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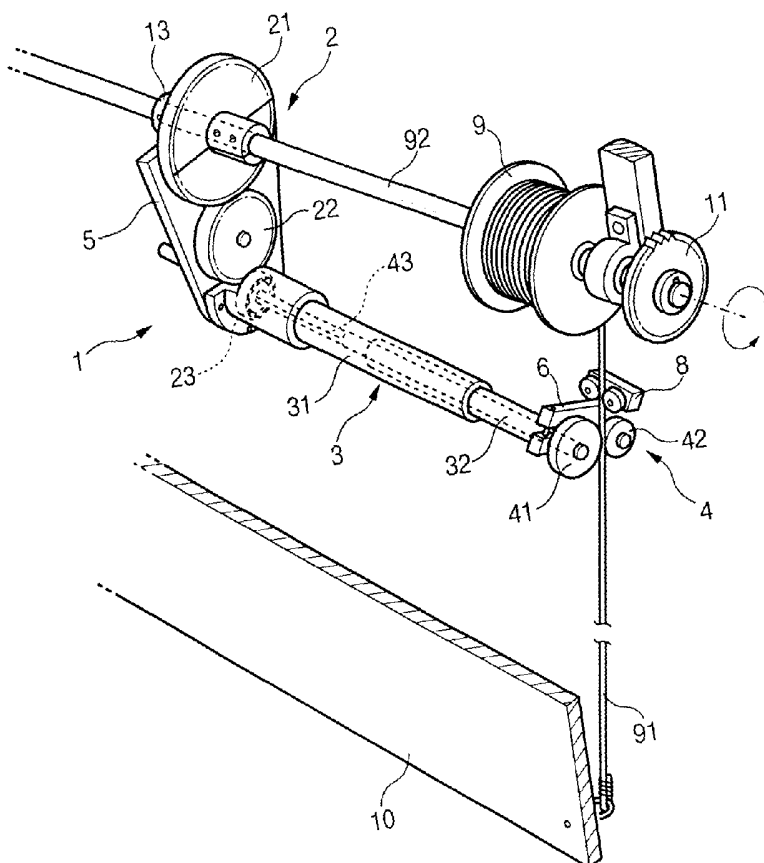
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(54) Title: A WIRE SEPARATION PREVENTER FOR AN OVERHEAD DOOR



(57) Abstract: The present invention relates to a wire separation preventer for an overhead door. The overhead door is provided with wire separation preventers for preventing wires from slipping off a pair of drums fixed to both ends of a horizontal rotational shaft when the overhead door is lifted or lowered through winding or unwinding of the wires wound around the respective drums. Each of the wire separation preventers comprises a power transmission unit rotated by the rotational shaft; a supporting unit coupled to the power transmission unit; and a tensioning unit coupled to the supporting unit for maintaining tension in the relevant wire to cause the wire to be in contact with an outer periphery of the relevant drum. Further, the wire separation preventers are installed to allow the wires to be tensioned, respectively, upon winding or unwinding of the wires so that the respective wires wound around the pair of the drums cannot slip off the drums.

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A WIRE SEPARATION PREVENTER FOR AN OVERHEAD DOOR

Technical Field

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The present invention relates to an apparatus for preventing a wire from slipping off a drum around which the wire is wound to open and close an overhead door (hereinafter, abbreviated to "door"), and more particularly, to a wire separation preventer for an overhead door, wherein a wire wound around a drum is prevented from slipping off the drum in such a manner that the wire is pulled in proportion to an unwinding speed of the wire when an overhead door is lowered through unwinding of the wire, whereas the wire is allowed to be consistently tensioned so that it can be safely wound onto the drum when the door is lifted, and the wire can be moved laterally to be aligned with a winding groove of the drum.

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Background Art

Generally, as shown in FIG. 6, a conventional overhead door 10 comprises a driving gear 11 fixed to one end of a horizontal rotational shaft 92, a pair of drums 9 installed at both ends of the rotational shaft 92 so that the drums simultaneously rotate as the driving gear 11 rotates, and wires 91 wound around the drums 9. Leading ends of the wires 91 are connected to both side portions of a lower end of the door 10, and the door 10 is constructed to be opened and closed while being lifted or lowered along tracks 12 when the wires 91 are wound onto or unwound from the drums 9. The driving gear 11 receives a rotational force by mean of a selected one of a manual type

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using a conventional chain and a handle and an electric-powered type using a chain and a motor, which are not shown in the figure.

