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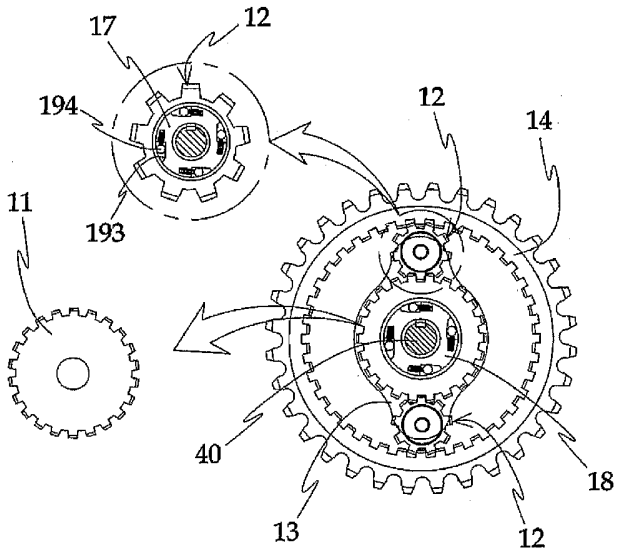
(54) Title: AUTOMATIC OUTPUT APPARATUS FOR CONVERTING TWO WAY DRIVE TO ONE WAY AND BICYCLE WITH IT



(57) Abstract: The present invention relates to an automatic output apparatus for converting two way drive into one way and a bicycle fabricated therewith, in particular to an automatic output apparatus for converting two way drive into one way drive, in which planetary gear group and one way bearing are engaged with each other so that driving power produced by driving in a forward or reverse direction without any separate outside operating device or action regardless of the driving way of the user can be smoothly converted into one way output, planetary rotation state, and backward breaking state, and a bicycle which is fabricated by such an one way output apparatus and removing means so that locked backward breaking state can be forcibly disentangled when backward progress is required.

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AUTOMATIC OUTPUT APPARATUS FOR CONVERTING TWO WAY DRIVE TO ONE WAY AND BICYCLE WITH IT

Technical Field

The present invention relates to an automatic output apparatus for converting two way drive into one way and a bicycle fabricated therewith, in particular to an automatic output apparatus for converting two way drive into one way, in which a planetary gear group and one way bearing are engaged with each other so that driving power produced by driving in a forward or reverse direction without any separate outside operating device or action regardless of the driving way of the user can be smoothly converted into one way output, planetary rotation state, and backward breaking state, and a bicycle which is fabricated by such an one way output apparatus and a lock relief device so that locked backward breaking state can be forcibly relieved when backward movement is required.

Background Art

In general, a bicycle output apparatus can move in a forward way by means of driving in the forward direction from a driving portion. However, several efforts have been made to develop a bicycle equipped with an apparatus (hereinafter, it is indicated as 'one way output apparatus'), which can produce one way output by means of two way drive in the forward or reverse

direction.

Such a one way output apparatus for a bicycle disclosed in Korean Patent application No. 2004-0025976 is a representative apparatus for it. As shown in FIG. 1, in such conventional apparatus, a forward direction bearing 2 and a reverse direction bearing 2' are respectively engaged with a pedal shaft 7, first bevel gear 3 is tooth-engaged with the forward direction bearing 2, third bevel gear 5 is tooth-engaged with the reverse direction bearing 2', the first bevel gear 3 and the third bevel gear 5 are tooth-engaged with each other via second bevel gear 4, and the second bevel gear 4 is movably engaged with a carrier 6 installed rotatably to the pedal shaft 7.

In the above conventional output apparatus, two way drive has been converted into one way output by means of the combination of the one way bearing and the bevel gears 3, 4 and 5. However, as it is a parallel type output apparatus in which power transmission paths of the forward and reverse drive employing the combination of the first, second and third bevel gears are different, and it is relatively big in size and requires operation of an outside separate operation lever at the time of reverse direction drive, it is disadvantageous because temporary stop of the drive and disconnection of the power transmission have been brought about to cause inconvenience and hurts in the harmful road surface such as a slope way, and a projected and recessed way. In other words, nowadays, the development of the bicycle is carried out in the direction to

make the weight thereof light and minimize volume thereof, however, in the above described conventional apparatus, it is disadvantageous because the volume and weight of the gear box itself have been increased owing to the use of the bevel gears, to thereby increase the whole weight and volume of the bicycle.

Further, as it is apparent from the structure of the conventional apparatus, the power transmission system is as complicated as that of a motor because input and output paths are different, and there are a lot of outside projections and small parts to cause decrease of durability and increase of the disorder. Also, it is heavy because of increase in the number of parts and volume, and it is difficult to design and fabricate, further production cost increases and size thereof increases to incur lots of unreasonable problems to block practice, although it is a progressive technique in comparison with the general bicycle.

Disclosure of Invention

Technical Problem

The present invention has been made to solve the above-mentioned problems occurring in the conventional output apparatus and bicycle fabricated therewith, and an object of the present invention is to provide an output apparatus for converting two way drive into one way, which is unified in power transmission path of forward and reverse direction drive by combining the planetary gear group and the one way bearing

regularly to form a simple serial type output apparatus, and can replace the complicated structure such as a motor, bevel gears of a relatively big volume, and so on, so that it can automatically convert the two way drive power such as forward direction or reverse direction drive power into one way drive power and can construct a planetary rotation clutch state and a backward breaking state, and which can be fabricated compact by simplifying the structure and can decrease weight and enhance rigidity and reliability of operation to thereby reduce production cost and disorder ratio.

Further, another object of the present invention is to provide an output apparatus for converting two way drive into one way, which is without noise and small parts in the basic structure to provide excellent durability and prevention of disorder, and can prevent impurities such as dust and so on from flowing in because it is an encasing type without any outside connecting operation devices, and which is diversified in rotation and torque ratio owing to the design parameter of the gear and can replace the conventional products.

