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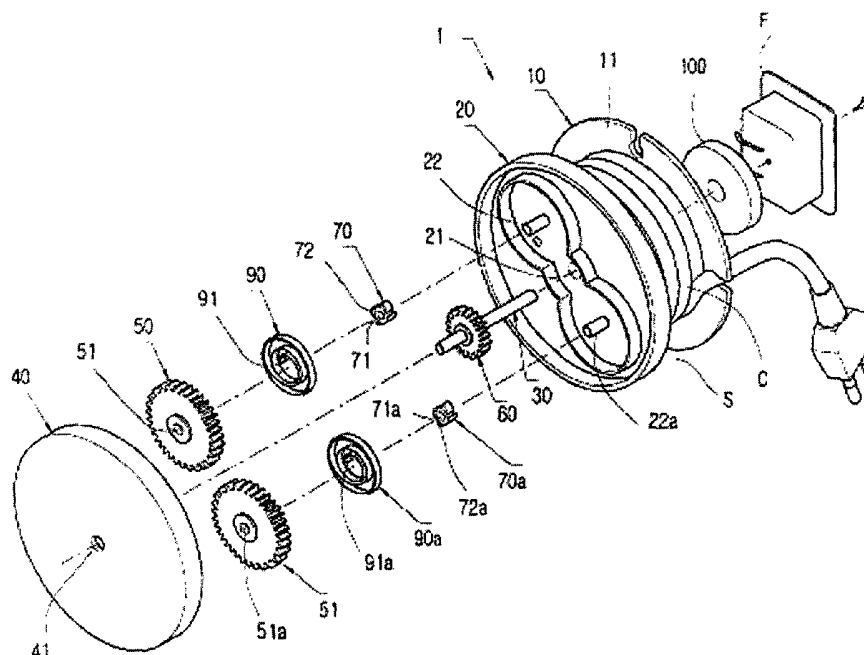
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(54) Title: A TAKE-UP REEL FOR WINDING AN ELONGATED FLEXIBLE MEMBER



(57) Abstract: Disclosed a take-up machine in which at least two reel spring gears are engaged with one reel shaft gear so that balanced centrifugal forces are generated in the least two reel spring gears which are rotated while being engaged with the reel shaft gear. Therefore, flexible members can be fed out in such a manner as to ensure stable torque, and a predetermined take-up velocity can be maintained, thereby providing a user with convenience and stability and extending the life of the machine.



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A TAKE-UP REEL FOR WIDDING AN ELONGATED FLEXIBLE MEMBER

Technical Field

The present invention provides a take-up machine
5 in which at least two reel spring gears are engaged
with one reel shaft gear so that balanced centrifugal
forces are generated in the at least two reel spring
gears which are rotated while being engaged with the
reel shaft gear, whereby a flexible member can be fed
10 out in such a manner as to ensure stable torque, and a
predetermined take-up velocity can be maintained,
thereby providing a user with convenience and stability
and extending the life of the machine.

15 Background Art

The present invention relates to a take-up machine
which is used to automatically take up a substantially
thin, long flexible member such as an electric cord, a
20 hose or the like at the time when the flexible member
is fed out from a reel on which the flexible member has
been taken up, wherein a predetermined force of
rotating the reel is constantly maintained when the
flexible member is fed out, reducing a manufacturing
25 cost of a reel spring used in the machine, and a
predetermined force of rotating the reel in a reverse
direction is constantly maintained even when the
braking force of a braking device for the reel rotating
during the drawing of the flexible member is released
30 to thus take up the flexible member on the reel, such
that the flexible member being fed out from the reel is
taken up smoothly on the machine, which does not give
any shock to both the flexible member and the machine.

In general, a take-up machine is configured in such a manner that a reel into which a reel shaft is inserted is rotated relative to the reel shaft, and a reel spring serving as a flat spiral spring capable of
5 rotating the rotating reel in a reverse direction is secured to the reel shaft at the inner end portion thereof and to the reel at the outer end portion thereof.

A separate braking device serves to stop the
10 rotation of the reel at the state where a predetermined force of elasticity is accumulated to the reel spring when the reel on which the flexible member is taken up is rotated to feed out the flexible member, and when a braking force from the braking device is released, the
15 reel is rotated in a reverse direction by the elasticity of the reel spring, such that the flexible member is taken up again, which results in the conveniences in carrying the flexible member and in keeping it at a predetermined place.

A conventional take-up machine is generally provided with the reel spring giving elasticity in winding the flexible member that has the same size as the outer periphery of the reel. In the conventional take-up machine, the longer the length of the flexible
25 member drawn from the reel is, the more a drawing force occurring when the flexible member is drawn from the reel increases. In the same manner as above, the longer the length of the flexible member drawn from the reel is, the larger a rotating force of the reel in the
30 reverse direction becomes. This results in giving no safety in use to a user as well as giving damages to the machine.