The conventional overhead door 10 has an advantage in that the entrance is fully opened to ensure a maximum entry space. However, there is a problem in that
5 the wires 91 wound around the drums 9 are not stopped and are continuously unwound and thus slip off the drums 9 in a case where upon lowering of the door 10, the lowering of the door is stopped due to the presence of an object below the door 10 or contact of the door with the tracks.

The separation of the wires 91 from the drums 9 occurs when the door 10 is
10 lowered, but hardly occurs when the door 10 is lifted since the wires 91 to be wound onto the drums 9 are tensioned due to the weight of the door 10.

A process of separation of the wires 91 from the drums 9 will be discussed. The rotational force transmitted to the driving gear 11 causes the rotational shaft 92 to rotate, and the drums 9 installed at both the ends of the rotational shaft 92
15 simultaneously rotate. Accordingly, the wires 91 are unwound from the drums. Since the leading ends of the wires 91 to be unwound from the drums 9 are fixed to the lower portions of the door 10, the wires are tensioned due to the weight of the door 10 acting thereon while the door 10 is lowered along the tracks. If there is an object having a predetermined height below the door 10, which is being lowered through the
20 unwinding of the wires 91 and due to its own weight, or the door 10 which is being lowered along the tracks 12 is caught by the tracks, cannot be further lowered and is finally stopped, the wires 91 cannot be further unwound only when the rotation of the drums 9 is stopped. However, the drums 9 continuously rotate and the wires 91 are also continuously unwound. Thus, there is a problem in that the wound wires 91 slip
25 off the drums 9 not to be used in the future.

Furthermore, even when the door 10 is not smoothly lowered along the tracks 12 and then suddenly stopped, there is a problem in that the wires 91 unwound from the drums 9 are entangled in each other and the winding and unwinding of the wires 91 cannot be smoothly performed, whereby there is a difficulty in opening and closing the door 10.

Disclosure of Invention

The present invention is conceived to solve the above problems in the prior art.

10 An object of the present invention is to provide a wire separation preventer for an overhead door, which is installed below each of drums of the door to allow each wire unwound from the drum for lowering of the door to be tensioned and to continuously maintain tension in the wire by pulling the wire unwound from the drum even when the door that is being lowered is stopped, so that the wire is prevented from slipping off the drum.

Another object of the present invention is to provide a wire separation preventer for an overhead door, wherein each tensioning unit is constructed to guide a wire while moving in accordance with a position of the wire wound onto or unwound from a relevant drum, so that the wire can be safely wound onto the drum all the time, and in a case of an electric-powered type using a chain and a motor, if tension is removed from a portion of the wire positioned between the tensioning unit and the door, rotation of the motor is immediately stopped and the unwinding of the wire from the drum is stopped, thereby preventing the wire from slipping off the drum.

In order to achieve the objects of the present invention, the present invention provides a wire separation preventer for an overhead door, which prevents each wire

from slipping off a relevant one of a pair of drums fixed to both ends of a horizontal rotational shaft when the overhead door is lifted or lowered through winding or unwinding of the wire wound around the relevant drum. The wire separation preventer comprises a power transmission unit including a main gear, and an idle gear and a driven gear which operate together with the main gear; a supporting unit including a supporting tube coupled to the center of the driven gear to penetrate therethrough, and a moving tube inserted into the supporting tube to move in the right and left direction; and a tensioning unit including a rotary rod installed rotatably to penetrate through the moving tube and the center of the driven gear, a driving roller fixed to a leading end of the rotary rod, and a pressing roller disposed close to the driving roller for bringing the wire into close contact with the driving roller. The main gear is fixed to the rotational shaft, and a bracket to which the idle and driven gears are rotatably attached is also coupled to the rotational shaft. A bracket to which the pressing roller of the tensioning unit is rotatably attached is fitted around and coupled to a leading end of the moving tube. Further, the wire separation preventer is installed to allow the wire to be tensioned upon winding or unwinding of the wire so that the wire wound around the relevant one of the pair of the drums cannot slip off the drum.

Brief Description of Drawings

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FIG. 1 is a perspective view showing an installed state of a wire separation preventer for an overhead door according to the present invention.

FIG. 2 is a sectional front view showing a portion of FIG. 1.

FIG. 3 is a sectional view of a tensioning unit for feeding a wire.

25 FIG. 4 is a perspective view showing a state where an electronic power control

unit is installed in a wire separation preventer for an overhead door according to another embodiment of the present invention.

FIG. 5 is a sectional front view of a portion of FIG. 4.

FIG. 6 is a schematic view showing a conventional overhead door.

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Best Mode for Carrying Out the Invention

Hereinafter, a wire separation preventer for an overhead door according to the present invention will be described in detail.