Still another object of the present invention is to provide an output apparatus for converting two way drive into one way, which can obtain output of uniform velocity, decreased velocity, and increased velocity, and can prevent temporary stop of the drive and disconnection of the power transmission because separate operation is not necessary for converting the drive, and can convert the driving power of the reverse drive into a

big power by the gear.

Still another object of the present invention is to provide a bicycle fabricated by combining the output apparatus for converting the two way drive into one way and a lock relief device, which can accomplish basic actions by the user's operating the pedal driven in the forward or reverse direction, and can be operated in the backward way automatically without any operation of the lever and so on, when the backward operation is again required for the parking at the lock state of the backward breaking.

Further objects and advantages of the present invention can be more fully understood from the following detailed description taken in conjunction with the accompanying drawings.

Advantageous Effects

As described above, according to the output apparatus for converting two way drive into one way drive and the bicycle fabricated therewith of the present invention, it is possible to provide an output apparatus for converting two way drive into one way drive, which is unified in power transmission path of forward and reverse direction drive by combining the planetary gear group and the one way bearing regularly to form a simple series type output apparatus, and can replace the complicated structure such as a motor, bevel gears of a relatively big volume, and so on so that it can automatically convert the two way drive power such as forward direction or reverse direction

drive power into one way drive power and can construct a planetary rotation clutch state and a backward breaking state, and which can be fabricated compact by simplifying the structure and can decrease weight and enhance rigidity and reliability of operation to thereby reduce production cost and disorder ratio.

Also, according to the output apparatus for converting two way drive into one way drive and the bicycle fabricated therewith, they are without noise and small parts in the basic structure that they can provide excellent durability and prevention of disorder, and can prevent impurities such as dust and so on from flowing in because the apparatus is an encasing type without any outside connection operation devices, and which is diversified in rotation and torque ratio owing to the design parameter of the gear and can replace the conventional products.

In addition, the output apparatus and the bicycle according to the present invention can obtain output of uniform velocity, decreased velocity, and increased velocity, and can prevent temporary stop of the drive and disconnection of the power transmission because separate operation is not necessary for converting the drive, and can convert the driving power of the reverse drive into a big power by the gear.

Furthermore, according to the present invention, t is possible to a provide multi-functional bicycle, in which basic operation actions can be accomplished by the user's operating the pedal driven in the forward or reverse direction, and the apparatus and the bicycle can be operated in the backward way

automatically without any operation of the lever and so on, when the backward operation is again required for the parking at the lock state of the backward break.

Also, according to the present invention, reliability and preference for the products can be enhanced by simplification and compactness of the products, and it is possible to provide useful bicycle that can serve induction of the user's interest, inspiration of use motivation, and health promotion.

Brief Description of the Drawings

FIG. 1 is a cross-sectional view showing a conventional one way output apparatus,

FIG. 2 is a planar view schematically showing an automatic output apparatus for converting two way drive into one way according to one embodiment of the present invention,

FIGs. 3 and 4 are schematic views showing process of power transmission from a prime gear according to one embodiment of the present invention,

FIGs. 5 and 6 are schematic views showing process of driving a ring gear by means of the inertia according to another embodiment of the present invention,

FIGs. 7 to 10 are views showing various embodiments of the automatic output apparatus for converting two way drive into one way according to the present invention,

FIG. 11 is an exploded perspective view showing another embodiment of a planetary gear, a planetary bearing, and a

planetary carrier according to the present invention,

FIG. 12 is a schematic view showing an one way bearing used in the present invention,

FIG. 13 shows the one way bearing of an another type,

FIGs. 14 and 15 are prime schematic views for explaining conversion of the rotation ratio and the torque of an input portion and an output portion at the time of forward or reverse direction drive conversion in the present invention,

FIG. 16 is a cross-sectional view showing a prime gear driven ring gear output apparatus installed at the fixed shaft according to one embodiment of the present invention,

FIG. 17 is a cross-sectional view showing a prime gear driven ring gear output apparatus installed at the rotation shaft according to one embodiment of the present invention,

FIG. 18 is a cross-sectional view showing a ring gear driven prime gear output apparatus installed at the fixed shaft according to one embodiment of the present invention,

FIG. 19 is a cross-sectional view showing a ring gear driven prime gear output apparatus installed at the rotation shaft according to one embodiment of the present invention,

FIG. 20 is a cross-sectional view showing the automatic output apparatus for converting two way drive into one way including a lock relief device which is configured to enable reverse direction rotation in an apparatus capable of one way output in the output portion according to another embodiment of the present invention,

FIG. 21 is a schematic view showing the lock relief device of the bicycle provided with the automatic output apparatus for converting two way drive into one way of the present invention,

FIG. 22 is a schematic view showing another embodiment of the lock relief device of the bicycle provided with the automatic output apparatus for converting two way drive into one way of the present invention,

FIG. 23 is a schematic view showing the lock relief device configured to be operated manually,

FIG. 24 is a cross-sectional view showing the principal portion of the bicycle provided with the lock relief device and the automatic output apparatus for converting two ways drive into one way at the rotation shaft formed integrally with the pedal according to preferred embodiment of the present invention,

FIGs. 25 and 26 are planar views showing the lock relief devices shown in FIG. 24,

FIG. 27 is an exploded perspective view of FIG. 17,

FIG. 28 is a cross-sectional view showing the principal portion of the bicycle provided with the lock relief device and the automatic output apparatus for converting two ways drive into one way at the fixed shaft of a rear wheel according to another embodiment of the present invention,

FIG. 29 is an exploded perspective view of FIG. 28,

FIG. 30 is a perspective view showing the principal portion of the lock relief device,

FIG. 31 is a cross-sectional view showing the principal

portion of the bicycle provided with the automatic output apparatus for converting two ways drive into one way within a gear room in a main body at the rotation shaft formed integrally with the pedal according to another embodiment of the present invention,

FIG. 32 is a planar view showing the lock relief device shown in FIG. 31,

FIG. 33 is an exploded perspective view of FIG. 31,

FIG. 34 is a cross-sectional view showing the principal portion of the bicycle provided with the lock relief device having an outside-tooth gear and the automatic output apparatus for converting two ways drive into one way at the rotation shaft according to another embodiment of the present invention,

FIG. 35 is a planar view showing the lock relief device of FOG. 34,

FIG. 36 is an exploded perspective view of FIG. 34.