As noted above, the reel spring has the same size

appropriately as the reel, which gives some defects that the whole weight increases, the manufacturing costs are raised, and its own elasticity becomes high such that it is not easy to handle the reel spring upon assembling.

To overcome these shortcomings, there has been presented Korean Patent laid-open publication No. 2002-78700 that has been filed earlier by the same applicant as the present invention, disclosing a take-up machine for electric wire/hose.

Such the take-up machine is shown in FIG. 1. Referring to the figure, a spring mounting part is comprised of a reel shaft 400, a reel spring gear 311, a reel spring 300, a bi-directional locking member 500 and a fixing shaft 320. The reel shaft 400 is passed through the central portion of a substantially round body 100 via the central portion of a flange 200 and is then coupled by use of an assembling screw 700 at one end thereof and it is provided with a reel shaft gear 410 at the other end thereof. The flange 200 is provided with the fixing shaft 320 to which the reel spring 300 is secured, at one side thereof, and the coupling with the fixing shaft 320 is carried out in the order of the bi-directional locking member 500, the reel spring 300, and the reel spring gear 311, wherein the reel spring gear 311 is engaged with the reel shaft gear 410 and the reel spring 300 is fixed at inner side of the reel spring gear 311 at one end thereof and locked onto a locking protrusion 510 of the bi-directional locking member 500 at the other end thereof.

It can be noted that the size of the reel spring is relatively smaller than before such that the manufacturing costs are reduced, and when the speed

ratios of the gears are controlled, it is possible to control the speed ratio between the flange and the reel spring, which enables the take-up machine to have a semi-permanent life period.

5 However, since the single reel spring gear 311 is engaged with the reel shaft gear 410 that is placed on the central portion of the take-up machine, there is a problem that torque gathers only to the single reel spring gear 311 while the two gears are being rotated.

10 In other words, the reel shaft gear 410 to which the reel is fixed spring is located at a position to be a centripetal point at the central portion of the round body and the reel spring gear 311 is rotated together with the reel, being engaged with the reel shaft gear

15 410, thereby producing a centrifugal force therefrom. As a result, the reel spring gear 311 creates thrust load in a vertical direction relative to the reel shaft 400, deviated from the central portion of the round body. This results in the wearing at the contact

20 surface between the two gear parts and the generation of the noises when they touch each other.

Disclosure of Invention

25 Accordingly, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a take-up machine in which at least two reel spring gears are formed in symmetrical relation with each other with respect to

30 one reel shaft gear that is secured to a reel, so that the size of the reel springs is reduced and balanced centrifugal forces are generated in the at least two reel spring gears which are rotated while being engaged

with the reel shaft gear, whereby a flexible member can be fed out in such a manner as to ensure stable torque, and a predetermined take-up velocity can be maintained, thereby providing a user with convenience and stability
5 and extending the life of the machine.

Brief Description of the Drawings

Further objects and advantages of the invention
10 can be more fully understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an exploded perspective view of a conventional take-up machine;

15 FIG. 2 is an exploded perspective view of a take-up machine according to an embodiment of the present invention;

FIG. 3 is a perspective view of the take-up machine at the state of being assembled;

20 FIG. 4 is a sectional view of the inside of the gears employed in the take-up machine of the present invention;

FIG. 5 is a side sectional view of the outside of the gears being engaged with each other in the take-up
25 machine of the present invention;

FIG. 6 is a front sectional view of the outside of the gears being engaged with each other in the take-up machine of the present invention; and

FIG. 7 is a front sectional view of the outside of
30 the gears being engaged with each other in a take-up machine according to another embodiment of the present invention.

Best mode for Carrying Out the Invention

A take-up machine according to the present invention including a reel shaft with a reel shaft gear fixed thereto, a reel to which the reel shaft is fixed and on which a flexible member is taken up, the reel being rotated with respect to the reel shaft, a reel spring gear being rotatably fixed to the reel and engaged with the reel shaft gear to be rotated at the time of taking up and feeding out the flexible member, and a reel spring fixed at one end thereof to a fixing shaft to which the reel spring gear is fixed and fixed at the other end thereof to the reel spring gear such that the flexible member on the reel is taken up or fed out, is characterized in that at least two reel spring gears are formed in symmetrical relation with each other with respect to the reel shaft gear so that balanced centrifugal forces are generated in the at least two reel spring gears which are rotated while being engaged with the reel shaft gear.

In more detail, the take-up machine of this invention is provided with first and second fixing shafts that are placed at the positions that are divided at the same angle relative to the reel shaft, the second fixing shaft being located at the position being symmetrical to the first fixing shaft to which the first reel spring gear is secured on a line where the central portions of the first fixing shaft and the reel shaft gear are extended in a straight line, wherein the second fixing shaft is provided with a second reel spring to which the second reel spring gear being in pair relation with the first reel spring gear is rotatably secured.