10 FIGS. 1 and 2 are a perspective view showing an embodiment of the wire separation preventer for the overhead door according to the present invention, and a sectional front view showing a portion of thereof. Reference numeral 1 designates the wire separation preventer, reference numeral 2 designates a power transmission unit coupled to a rotational shaft 92 to which a driving gear 11 and a drum 9 are fixed,
15 reference numeral 3 designates a supporting unit, reference numeral 4 designates a tensioning unit, and reference numerals 5 and 6 designate brackets.

Each wire separation preventer 1 is installed such that each wire 91 wound around a relevant one of a pair of drums 9 fixed to both ends of the horizontal rotational shaft 92 is prevented from slipping off the relevant drum 9 when the door is lifted or
20 lowered through winding or unwinding of the wire 91.

The power transmission unit 2 includes a main gear 21, and an idle gear 22 and a driven gear 23 which operate together with the main gear 21. The main gear 21 is fixed to and rotates together with the rotational shaft 92 which causes the drum 9 to rotate. The idle and driven gears 22 and 23 are rotatably attached to the plate-shaped
25 bracket 5 of which an upper portion is coupled to the rotational shaft 92 so that it is

suspended from and supported by the rotational shaft not to rotate together therewith. Further, in order to cause the idle gear 22 coupled to the bracket 5 to be always in engagement with the main gear 21, a ring 13 is fixed to one side of the upper portion of the bracket 5 coupled to the rotational shaft 92, as shown in FIG. 2, to be always
5 positioned between the main gear 21 and the ring 13.

The supporting unit 3 includes a hollow supporting tube 31 coupled to the center of the driven gear 23 to penetrate therethrough, and a hollow moving tube 32 inserted into the supporting tube 31 to move in the right and left direction. One end of the supporting tube 31 is coupled to the bracket 5 so that the driven gear 23 rotatably
10 attached to the bracket 5 is prevented from escaping therefrom. The supporting tube has a predetermined length so that after inserted into the other end of the supporting tube, the moving tube 32 can be horizontally extended out of and retracted into the other end.

The tensioning unit 4 includes a rotary rod 43 installed to penetrate through the
15 moving tube 32 and the center of the driven gear 23 and to rotate together with the driven gear 23, a driving roller 41 fixed to a leading end of the rotary rod 43, and a pressing roller 42 disposed close to the driving roller for bring the wire 91 into close contact with the driving roller 41. The rotary rod 43 is constructed to have a rectangular cross section at a portion thereof inserted into the driven gear 23 so that
20 after insertion into the driven gear 23, the rotary rod 43 can rotate together with the driven gear 23 while sliding in the right and left direction. Furthermore, The bracket 6 to which the pressing roller 42 of the tensioning unit 4 is rotatably attached is fitted around and coupled to a circumferential surface of the leading end of the moving tube 32. Thus, the pressing roller 42 always abuts on the driving roller 41 so that the wire
25 91 interposed therebetween comes into close contact with the rollers.

Moreover, the rotational speed of the driving roller 42 rotated by the power transmission unit 2, and the length of the wire 91 unwound from or wound onto the drum 9 are major factors for generating tension that allows the wire 91 to be in close contact with an outer periphery of the drum 9. The numbers of teeth of the main gear 21, idle gear 22 and driven gear 23 of the power transmission unit 2 are adjusted
5 depending on the size of the drum 9 so that the tension is always maintained in the wire 91.

Further, each wire separation preventer 1 is installed to allow each wire 91 wound around the relevant one of the pair of drums 9 to be tensioned so that the wire 91
10 does not slip off the relevant drum. In addition, when a position where the wire is unwound from or wound onto the drum moves in the right and left direction, the moving tube 32 of the supporting unit 3 with the tensioning unit 4 fixed thereto moves in the right and left direction while being extended out of or retracted into the supporting tube 31.

As to the operation of the wire separation preventer 1, when the driving gear 11
15 is manually rotated using a conventional chain and handle which are not shown, the wire 91 wound around the drum 9 is unwound or wound in accordance with the rotation direction of the driving gear. At this time, as the rotational shaft 92 rotates, the main gear 21, idle gear 22 and driven gear 23 of the power transmission unit 2 sequentially
20 rotate, and at the same time, the rotary rod 43 installed in the center of the driven gear 23 rotates to cause the tensioning unit 4 to operate. The tensioning unit 4 causes the driving roller 41 fixed to the leading end of the rotary rod 43 to rotate, and the rotational force from the rotating driving roller 41 causes the wire 91, which is in close contact with the driving roller 41 by the pressing roller 42, to be pulled downward or raised
25 toward the drum 9. Since a state where the amount of rotation of the driving roller 41

is identical with the length of the wire 91 unwound from or wound onto the drum 9 is established, a portion of the wire 91 positioned between the pressing roller 42 and the drum 9 is always tensioned and thus the wire 91 is prevented from slipping off the drum.