<Explanation on essential elements of drawings>

10 : planetary gear group	11 : prime gear	12 : planetary gear
13 : planetary carrier	14 : ring gear	15 : gear room
16 : wheel hub	17 : planetary bearing	18 : carrier bearing
19 : sprocket	20 : lock relief device	21 : ratchet wheel
22 : lever	23 : fixing support member	
24 : spacing lever(gap lever)	25 : housing	25' : housing cap
26 : sub-gear	27 : inside tooth gear	28 : outside tooth gear
30 : rotation shaft	40 : fixing shaft	50 : wire
60 : bicycle body	121 : fixing fin	122 : bearing cap

131 : holder	132 : projecting portion	133 : pin hole
151 : room body	152 : room disk plate	153 : sprocket cover
161 : wheel hub cover	191 : inner wheel	192 : outer wheel
193 : groove	194 : ball	211 : engaging groove
212 : cylindrical portion	213 : bushing	221 : engaging projection
222 : long hole	231 : guiding curved surface	
241 : projecting pin	251 : rotation clutch	252 : spacing clutch
253 : guide bar	254 : engaging portion	255 : pulling lever
256 : bracket	257 : spring	257a : short spring
257b : long spring	261 : sub-gear fixing support member	
262 : guide projection	263 : retraction spring	264 : sub-bearing

Best Mode for Carrying Out the Invention

The automatic output apparatus for converting two way drive into one way to accomplish the above objects of the present invention, is characterized in that, a prime gear is engaged with a fixing shaft so that it can rotate freely, and a planetary carrier is engaged with the fixing shaft so that it can rotate in one way by installing an one way carrier bearing at the center of the planetary carrier, and a planetary gear with an one way planetary bearing installed at the center thereof, is installed at one side of the planetary carrier with bearing, and the planetary gear is tooth-engaged with the inside tooth of a ring gear rotatably installed at an identical shaft with that of the planetary carrier.

Also, a rotation shaft can be employed in place of the

fixing shaft, and the prime gear may be formed integrally with the rotation shaft.

Further, the bicycle provided with an automatic output apparatus for converting two way drive into one way, is characterized in that, a lock relief device, and a planetary gear group comprising a prime gear, an one way bearing, a planetary gear, a planetary carrier, and a ring gear are installed to a rotation shaft to which a driving portion of the bicycle, a pedal, is installed, the lock relief device enabling the backward movement by attaching and detaching the lever installed to a ratchet wheel and a fixing support member; wherein the planetary gear group is constructed such that, the prime gear is engaged integrally with the rotation shaft so that the power can be transmitted directly, a room disk plate is engaged with one side of the rotation shaft to form a gear room and a ratchet wheel formed with a step portion at an outer peripheral surface is engaged with an other side of the rotation shaft by bearing, the planetary carrier is engaged with the ratchet wheel in the prime gear side by the one way carrier bearing and a sprocket cover is engaged with the ratchet wheel in the outside to contain the prime gear and the planetary carrier to be bolt-engaged with the room disk plate, an the inside tooth of the ring gear is formed at an inner peripheral surface of the sprocket cover, and a planetary gear is installed to one side of the planetary carrier by the one way planetary bearing to be tooth-engaged with the prime gear and the ring

gear concurrently; wherein the lock relief device is constructed such that, the ratchet wheel is engaged with the rotation shaft by bearing, a fixing support member is engaged with a bicycle body supporting the rotation shaft, a pair of levers formed with an engaging projection tooth-engaged with an engaging groove of the ratchet wheel are installed to the fixing support member to face each other, a short spring and a long spring are respectively engaged with upper portion and lower portion of the two levers, and a spacing lever is installed between the engaged levers to hinge rotate so that interval between the two levers can be broadened by pulling a cable wire connected to the lever.

In addition, a projecting pin may be formed at the fixing support member of the lock relief device and an elongate hole is formed at the lever so that the projecting pin can be engaged with the elongate hole, and the spacing lever is located by a predetermined distance away downward so that upper and lower portions of the spacing lever can be separated by the rotation of the spacing lever in sequence.

The present invention will hereinafter be described in further detail with reference to the appended drawings.

FIG. 2 is a planar view schematically showing an automatic output apparatus for converting two way drive into one way according to one embodiment of the present invention, FIGs. 3 and 4 are schematic views showing process of power transmission from a prime gear according to one embodiment of the present invention, FIGs. 5 and 6 are schematic views showing process of

driving a ring gear by means of the inertia according to another embodiment of the present invention, and FIGs. 7, 8, 9 and 10 are views showing various embodiments of the automatic output apparatus for converting two way drive into one way according to the present invention.

As shown in FIG. 2, the automatic output apparatus converting two way drive into one way according to the present invention, comprises a prime gear 11, planetary carrier 13, planetary gear 12, and a ring gear 14, and in which the planetary carrier 13 and the planetary gear 12 are provided with a carrier bearing 18 and a planetary bearing 17, which are one way bearings.

The prime gear 11 is a gear to which power can be transmitted directly from the power source such as a pedal and so on, and when the power is transmitted to it, it rotates in the forward or reverse direction, and it is engaged with a fixed shaft 40 rotatably.

The planetary carrier 13 is provided with a carrier bearing 18, which is an one way bearing secured to the fixed shaft 40, so the planetary carrier 13 can rotate to only one way.

The planetary gear 12 is installed at one side of the planetary carrier 13, and a planetary bearing 17, which is an one way bearing similar to the carrier bearing 18, is installed at the center of the planetary gear 12 so that the center of the planetary bearing 17 is secured to the planetary carrier 13.