Therefore, there are provided the first and second reel spring gears having the first and second reel springs with respect to the reel shaft gear secured to the reel shaft, such that they cooperate to each other
5 when the reel is rotated by drawing the flexible member or winding it, thereby making the torque of the reel maintained at a predetermined force. In other words, when the first and second reel spring gears that are formed in symmetrical relation with each other with
10 respect to the reel shaft are rotated to form predetermined tracks in a circumferential direction thereof with respect to the reel shaft, the total centrifugal forces that act at the same time toward the outside from the first and second reel spring gears
15 become '0', such that balanced centrifugal forces are generated, which ensures the reel spring gears being rotated not to be deviated from their tracks. Of course, it means no thrust load is generated with respect to the reel shaft.

20 According to another embodiment of the present invention, there is provided a take-up machine including a reel shaft with a reel shaft gear fixed thereto, a reel to which the reel shaft is fixed and on which a flexible member is taken up, the reel being
25 rotated with respect to the reel shaft, a reel spring gear being rotatably fixed to the reel and engaged with the reel shaft gear to be rotated at the time of taking up and feeding out the flexible member, and a reel spring fixed at one end thereof to a fixing shaft to
30 which the reel spring gear is fixed and fixed at the other end thereof to the reel spring gear such that the flexible member on the reel is taken up or fed out, characterized in that first, second and third fixing

shafts are placed at the positions that are divided at the same angle relative to the reel shaft, the first, second and third fixing shafts rotatably securing first, second and third reel spring gears each having a reel
5 spring correspondingly thereto.

Therefore, there are provided the first and second reel spring gears having the first, second and third reel springs with respect to the reel shaft gear secured to the reel shaft, such that they cooperate to
10 each other when the reel is rotated by drawing the flexible member or winding it, thereby making the torque of the reel maintained at a predetermined force. In other words, when the first to third reel spring gears that are formed in symmetrical relation with one
15 another at both sides relative to the reel shaft are rotated to form predetermined tracks in a circumferential direction thereof with respect to the reel shaft, the total centrifugal forces that at the same time act toward the outside from the positions at
20 which the three reel spring gears are divided at the same angle become '0', such that balanced centrifugal forces are generated, which ensures the reel spring gears being rotated not to be deviated from their tracks. Of course, it means no thrust load is generated
25 relative to the reel shaft.

Now, an explanation of the preferred embodiments of the present invention will be in detail given hereinafter.

In the preferred embodiments of the present
30 invention, the flexible member will be shown and described as an electric cord.

FIG. 2 is an exploded perspective view of a take-up machine according to an embodiment of the present

invention, and FIG. 3 is a perspective view of the take-up machine at the state of being assembled.

Referring to these figures, a reel 1 includes a body 10 and a flange 20.

5 The body 10 has a substantially cylindrical protruding part 13 provided with a space part 12 that is passed through the central portion of a substantially vertical disc part 11.

10 The flange 20 has a shaft hole 21 into which a first reel shaft 30 is inserted, on the central portion thereof, and is provided with a first fixing shaft 22 for fixing a first reel spring gear 50 and a second fixing shaft 22a for fixing a second reel spring gear 50a that are protruded from the one side to which a
15 cover 40 is coupled, and with an insertion part 23 that is formed on the opposite side to the one side thereof in such a manner as to be inserted into the space part 12 of the cylindrical protruding part 13 of the body 10.

20 In this case, the central portions of the first and second fixing shaft 22 and 22a are located at the positions that are divided by 180° in a circumferential direction thereof, i.e. at the two positions that are in a line with respect to the central portion of the reel shaft 30 at the same radius
25 from the central portion of the reel shaft 30.

30 The insertion part 23 of the flange 20 is inserted into the space part 12 of the cylindrical protruding part 13 such that the flange 20 is placed at the opposite position to the vertical disc part 11 of the body 10, separated from a predetermined distance therefrom, thereby providing a space portion S on which a cord C is taken up.

 The reel shaft 30 is provided with a reel shaft

gear 60 that is integrally fixed thereto for rotating the first and second reel spring gears 50 and 50a, the reel shaft gear 60 being inserted into the shaft hole 21 of the flange 20 in such a manner as to be secured to a fixed stand F relative to a machine which is not shown, at one end portion thereof and being passed through a shaft hole 41 of the cover 40 in such a manner as to be supported by a support bar P, at the other end portion thereof.

10 The first and second reel spring gears 50 and 50a that are of the same size are placed around the reel shaft gear 60, in such a manner that the first reel spring gear 50 is rotatably fixed to the first fixing shaft 22 on the flange 20 and the second reel spring gear 50a is rotatably fixed to the second fixing shaft 22a thereon.

The first and second reel spring gears 50 and 50a have first and second reel springs 90 and 90a that give a restoring force thereto after the rotation by means of the reel shaft gear 60.

Now, a method of fixing the first and second reel springs 90 and 90a to the first and second reel spring gears 50 and 50a is as follows:

The first reel spring gear 50 has a first shaft hole 51 into which the first fixing shaft 22 is inserted on the central portion thereof and has a first fixing member 70 with a first protrusion 72 for fixing the first reel spring 90 on the outer peripheral surface thereof, such that a first locking part 91 of the first reel spring 90 is fixed to the first protrusion 72 of the first fixing member 70 and the outer end portion of the first reel spring 90 is fixed to the inside surface of the first reel spring gear 50.