Furthermore, a guide roller 8 is installed at an upper portion of the bracket 6 so
5 that the wire 91 is safely guided into between the driving roller 41 and the pressing roller 42 of the tensioning unit 4 even though there is a change in the position of the wire 91 where the wire is unwound from or wound onto the drum 9.

Moreover, an upper coupling portion of the bracket 5 and the main gear 21 of the wire separation preventer 1 according to the present invention are formed in a
10 bisected state and then coupled to the rotational shaft 92. Thus, the wire separation preventer can be conveniently installed on the existing rotational shaft 92 that has been previously installed.

Further, as shown in FIG. 3, the pressing roller 42 of the tensioning unit 4 is installed on a support 46 through a shaft, and the support 46 brings the wire into close
15 contact with the rollers by means of an adjustment bolt 44 fastened to the bracket 6 and a spring 45 interposed between the bolt 44 and the bracket 6. Accordingly, even when the driving roller 41 and the pressing roller 42 are worn due to long-term use thereof and thus the pressing force acting on the wire 91 is reduced, the wire is allowed to be always in close contact with the rollers by means of the elastic force of the spring 45.
20 Therefore, it is not necessary to additionally adjust the pressing force of the pressing roller 42 in the future.

Furthermore, according to the present invention, considering that the separation of the wire from the drum mainly occurs when the wire 91 wound around the drum 9 is unwound therefrom, a clutch bearing 7 is installed in the center of the driven gear 23.
25 The clutch bearing 7 transmits the driving force to the driving roller 41 fixed to the

leading end of the rotary rod 43 only when the wire 91 wound around the drum 9 is unwound therefrom, so that the wire 91 is pulled downward to be tensioned and thus prevented from slipping off the drum. When the wire 91 is wound onto the drum 9, the driving force is not transmitted from the clutch bearing 7 to the driving roller 41
5 fixed to the leading end of the rotary rod 43, so that only tension naturally produced due to the weight of the door 10 acts on the wire 91 which is in close contact with the driving roller 41 and the pressing roller 42. Accordingly, the driving force for rotating the drum 9 can be reduced.

Further, according to the present invention, in a case where the driving gear 11
10 is rotated in an electronic-powered manner using a chain and a motor, which are not shown, as shown in FIGS. 4 and 5, a supporting member 15 is attached to the bracket 6 of the tensioning unit 4. Provided is a catcher 14 that has one end movably installed to penetrate through the supporting member 15, and guide rollers 141 at a leading end thereof by which the wire 91 is caught. The wire separation preventer is further
15 provided with an electric power control unit 19 including a lever 17 fixed perpendicularly to a trailing end of the catcher 14 and a spring 16 interposed to resiliently urging the lever 17 in one direction. If the wire 91 that is moving downward from the tensioning unit 4 is not pulled by the weight of the door 10 any longer and then becomes loose, the catcher 14 is moved by the elastic force of the
20 spring 16 in a direction designated by an arrow in Fig. 5. Thus, the lever 17 operates a switch 18 to shut off the electric power supplied to the motor. Consequently, the electric power control unit 19 causes the wire 91 not to be further unwound from the drum 9 and thus allows a failure to be early settled.

According to the present invention, each wire wound onto or unwound from the
25 relevant drum is moved in a state where it is interposed between and in close contact

with the driving roller and the pressing roller of the tensioning unit so that the wire is always tensioned. Consequently, the wire is in close contact with the outer periphery of the drum and thus is prevented from slipping off the drum. Since the tensioning unit is constructed to guide the wire while moving in accordance with the position of the wire wound onto or unwound from the drum, the wire can be safely wound onto the drum all the time. In case of the electric-powered type using the chain and motor, if the tension is removed from a portion of the wire positioned between the tensioning unit and the door, rotation of the motor is immediately stopped and the unwinding of the wire from the drum is stopped. Consequently, the wire is prevented from slipping off the drum and thus safe use thereof can be always ensured.