Then, the ring gear 14 is engaged with the fixed shaft 40

rotatably, and is formed with gear-tooth at an inner peripheral surface to thereby engage with the planetary gear 12. Further, an outer peripheral surface of the ring gear is formed with a sprocket around which a chain can be installed to transmit rotation power to another shaft as shown in the drawing, or the outer peripheral surface can be a driving wheel itself. Also, the ring gear 14 can be driven by the power transmitted directly from the power source such as the pedal and so on.

The automatic output apparatus for converting two way drive into one way constructed as such can be configured that the number of the planetary gear 12 installed to the planetary carrier 13 can be at least one, as required, in addition to two, as shown in the drawing, however, it is preferable to install two to four planetary gear to facilitate power transmission and to minimize friction. Accordingly, various types of gears such as a helical gear, and a spur gear can be employed to minimize frictional noise for the prime gear 11, planetary gear 12, and the ring gear 14.

As for the carrier bearing 18 and the planetary bearing 17, an inner peripheral surface thereof is formed with non-symmetrical groove 193 in which a depth of one side differs from that of the other side, and a ball 194 is inserted into the groove 193. In other words, it is constructed such that the planetary gear 12 or the planetary carrier 13, which is located at the outside of the bearing, rotates when the ball 194 is located at a deep portion of the groove 193, and when the ball

194 is located at the other thin portion, the ball is caught between the groove of the bearing and an outside portion so that the center of the bearing and the outside portion are integrally secured.

Further, a hole can be formed at the end of the deep portion of the groove 193 so as to facilitate the integral securing operation, and a spring can be inserted into the hole so that it can always forcibly urge the ball 194 toward the other side thin portion.

Also, if the space is narrow and the size is small, inside wheel and outside wheel are removed and the groove 193 can be formed directly at the center shaft, so that the shape of the groove is non-symmetric, where depth of one side of the groove differs from that of the other side of the groove, and it can be configured that the ball 194 is inserted into the groove 193.

The operation of the automatic output apparatus for converting two way driving into one way as constructed above will be described with regard to the drawings below.

As shown in FIG. 3, when the driving portion is rotated in the forward direction (clockwise way), the prime gear 11 rotates in the forward direction identical with that of the driving portion.

According to the clockwise rotation of the prime gear 11, the planetary gear 12 tooth-engaged with the prime gear 11 rotates in the reverse direction, however, the planetary gear 12 is locked to rotate by the planetary bearing 17 engaged at the

center thereof, so that the planetary gear 12 and the planetary bearing 17 are integrally locked. In other words, the planetary gear 12 is engaged with a planetary bearing which can only rotate in the forward direction, therefore, when the planetary gear rotates in the reverse direction, the ball 194 received in the groove 193 of the planetary bearing 17 is transported to a way having a narrow depth to thereby being caught so that the planetary gear 12 and the planetary bearing 17 are integrally fixed, and as the planetary carrier 13 is fixed to the center shaft of the planetary bearing, the planetary gear 12, the planetary bearing, and the planetary carrier 13 are integrally fixed.

Accordingly, a gear group made of the planetary gear 12, the planetary bearing 17, and the planetary carrier 13 is rotated in the forward direction by the power transmitted from the prime gear 11, and rotation power in the forward direction is transmitted to the carrier bearing 18 engaged with the planetary bearing 13 to make the planetary carrier rotate without any locking.

Therefore, the ring gear 14 tooth-engaged with the planetary gear 12 also rotates in the forward direction so that final output can be accomplished at uniform velocity in the forward direction.

Fig. 4 shows that the prime gear 11 rotates in the reverse direction, as shown in the drawing, when the driving portion is rotated in the reverse direction (which is reverse to the

progressive way, in other words, anti-clockwise way), the prime gear rotates in the reverse direction identical with that of the driving portion.

According to the reverse direction rotation of the prime gear 11, forward direction rotation power is produced at the planetary gear 12 tooth-engaged with the prime gear 11, and forward direction rotation power is also transmitted to the planetary bearing 17 engaged with the center of the planetary gear 12 to rotate the planetary gear in the forward direction. Accordingly, reverse direction rotation power, which rotates the planetary gear 12 in the reverse direction along with the ring gear 14 tooth-engaged at the center with the planetary gear 12, is produced at the planetary gear 12 rotating in the forward direction, and the planetary carrier 13 is to move in the reverse direction by means of the reverse direction rotation power.

In this instance, the carrier bearing 18 engaged with the center of the planetary carrier 13 is locked based on the identical operation with that of the planetary bearing, so that forward direction rotation of the planetary gear 12 is directly transmitted to the ring gear 14 to thereby rotate the ring gear in the forward direction resulting in the forward direction decreased velocity of the final output.

Meanwhile, FIG. 5 explains when the ring gear 14 rotates in the forward direction by means of the law of the gravitation or the law of inertia regardless of the power transmission of the

driving portion. As shown in the drawing, the rotation power is produced in the forward direction in the ring gear 14, and the planetary gear 12 tooth-engaged with the ring gear is to rotate in the forward direction. Such forward direction rotation power is transmitted to the planetary bearing 17 engaged with the planetary gear 12 so that locking action cannot be produced in the planetary bearing, and the planetary gear 12 can rotate freely. In this instance, as the prime gear 11 connected to the driving portion is tooth-engaged with the planetary gear 12, when the driving portion is fixed, the prime gear is fixed to make the planetary gear 12 tooth-engaged with the prime gear 11 can rotate between the prime gear 11 and the ring gear 14 in the forward direction with centering the fixed shaft 40.

Accordingly, the rotation power of the ring gear 14 is transmitted to the planetary carrier 13 to which the planetary gear 12 is secured, and also forward direction rotation power is transmitted to the carrier bearing 18 engaged with the center of the planetary carrier, so that the carrier bearing 18 can rotate freely as can the planetary bearing 17 resulting in the idle rotation clutch state in which the driving portion and the prime gear 11 can rotate in the forward direction without any friction by the forward direction rotation power of the ring gear 14 driven by the law of inertia. Such automatic identical operation is provided at the driving stop of the driving portion during the operation or at the rotation driving being slower than the output portion.