In the same manner as mentioned above, the second reel spring gear 50a has a second shaft hole 51a into which the second fixing shaft 22a is inserted on the central portion thereof and has a second fixing member 70a with a second protrusion 72a for fixing the second reel spring 90a on the outer peripheral surface thereof, such that a second locking part 91a of the second reel spring 90a is fixed to the second protrusion 72a of the second fixing member 70a and the outer end portion of the second reel spring 90a is fixed to the inside surface of the second reel spring gear 50a.

After the fixing, the first shaft hole 71 of the first fixing member 70 coincides with the first shaft hole 51 of the first reel spring gear 50 at the same shaft, and the second shaft hole 71a of the second fixing member 70a coincides with the second shaft hole 51a of the second reel spring gear 50a at the same shaft.

In this state, the first fixing shaft 22 is inserted through the first shaft hole 71 of the first fixing member 70 and the first shaft hole 51 of the first reel spring gear 50 such that the first fixing member 70 is secured to the first fixing shaft 22 and the first reel spring gear 50 is rotatably secured thereto.

In the same manner as mentioned above, the second fixing shaft 22a is inserted through the second shaft hole 71a of the second fixing member 70a and the second shaft hole 51a of the second reel spring gear 50a such that the second fixing member 70a is secured to the second fixing shaft 22a and the second reel spring gear 50a is rotatably secured thereto.

When the first and second reel shaft gears 50 and

50a are secured, they are engaged in symmetrical relation with each other at both sides of the reel shaft gear 60 rotatably fixed to the shaft hole 21 of the reel 1.

5 At that time, the first and second reel springs 90 and 90a that are received in the first and second reel spring gears 50 and 50a are fixed to have the same winding direction, and the first and second fixing members 70 and 70a are fixed in the same direction as
10 each other.

 When the reel shaft 30 is rotated together with the reel 1, therefore, the first and second reel spring gears 50 and 50a that are fixed to the first and second fixing shafts 22 and 22a are rotated in the same
15 direction, forming predetermined tracks in a circumferential direction thereof with respect to the reel shaft 30. At that time, the first and second reel spring gears 50 and 50a are engaged with the reel shaft gear 60 that is rotatably fixed to the central portion
20 of the reel 1, such that they can be rotated in the same direction as each other.

 Thus, the first and second reel springs 90 and 90a save their elasticity at the same time and release it at the same time, depending upon the rotating direction
25 of the first and second reel spring gears 50 and 50a. The first and second reel spring gears 50 and 50a that have been fixed to the first and second fixing shafts 22 and 22a are finally secured by means of the cover 40 that is fixed to the flange 20 of the reel 1.

30 As the cover 40 is fixed to the flange 20, the reel shaft 30 is passed through the shaft hole 41 and is supported by means of the support bar P at the one end thereof.

Thereby, the electric wire of the cord C that is wound on the reel 1 is connected to a rotary disc 100 that is secured to the fixing stand F, comprising a general structure to which power is supplied.

5 Now, an explanation of an operation of the take-up machine according to the first embodiment of the present invention will be given below.

When the cord C that is taken up on the reel 1 is pulled to be fed out, the reel 1 comprised of the body
10 10 and the flange 20 starts to be rotated and the reel shaft 30 that is fixed to the flange 20 is accordingly rotated.

When the reel shaft 30 is rotated, the first and second reel spring gears 50 and 50a that are engaged
15 with the reel shaft 30 are at the same time rotated.

An explanation of the rotation procedure is in more detail given with reference to FIG. 6.

In the embodiment of FIGS. 2 and 3, the cord C is wound on the reel 1 in a counterclockwise direction to
20 be fed out at the right side from the lower portion of the reel 1.

When the cord C is fed out, thus, the reel 1 is rotated in the counterclockwise direction and the reel shaft gear 60 that is fixed to the reel 1 is
25 accordingly rotated in the counterclockwise direction, as shown in FIG. 6.

At the same time, as the first and second reel spring gears 50 and 50a that are engaged with the reel shaft gear 60 are rotated in the clockwise direction
30 around the first and second fixing shafts 22 and 22a, they are rotated in the counterclockwise direction together with the reel 1, forming predetermined tracks in a circumferential direction with respect to the reel

shaft gear 60.

At that time, the first and second fixing members 70 and 70a are secured to the first and second fixing shafts 22 and 22a and the first and second reel springs 90 and 90a are secured to the first and second protrusions 72 and 72a of the first and second fixing members 70 and 70a and the first and second reel spring gears 90 and 90a at both end portions thereof, such that the first and second reel springs 90 and 90a are taken up to save their elasticity, as the first and second reel spring gears 50 and 50a are rotated.