CLAIMS

1. A wire separation preventer (1) for an overhead door (10), which prevents each wire (91) from slipping off a relevant one of a pair of drums (9) fixed to both ends of a horizontal rotational shaft (92) when the overhead door is lifted or lowered through winding or unwinding of the wire (91) wound around the relevant drum (9), comprising:
a power transmission unit (2) including a main gear (21), and an idle gear (22) and a driven gear (23) which operate together with the main gear (21);
a supporting unit (3) including a supporting tube (31) coupled to the center of the driven gear (23) to penetrate therethrough, and a moving tube (32) inserted into the supporting tube (31) to be moved in the right and left direction; and
a tensioning unit (4) including a rotary rod (43) installed rotatably to penetrate through the moving tube (32) and the center of the driven gear (23), a driving roller (41) fixed to a leading end of the rotary rod (43), and a pressing roller (42) disposed close to the driving roller (41) for brining the wire (91) into close contact with the driving roller (41), wherein the main gear (21) is fixed to the rotational shaft (92), and a bracket (5) to which the idle and driven gears (22, 23) are rotatably attached is coupled to the rotational shaft (92),
a bracket (6) to which the pressing roller (42) of the tensioning unit (4) is rotatably attached is fitted around and coupled to a leading end of the moving tube (32), and
the wire separation preventer (1) is installed to allow the wire (91) to be tensioned upon winding or unwinding of the wire so that the wire wound around the relevant one of the pair of the drums (9) cannot slip off the drum.
2. The wire separation preventer as claimed in claim 1, wherein a clutch bearing

(7) is installed in the center of the driven gear (23) so that the driving roller (41) fixed to the leading end of the rotary rod (43) is rotated by a driving force transmitted through the clutch bearing only when the wire (91) wound around the drum (9) is unwound therefrom, and the rotary rod (43) is coupled to the clutch bearing (7).

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3. The wire separation preventer as claimed in claim 1 or 2, wherein a guide roller (8) is installed on the bracket (6) so that the wire (91) unwound from or wound onto the drum (9) is safely guided to the tensioning unit (4).

10 4. The wire separation preventer as claimed in claim 1 or 2, wherein an upper coupling portion of the bracket (5) and the main gear (21) are formed in a bisected state to be then coupled to each other, so that the wire separation preventer (1) can be installed on the existing rotational shaft (92) that has been previously installed.

15 5. The wire separation preventer as claimed in claim 1, wherein the pressing roller (42) of the tensioning unit (4) is installed on a support (46) through a shaft, and the support (46) brings the wire into close contact with the rollers by means of an adjustment bolt (44) fastened to the bracket (6) and a spring (45) interposed between the bolt and the bracket.

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6. The wire separation preventer as claimed in claim 1 or 2, further comprising an electric power control unit (19) including a supporting member (15) attached to the bracket (6) of the tensioning unit (4), a catcher (14) that is installed to penetrate through the supporting member (15) and has guide rollers (141) at a leading end thereof by
25 which the wire (91) is caught, a lever (17) fixed perpendicularly to a trailing end of the

catcher (14), and a spring (16) interposed to resiliently urging the lever (17) in one direction, whereby the lever (17) operates a switch (18) to shut off electric power.