FIG. 6 shows the reverse rotation of the ring gear 14 during the process in which the ring gear is operated to go downward when the power in the driving portion is removed at the time of its going upward from the slanting place. As shown in the drawing, if the rotation power in the reverse direction is produced at the ring gear 14 when the driving portion is not driven, the reverse direction rotation power is also transmitted to the planetary gear 12 tooth-engaged with the ring gear 14 to thereby lock the planetary bearing 17 engaged with the planetary gear. Accordingly, the reverse direction rotation power is transmitted to the planetary carrier 13 to which the planetary gear 12 is secured to thereby lock the carrier bearing 18 engaged with the planetary carrier resulting in the fixing of the planetary carrier 13.

In other words, when the ring gear 14 itself becomes to rotate in the reverse direction, the planetary gear 12, the prime gear 11, and the planetary carrier 13 tooth-engaged with the ring gear are wholly fixed to thereby prevent free backward movement at the time of climbing the slant place.

In the present automatic output apparatus for converting two way drive into one way output, decreased velocity, uniform velocity, and increased velocity can be produced based on the position where the power from the planetary gear group is transmitted, and also the engaged rotatable way of the one way bearing becomes to be changed. Further, the rotatable way with which the one way bearing is engaged is changed based on the

output way of the one way bearing required at last.

1. When the planetary bearing can rotate in the forward direction and the carrier bearing can rotate in the forward direction as shown in FIG. 7

1-1. After the power is produced, the prime gear rotates in the forward direction; and the output portion is the ring gear

The planetary gear 12 tooth-engaged with the prime gear 11 is secured to the planetary carrier 13, so that the planetary carrier rotates in the forward direction at the unloaded state to make the ring gear 14 tooth-engaged with the planetary gear to rotate in the forward direction to produce uniform velocity output.

1-2. After the power is produced, prime gear rotates in the reverse direction; and the output portion is the ring gear

The planetary gear 12 tooth-engaged with the prime gear 11 rotates in the forward direction at the unloaded state, and the planetary carrier 13 is fixed by the production of the reverse direction rotation power, so that the rotation power of the planetary gear is transmitted to the ring gear 14 to make the ring gear output in the forward direction. In this instance, as the number of the gear tooth of the ring gear is more than that of the prime gear 11, decreased output in the forward direction is produced.

1-3. After the power is produced, the ring gear rotates in

the forward direction; the output portion is the prime gear

The planetary gear 12 tooth-engaged with the ring gear 14 rotates in the forward direction, and the planetary carrier 13 also becomes to rotate in the forward direction at the unloaded state so that power is not transmitted to the prime gear 11 to become idle rotation state.

1-4. After the power is produced, the ring gear rotates in the reverse direction; the output portion is the prime gear

Reverse direction rotation is transmitted to the planetary gear 12 tooth-engaged with the ring gear 14 and the planetary carrier 13 engaged with the planetary gear respectively, so that the planetary bearing 17 and the carrier bearing 18 are locked to stop rotation.

The above explanations can be summarized as represented in table 1.

【Table 1】

Driving Portion	Planetary gear	Planetary carrier	Output portion	Results
Prime gear Forward direction	Lock	Forward direction	Ring gear Forward direction	Increased output
Prime gear reverse direction	Forward direction	lock	Ring gear forward direction	Decreased Output
Ring gear forward direction	Forward direction	Forward direction	Power transmission impossible	Idle rotation
Ring gear reverse direction	lock	lock	Lock	Stop

2. When the planetary bearing can rotate in the reverse direction and the carrier bearing can rotate in the forward direction as shown in FIG. 8

2-1. After the power is produced, the prime gear rotates in the forward direction; and the output portion is the ring gear

The planetary gear 12 tooth-engaged with the prime gear 11 rotates in the reverse direction at unloaded state, and the planetary carrier 13 also rotates in the forward direction at unloaded state, so that power is not transmitted to the ring gear 14 to accomplish the idle rotation state.

2-2. After the power is produced, the prime gear rotates in the reverse direction; and the output portion is the ring gear

Rotation power in the forward direction is transmitted to the planetary gear 12 tooth-engaged with the prime gear 11, and rotation power in the reverse direction is transmitted to the planetary carrier 13, so that they are locked to prevent rotation.

2-3. After the power is produced, the ring gear rotates in the forward direction; and the output portion is the prime gear

The planetary gear 12 tooth-engaged with the ring gear 14 is fixed to the planetary carrier 13, the planetary carrier rotates in the forward direction at the unloaded state, and the prime gear 11 tooth-engaged with the planetary gear rotates in the forward direction to produce uniform output.

2-4. After the power is produced, the ring gear rotates in the reverse direction; and the output portion is the prime gear

The planetary gear 12 tooth-engaged with the ring gear 14 rotates in the reverse direction at the unloaded state, the planetary carrier 13 is fixed by the reverse rotation power, so that the rotation power of the planetary gear 12 is transmitted to the prime gear 11 to produce output in the forward direction. In this instance, as the number of the gear tooth of the prime gear 11 is smaller than that of the ring gear 14, velocity increased output in the forward direction is produced.

The above explanations can be summarized as represented in table 2.

【Table 2】

Driving Portion	Planetary gear	Planetary carrier	Output portion	Results
Prime gear Forward direction	Reverse direction	Forward direction	Power transmission impossible	Idle rotation
Prime gear reverse direction	Lock	lock	Lock	Stop
Ring gear forward direction	Lock	Forward direction	Prime gear forward direction	Uniform output
Ring gear reverse direction	Reverse direction	lock	Prime gear Forward direction	Increased output

3. When the planetary bearing can rotate in the reverse direction and the carrier bearing can rotate in the reverse direction as shown in FIG. 9

3-1. After the power is produced, the prime gear rotates in the forward direction; and the output portion is the ring gear

The planetary gear 12 tooth-engaged with the prime gear 11 rotates in the reverse direction at unloaded state, and rotation power in the forward direction is transmitted to the planetary carrier 13 to become locked, so that the ring gear 14 tooth-engaged with the planetary gear rotates in the reverse direction to produce output in the reverse direction. In this instance, as the number of the gear tooth of the ring gear is more than that of the prime gear 11, velocity decreased output in the reverse direction is produced.