When the cord C is fed out to a desired length, a known braking device B as shown in FIG. 3 abuts the outer peripheral surface of the flange 20 of the reel 1 to stop rotating, such that the reel 1 stops to supply the electric cord C to a desired place.

When the braking force of the braking device B is released after the power supply is finished, the elasticity stored in the first and second reel springs 90 and 90a becomes restored such that the first and second reel spring gears 50 and 50a are rotated in the counterclockwise direction opposite to the direction rotated when the cord C is fed out and at the same time the reel shaft gear 60 is rotated in the clockwise direction.

Therefore, the reel 1 having the body 10 and the flange 20 to which the reel shaft 30 of the reel shaft gear 60 is secured takes up the cord C again, being rotated in the opposite direction to the direction rotated when the cord C is fed out.

FIG. 7 shows a take-up machine according to another embodiment of the present invention. In this embodiment, the same reference numerals are designed to

the same parts as the first embodiment of the present invention.

Referring to this figure, the body 10 is provided with the reel shaft 30 to which the reel shaft gear 6
5 is secured that is rotatably fixed on the central portion thereof, and the second and third fixing shafts 22a and 22b are placed at the positions divided by an equal angle with respect to the first fixing shaft 22.

In more detail, the central portions of the first
10 to third fixing shafts 22, 22a and 22b are located at the positions that are divided by 120 ° at the same radius in a circumferential direction thereof from the central portion of the reel shaft 30, as shown in FIG. 7.

15 The first reel spring gear 50 and the first fixing member 70 are secured to the first fixing shaft 22, the second reel spring gear 50a and the second fixing member 70a are secured to the second fixing shaft 22a, and the third reel spring gear 50b and the third fixing
20 member 70b are secured to the third fixing shaft 22b.

The first to third fixing members 70, 70a and 70b are provided with the first to third protrusions 72, 72a and 72b for fixing the respective reel springs.

The first to third reel spring gears 50, 50a and
25 50b are secured to the first to third fixing shafts 22, 22a and 22b such that they are engaged with the reel shaft gear 60.

In the same manner as in the first embodiment, the
30 first reel spring 90 is secured to the first protrusion 72 of the first fixing member 70 and to the first reel spring gear 50, the second reel spring 90a is secured to the second protrusion 72a of the second fixing member 70a and to the second reel spring gear 50a, and

the third reel spring 90b is secured to the third protrusion 72b of the third fixing member 70b and to the third reel spring gear 50b.

5 In this embodiment, when the reel shaft gear 60 is rotated together with the reel shaft 30, the first to third reel spring gears 50, 50a and 50b are at the same time rotated. In this case, they are rotated at the positions divided equally by three, thereby generating stable torque.

10 While the present invention has been described with reference to a few specific embodiments, the description is illustrative of the invention and is not to be construed as limiting the invention. Various modifications may occur to those skilled in the art
15 without departing from the true spirit and scope of the invention as defined by the appended claims.

What Is Claimed Is:

1. In a take-up machine comprising a reel shaft (30) with a reel shaft gear (60) fixed thereto, a reel (1) to which the reel shaft (30) is fixed and on which a flexible member is taken up, the reel (1) being rotated with respect to the reel shaft (30), a reel spring gear rotatably fixed to the reel (1) and engaged with the reel shaft gear (60) to be rotated at the time of taking up and feeding out the flexible member, and a reel spring fixed at one end thereof to a fixing shaft to which the reel spring gear is fixed and fixed at the other end thereof to the reel spring gear such that the flexible member on the reel (1) is taken-up or fed out, the improvement wherein at least two reel spring gears are formed in symmetrical relation with each other with respect to the reel shaft gear (60) so that balanced centrifugal forces are generated in the at least two reel spring gears which are rotated while being engaged with the reel shaft gear (60).

2. The take-up machine according to claim 1, wherein a second fixing shaft (22a) is located in symmetrical relation with a first fixing shaft (22) to which the first reel spring gear (50) is secured at the positions that are divided at the same angle relative to the reel shaft (30), the second fixing shaft (22a) having the second reel spring gear (50a) rotatably fixed thereto, the second reel spring gear (50a) having a second reel spring (90a) that is the same as a first reel spring (90) fixed to the first reel spring gear (50), such that the first and second reel spring gears (50 and 50a) are at the same time rotated with respect

to the reel shaft gear (60).

3. The take-up machine according to claim 1,
wherein first to third fixing shafts (22, 22a and 22b)
are placed at the positions divided by an equal angle
5 with respect to the reel shaft (30), the first to third
fixing shafts having first to third reel spring gears
(50, 50a and 50b) at the same time rotatably secured
thereto, the first to third reel spring gears having
first to third reel springs (90, 90a and 90b) fixed
10 thereto.

