKIDIS S.		
<table><tr><td>CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</td><td>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document</td></tr></table>				CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document	T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document
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