3-2. After the power is produced, the prime gear rotates in the reverse direction; and the output portion is the ring gear

Rotation power in the forward direction is transmitted to the planetary gear 12 tooth-engaged with the prime gear 11 to lock it, and the planetary carrier 13 to which the planetary gear is fixed rotates in the reverse direction, so that the ring gear 14 tooth-engaged with the planetary gear produces uniform output in the reverse direction.

3-3. After the power is produced, the ring gear rotates in the forward direction; and the output portion is the prime gear

Rotation power in the forward direction is transmitted to the planetary gear 12 tooth-engaged with the ring gear 14 and the planetary carrier 13 respectively, so that the planetary bearing 17 and the carrier bearing 18 are made to be locked to thereby stop rotation.

3-4. After the power is produced, the ring gear rotates in the reverse direction; and the output portion is the prime gear

The planetary gear 12 tooth-engaged with the ring gear 14 rotates in the reverse direction at the unloaded state, and the planetary carrier 13 rotates in the reverse direction at the unloaded state, so that the rotation power is not transmitted to the prime gear 11 to construct the idle rotation state.

The above explanations can be summarized as represented in table 3.

【Table 3】

Driving Portion	Planetary gear	Planetary carrier	Output portion	Results
Prime gear Forward direction	Reverse direction	Lock	Ring gear reverse direction	Decreased output
Prime gear reverse direction	Lock	Reverse direction	Ring gear reverse direction	Uniform output
Ring gear forward direction	Lock	Lock	Lock	Stop
Ring gear reverse direction	Reverse direction	Reverse direction	Power transmission impossible	Idle rotation

4. When the planetary bearing can rotate in the forward direction and the carrier bearing can rotate in the reverse direction as shown in FIG. 10

4-1. After the power is produced, the prime gear rotates in the reverse direction; and the output portion is the ring gear

Rotation power in the reverse direction is transmitted to the planetary gear 12 tooth-engaged with the prime gear 11, and the rotation power in the forward direction is transmitted to the planetary carrier 13 tooth-engaged with the planetary gear respectively, so that the planetary bearing 17 and the carrier bearing 18 are made to be locked to thereby stop rotation.

4-2. After the power is produced, the prime gear rotates in the reverse direction; and the output portion is the ring gear

The planetary gear 12 tooth-engaged with the prime gear 11 rotates in the forward direction at the unloaded state, and the planetary carrier 13 rotates in the reverse direction at the unloaded state, so that power is not transmitted to the ring gear 14 to construct the idle rotation state.

4-3. After the power is produced, the ring gear rotates in the forward direction; and the output portion is the prime gear

The planetary gear 12 tooth-engaged with the ring gear 14 rotates in the forward direction at the unloaded state, and rotation power in the forward direction is produced at the planetary carrier 13 to lock it, so that rotation power of the

planetary gear is transmitted to the prime gear 11 to produce output in the reverse direction. In this instance, as the number of the gear tooth of the prime gear 11 is smaller than that of the ring gear 14, velocity increased output in the reverse direction is produced.

4-4. After the power is produced, the ring gear rotates in the reverse direction; and the output portion is the prime gear

The planetary gear 12 tooth-engaged with the ring gear 14 is fixed to the planetary carrier 13, so that the planetary carrier rotates in the reverse direction at the unloaded state, and the prime gear 11 tooth-engaged with the planetary gear 12 rotates in the reverse direction to produce uniform output.

The above explanations can be summarized as represented in table 4.

【Table 4】

Driving Portion	Planetary gear	Planetary carrier	Output portion	Results
Prime gear Forward direction	Lock	Lock	Lock	Stop
Prime gear reverse direction	Forward direction	Reverse direction	Power transmission impossible	Idle rotation
Ring gear forward direction	Forward direction	Lock	Prime gear reverse direction	Increased output
Ring gear reverse direction	lock	Reverse direction	Prime gear reverse direction	Uniform output

As described above, it has been described that the prime gear 11, the planetary gear 12, the planetary carrier 13, and the ring gear 14 are engaged with each other centering the fixed shaft 40, however, the apparatus of the present invention can employ the system in which respective gear can be installed to the rotation shaft. In this instance, with regard to the planetary bearing and the carrier bearing, which are one way bearings, the rotation way of them can be selected based on the required output.

FIG. 11 is an exploded perspective view showing another embodiment of a planetary gear, a planetary bearing, and a planetary carrier according to the present invention, in which a bearing cap 122 is integrally formed at one end surface of the planetary gear 12 to be engaged with the planetary bearing 17. As to the engagement method, the bearing cap 12 has been formed to be bigger than the planetary bearing, and then the planetary bearing 17 is installed inside of the bearing cap, or the bearing cap has been formed to be smaller than the planetary bearing and then the planetary bearing is installed outside of the bearing cap, or they have been formed to have identical diameters and then they are engaged with each other by separate engagement means.

As shown in the drawing, the planetary carrier 13 is formed to be a tube body, in which one end is closed and a holder 131 is provided to the closed end for installing the

carrier bearing 18, and the other end is formed to be open for assembling the prime gear. Also, projecting portions 132 are formed respectively at one side of the both ends of the tube body and at the corresponding other side, and pin holes 133 are formed at the projecting portions so that fixed pins 121 can be inserted into the pin holes.

The pin holes 133 are provided at the corresponding two projecting portions to form one pair, in which one pin hole is formed to be a round-shape at one projecting portion and the other pin hole is formed to be a partially-cut shape at the other projecting portion so that they can prevent the fixed pin from rotating freely in the pin holes.