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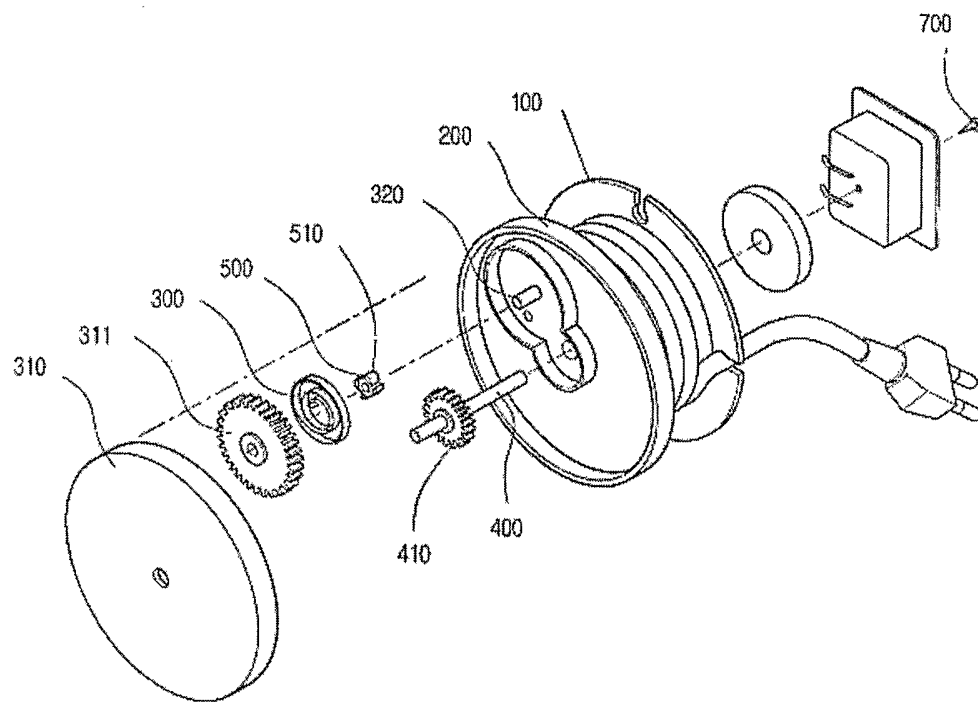


FIG. 1

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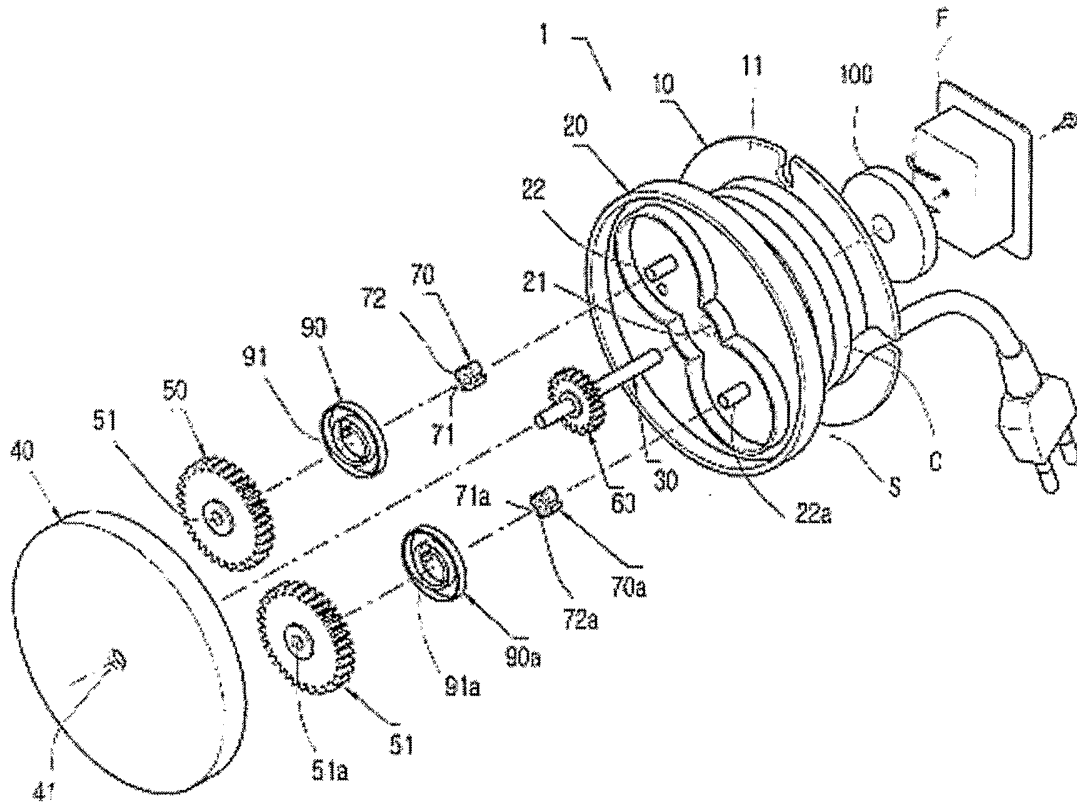