FIG. 2

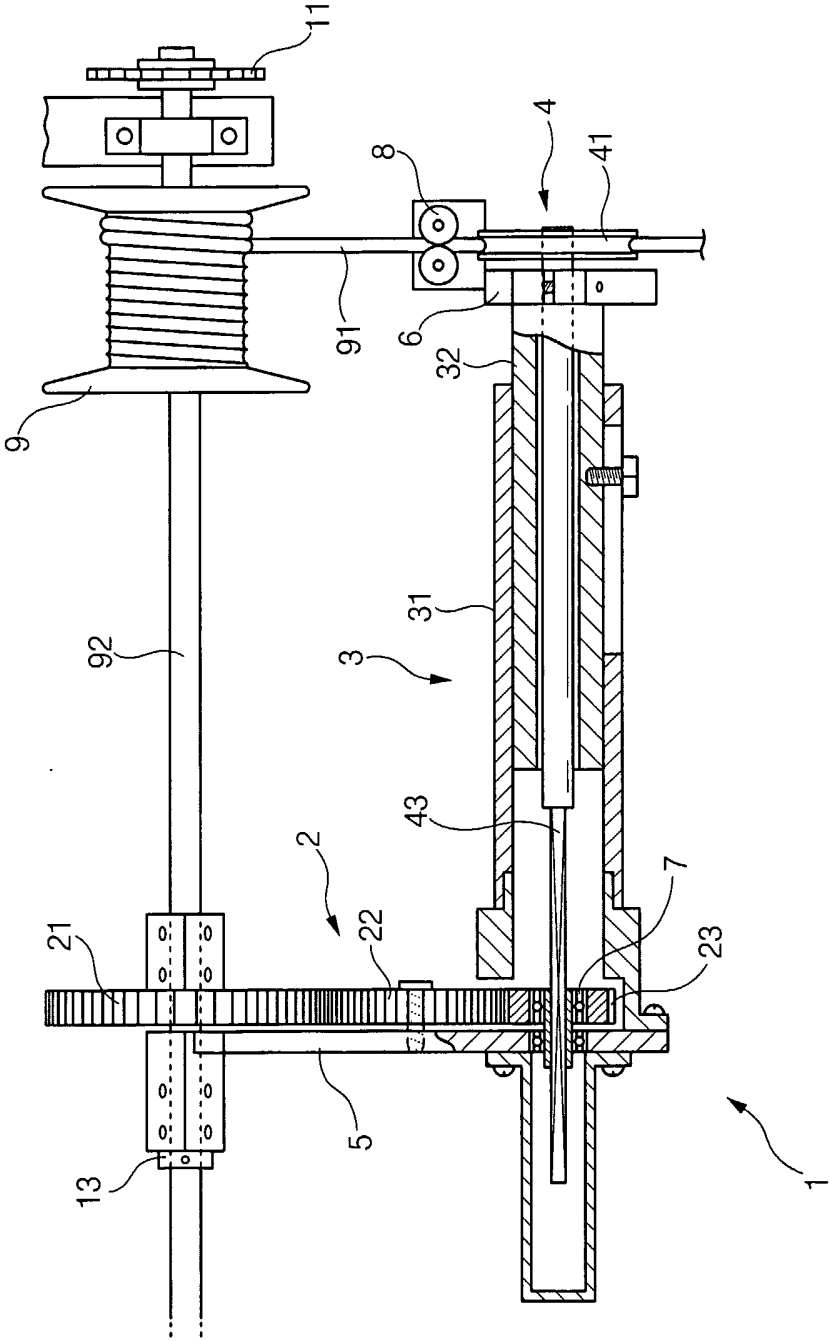
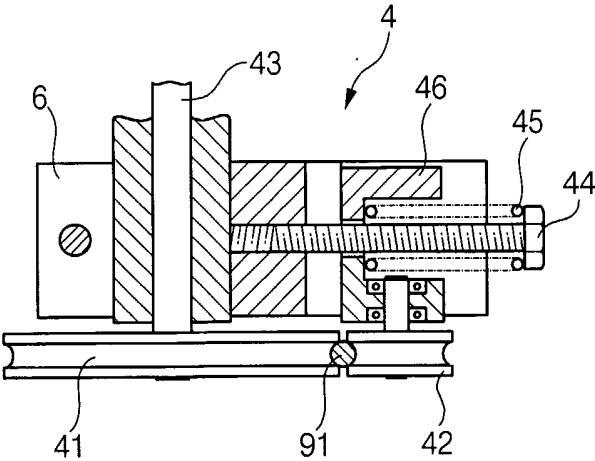