FIG. 12 is a schematic view showing a one-way bearing used in the present invention.

The one-way bearing is separately formed into an inner wheel 191 and an outer wheel 192. The outer wheel is formed with a slant groove 193, and a ball 194 is inserted into inside of the groove so that the outer wheel can rotate integrally with the outer gear or rotate idly along with the movement of the ball, and a spring 195 is further installed to one side of the groove so that the ball can be seated eccentrically at one side of the groove when the rotation power is not transmitted.

FIG. 13 shows the one-way bearing of another type, in which the slant groove 193 is formed at any one of an inner wheel portion of a gear or an outer wheel portion of a shaft

directly and the ball 194 can be inserted into inside of the groove.

FIGs. 14 and 15 are cross-sectional views showing the automatic output apparatus for converting two-way drive to one-way, which is installed to a bicycle according to the present invention.

In FIG. 14, the gear room 15 including the prime gear 11, the planetary carrier 13, the planetary gear 12 and the planetary gear group comprised of such gears is constructed so that it is engaged with the shafts 30, 40. In other words, the prime gear, the planetary carrier, and the gear room including them are engaged with the shaft by bearing, the planetary gear is engaged with the planetary carrier by employing the one-way planetary bearing 17, the planetary gear is engaged with the outer tooth of the prime gear in the shaft-engagement direction and is engaged with a gear-tooth formed at inner peripheral surface of the gear room in the outer direction, and the planetary gear provides ratios of decreased velocity, uniform velocity, and increased velocity by forming two gears having different numbers of teeth to be a integral gear, and in this instance, the gear room 15 operates as the ring gear.

As shown in FIG. 15, inside of one side plate in the two disk plates constituting the gear room 15 projects toward an axial way, and gear tooth is formed at an outer peripheral surface to act as the prime gear. Also, the planetary carrier 13

and the ring gear 14 are engaged with the shaft 30, 40 by the bearing, and the planetary gear 12 is engaged with the planetary carrier by the planetary bearing which is the one way bearing. In this instance, inside of the planetary gear is engaged with the gear tooth in the projected outside surface of the gear room, which is the prime gear, and the outside thereof is tooth-engaged with the ring gear 14.

FIG. 16 is a cross-sectional view showing a ring gear output apparatus driven by the prime gear according to one embodiment of the present invention.

As shown in the drawing, the prime gear 11, the planetary carrier 13, and a wheel hub formed with the ring gear at the inner peripheral surface are rotatably installed to the fixing shaft 40, and the planetary gear 12 is installed to the planetary carrier 13. Also, the planetary gear 12 tooth-engaged with the outside teeth of the prime gear 11, and the planetary gear 12 is tooth-engaged with the the inside tooth of the ring gear 14. In such a structure, the planetary carrier 13 is installed to the fixing shaft by the carrier bearing, which is the one way bearing, and the planetary gear 12 is installed to the planetary carrier by the planetary bearing 17. Further, the planetary gear group can block the outside dust, impurities, and so on, because inside gears of the planetary gear group are protected by the wheel hub 16 formed with the ring gear 14.

*Power transmission system is summarized as follows, and

the one way bearing is installed to rotate in the forward direction.

1) When the driving portion is driven in the forward direction: sprocket 19 →prime gear 11 →planetary gear 12 → ring gear 14,

2) When the driving portion is driven in the reverse direction: sprocket 19 →prime gear 11 →planetary gear 12 → ring gear 14,

3) When the ring gear is driven in the forward direction: ring gear 14 →planetary gear 12,

4) When the ring gear is driven in the reverse direction: ring gear 14 →planetary gear 12 →planetary carrier 13 →fixing shaft 40.

Further, the driving way and the output results are as shown in table 1.

FIG. 17 is a cross-sectional view showing the ring gear output apparatus driven by the prime gear according to one embodiment of the present invention.

As shown in the drawing, the prime gear 11 is formed integrally with the rotation shaft 30 provided with the sprocket 19 to rotate identically, the wheel hub 16 formed with the planetary carrier 13 and the ring gear 14 at the inner peripheral surface is installed to the rotation shaft 30 by using the bearing, and the planetary gear 12 is engaged with the

planetary carrier at one side thereof. The planetary bearing 17 for engaging the planetary gear with the planetary carrier, and the carrier bearing 18 for securing the the planetary carrier to the rotation shaft are constructed by the one way bearing, so that power can only be transmitted to one specific way. In other words, the outside teeth of the prime gear 11 are engaged with the planetary gear 12, and the planetary gear 12 is tooth-engaged with the inside teeth of the ring gear 14.

*Power transmission system is summarized as follows, when the two one way bearings are installed to rotate in the forward direction.

1) When the prime gear is driven in the forward direction: prime gear 11 →planetary gear 12 →ring gear 14 output,

2) When the prime gear is driven in the reverse direction: prime gear 11 →planetary gear 12 →ring gear 14 output,

3) When the ring gear is driven in the forward direction: Planetary gear 12 →planetary carrier 13,

4) When the ring gear is driven in the reverse direction: ring gear 14 →planetary gear 12 →planetary carrier 13.

Further, the driving way and the output results are as shown in table 1.

FIG. 18 is a cross-sectional view showing a prime gear output apparatus driven by the ring gear installed to the fixing shaft according to one embodiment of the present invention.

The prime gear 11 may be formed integrally with the main body of the output portion or may be fixed to the main body, the ring gear 14 provided with the sprocket is rotatably engaged with the fixed shaft 40, and the planetary carrier 13 and the prime gear 11 are engaged with each other by the bearing so that one or a plurality of planetary gears are installed to one side of the planetary carrier at uniform intervals from the fixing shaft 40 to thereby make the planetary gear 12 to be tooth-engaged with the inside teeth of the ring gear 14 and the outside teeth of the prime gear 11, and the wheel hub 16 which can include the gear group is rotatably installed.