FIG. 2

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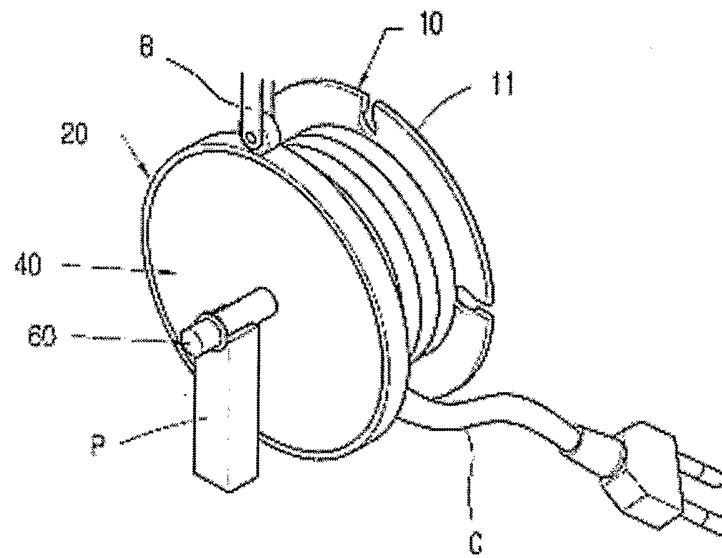


FIG. 3

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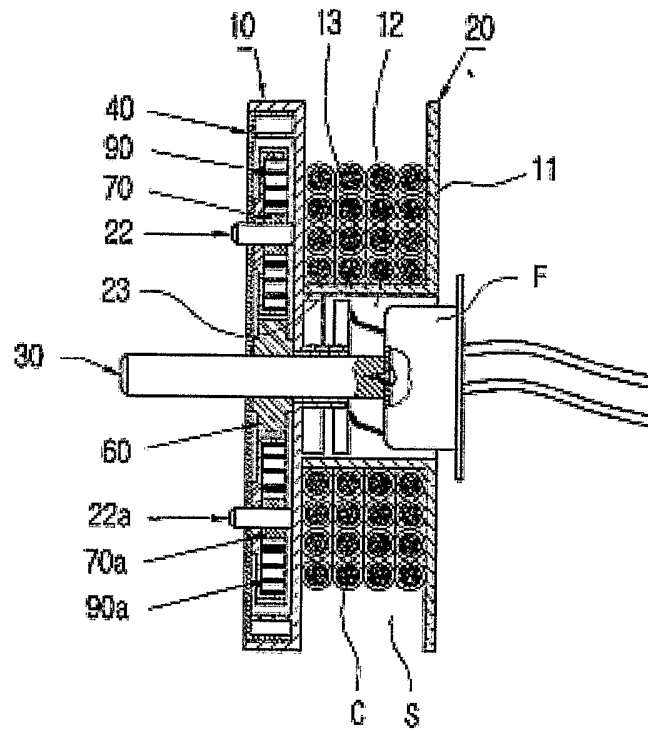


FIG. 4

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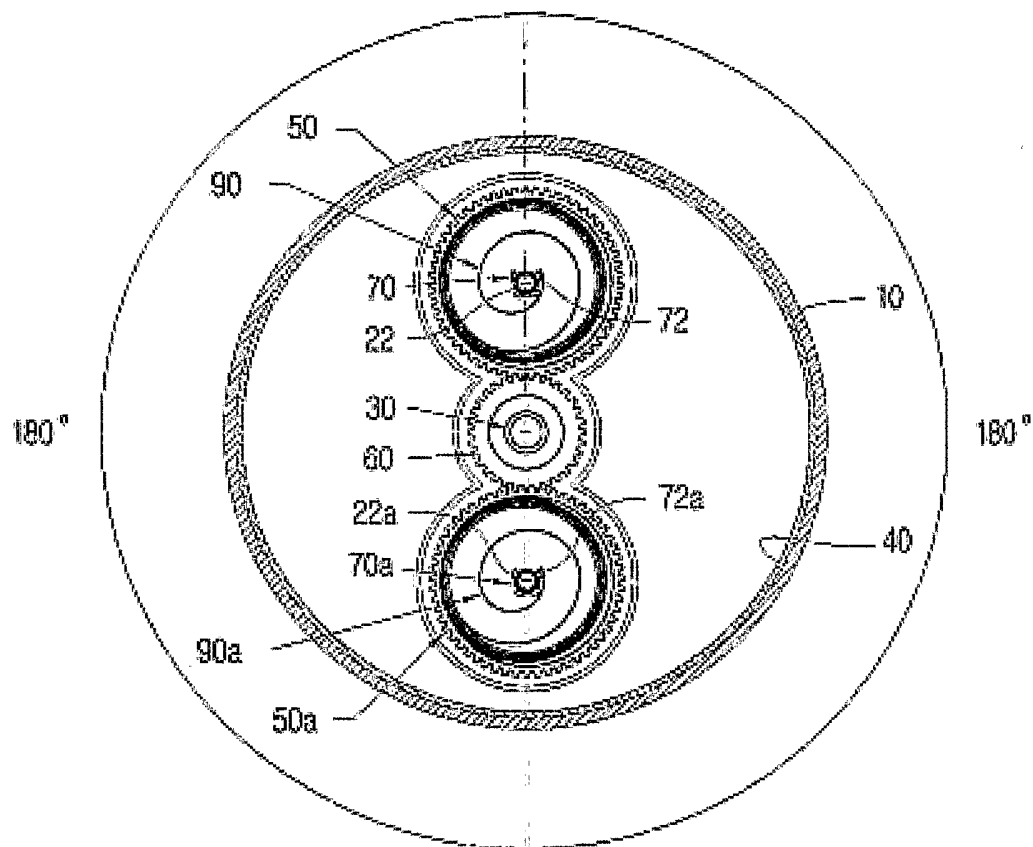