FIG. 3



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FIG.4

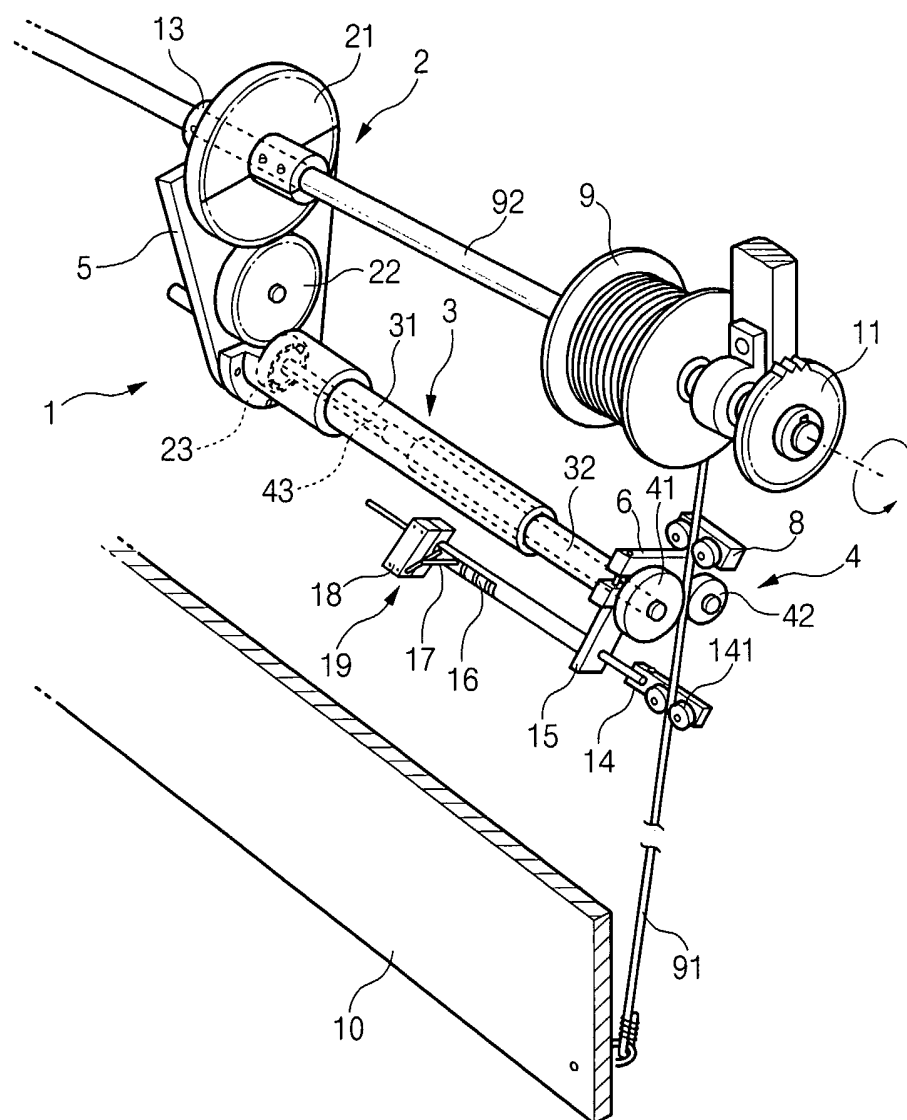


FIG.5

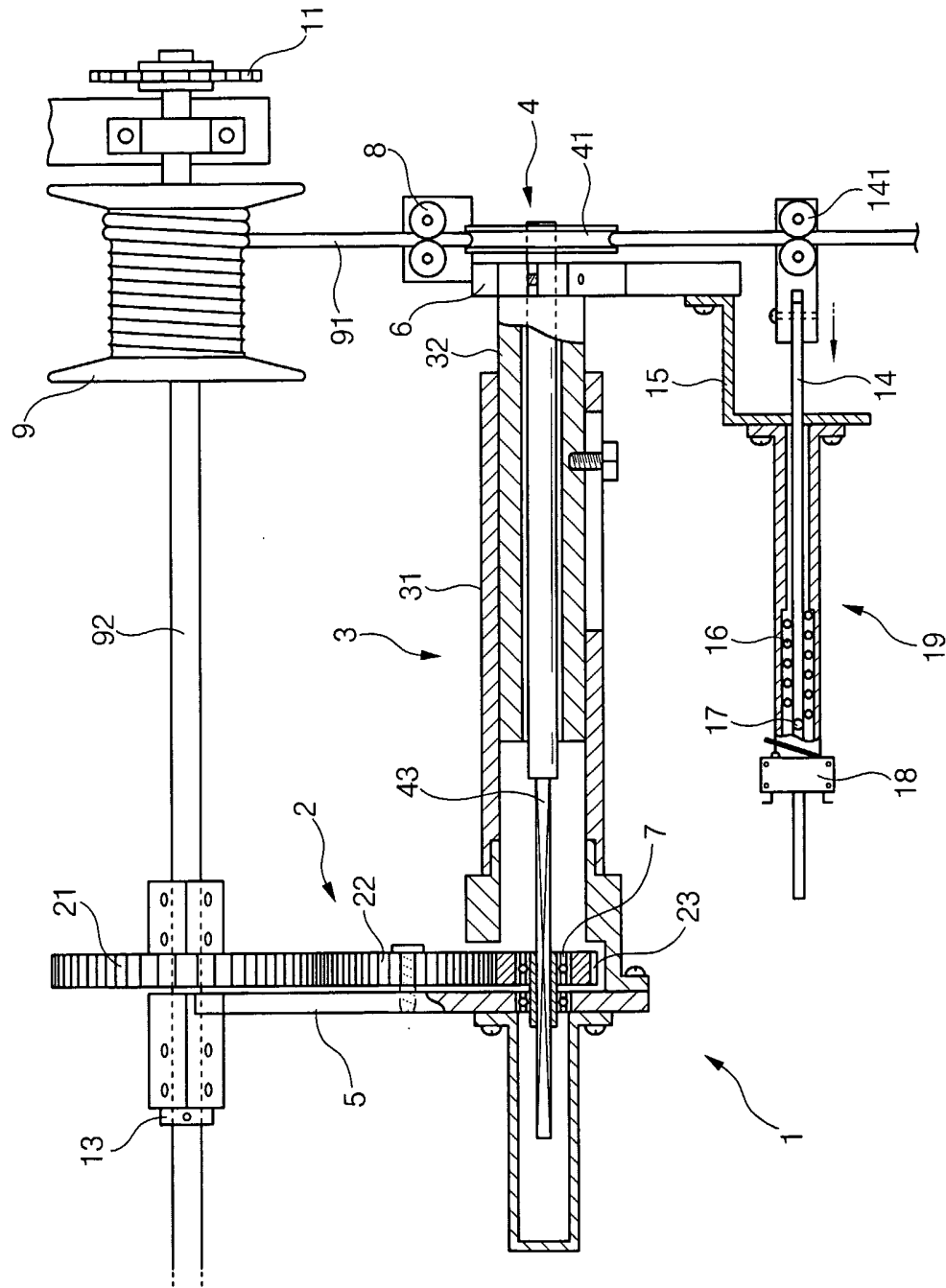
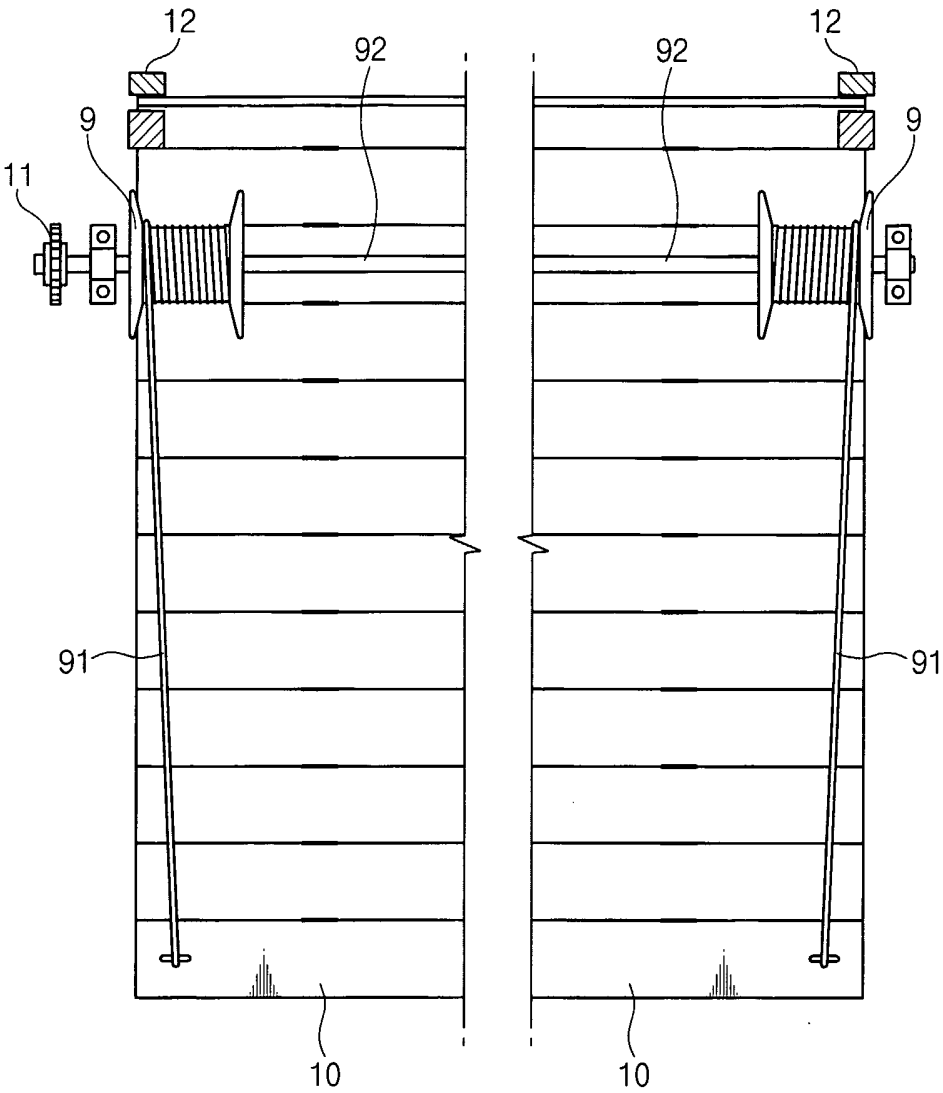


FIG.6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR02/01639**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 E06B 9/17**

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)

E06B

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

KR, JP : Class as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6095224 A(JAMES V. MILLER) Aug 1 2000	1
A	KR 10-1997-11274(LEE, SEOK RYUL) Mar 27 1997	1
A	JP 11-30084 A(UETAKE TORU , ARIYAMA TOSHIHIKO) Feb 2 1999	1

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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