FIG. 6

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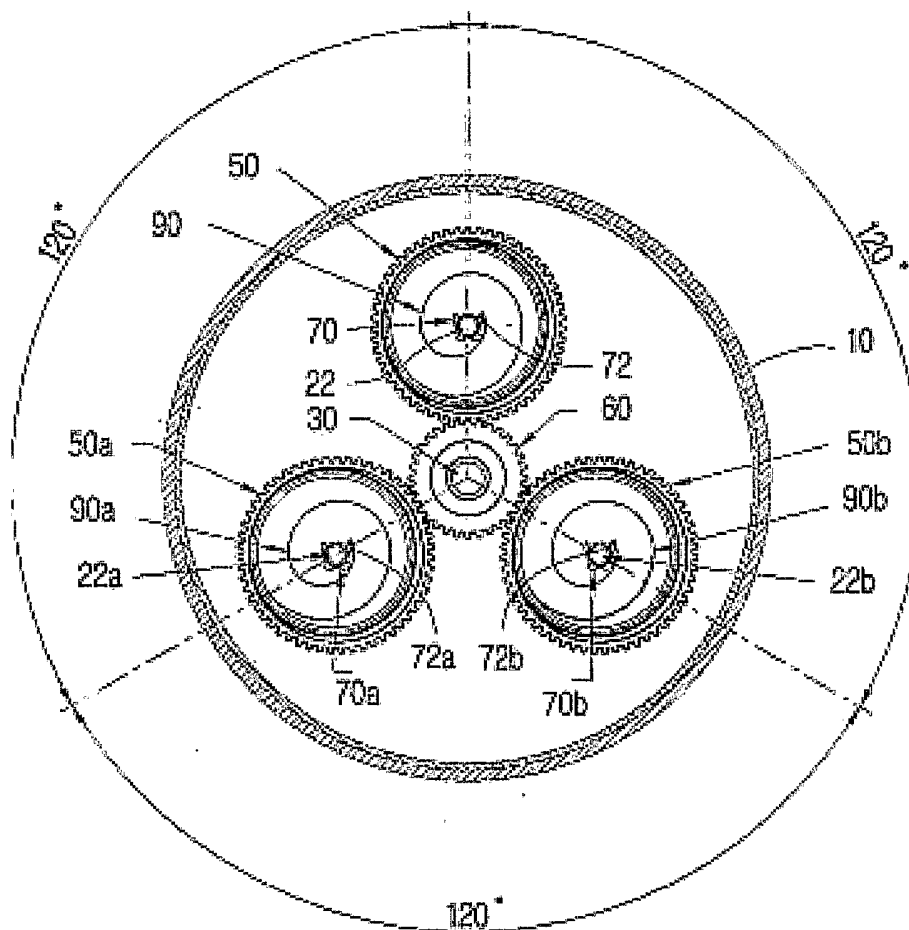


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR03/00089

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 H02G 11/02**

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)

IPC7 H02G 11/02, B65H 75/48, 75/34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Patents and application for inventions since 1975

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	KR 2002-0078500 A (Dual Mechanics Co., Ltd) 19 October 2002 see same the figure 1 as this invention figure 1	1-3
A	JP 03067203(GN)Y , 22 December 1999, see the abstract; figures.	1-3
A	US 6,179,104 B1 (Atlanta Kabel Steinmuller GmbH+Co. KG , DE), 30 January 2001. see the abstract; figures.	1-3
A	US 4,402,472 A (Paul Burtcher), 6 September 1983. see the abstract; figures.	1-3

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

* Special categories of cited documents:

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 2002-0078500 A1	19-10-2002	None	
JP U03067203(GN) A1	22-12-1999	None	
US 6,179,104 B1	30-01-2001	HU 9902008 A0	30-08-1999
		EP 966083 A3	20-09-2000
		DE 19826661 C1	21-10-1999
		TR 9901324 A2	21-01-2000
US 4,402,472 A	06-09-1983	EP 22230 B1	16-05-1984
		AU 540979 B2	13-12-1984
		CA 6001580 A1	15-01-1981
		AT 7481	15-06-1984