In other words, transmitted power can be adapted to be transmitted in any one specific way by installing the carrier bearing 18 which is operated to engage the planetary carrier with the fixing shaft 40, and the planetary bearing 17 which is operated to engage the planetary gear 12 with the planetary carrier 13 by employing the one way bearing.

In case of the output by the prime gear, in which the planetary bearing 17 is installed to rotate idly in the reverse direction and the carrier bearing 18 is installed to rotate idly in the forward direction, one way output is always produced from the two way driving.

*Power transmission system is summarized as follows.

1) When the ring gear is driven in the forward direction: ring gear 14 →planetary gear 12 →prime gear 11 output,

2) When the ring gear is driven in the reverse direction:

ring gear 14 →planetary gear 12 →prime gear 11 output,

3) When the prime gear is driven in the forward direction: prime gear 11 →planetary gear 12,

4) When the prime gear is driven in the reverse direction: prime gear 11 →planetary gear 12 →planetary carrier 13 →fixing shaft 40.

Also, the driving way and the output results are shown in table 2.

FIG. 19 is a cross-sectional view showing a prime gear output apparatus driven by the ring gear installed to the rotation shaft according to one embodiment of the present invention.

The prime gear 11 may be formed integrally with the main body of the output portion or may be fixed to the main body, the rotation shaft 30 is formed integrally with the ring gear 14, and the planetary carrier 13 and the prime gear 11 are engaged with each other by the bearing, and the planetary carrier is engaged with the planetary gear 12 by the bearing so that outside teeth of the prime gear 11 is tooth-engaged with the planetary gear 12, and the planetary gear 12 is tooth-engaged with the inside teeth of the ring gear 14.

In other words, transmitted power can be adapted to be transmitted in any one specific way by installing an engaging portion of the planetary gear 12 and the planetary carrier 13, and an engaging portion of the planetary carrier 13 and the

rotation shaft 30 by employing the one way bearing.

In case of the output by the prime gear, in which the planetary bearing 17 is installed to rotate idly in the reverse direction and the carrier bearing 18 is installed to rotate idly in the forward direction so that they are installed to rotate adversely, one way output is always produced from the two way driving.

*Power transmission system is summarized as follows.

1) When the ring gear is driven in the forward direction: the rotation shaft 30 is driven by the rotation of the sprocket 19 → ring gear 14 →planetary gear 12 →prime gear 11 →output,

2) When the ring gear is driven in the reverse direction: the rotation shaft 30 is driven by the rotation of the sprocket 19 → ring gear 14 →planetary gear 12 →prime gear 11 output,

3) When the prime gear is driven in the forward direction: prime gear 11 →planetary gear 12,

4) When the prime gear is driven in the reverse direction: prime gear 11 →planetary gear 12 →planetary carrier 13 →fixing shaft 40.

Also, the driving way and the output results are shown in table 2.

FIG. 20 shows the cross-sectional view of the one way output apparatus from two ways driving according to another embodiment of the present invention in which the lock relief

device is included to relieve the backward breaking state automatically without any operation of the outside operating device, when the output portion rotates in the reverse direction.

As shown in the drawing, the prime gear 11, a ratchet wheel 21, and the wheel hub 16 is rotatably installed to the fixing shaft 40, and the planetary carrier 13 s installed to one side of the ratchet wheel 21, and the planetary gear 12 is installed to one side of the planetary carrier. The wheel hub 16 is formed to be a barrel shape to receive respective gear group therein, an outside toothed gear 28 is formed at the shaft adjacent to the ratchet wheel 21, an inside surface of the outside toothed gear 28 is engaged with the main body of the output portion at which the ring gear 14 is formed. In such structure, the prime gear 11 is tooth-engaged with the planetary gear 12, and the planetary gear 12 is tooth-engaged with the the inside tooth of the ring gear 14. The planetary carrier 13 is engaged with the ratchet wheel 21 by means of the carrier bearing 18 which is the one way bearing, and the planetary gear 12 is engaged with the planetary carrier 13 by means of the planetary bearing 17 which is the one way bearing, so that the planetary carrier and the planetary gear can rotate in one way.

Further, the ratchet wheel 21 can be engaged with the fixing shaft 40 by using a bushing 213, and is formed with a plurality of engaging grooves 211 along with its outer peripheral surface so that engaging projections 221 of a lever 22 which are to be described below, can be engaged with them,

and cylindrical portion 212 is partially projected in the axial way to engage with the planetary carrier 13 by means of the bearing.

Also, if a plate-shaped fixing support member 23 is provided in the main body, it is secured to the fixing shaft 40 between the ratchet wheel 21 and the outside toothed gear 28, and if the fixing support member 23 is provided outside of the main body, it is engaged with the ratchet wheel 21 in the order of the outside toothed gear 28, the ratchet wheel 21, and the fixing support member 23, and one side of the lever 22 is hinged to the fixing support member 23. Thus, the lever 22 is formed with the engaging projection 221 corresponding to the engaging groove of the ratchet wheel 21 at inside thereof, and sub-gear 26 is installed at the other end of the lever 22 by the one way bearing. The sub-gear 26 tooth-engages with the outside tooth 28 formed at the inside or at the outside of the wheel hub 16.

The ratchet wheel 21, the outside toothed gear 28, the lever 22, and the sub-gear 26 constituting the lock relief device 20 for unlock the locking of the two way output apparatus at the time of backward movement, in which a spring 257 whose one end and the other end are respectively engaged with the lever 22 and the fixing support member 23 is further comprised so that the lever 22 can rotate with centering a hinge axis to return the lever to its original position from an unlock state.

In other words, the lock relief device 20 is not operated at the time of two way driving and idle rotation clutch state,

and is operated automatically at the breaking state of the rotation locking without any outside operating action when the backward rotation of the ring gear 14 which is the output portion is required, to thereby forcibly unlock the backward breaking state to enable the backward rotation.

Meanwhile, in the automatic output apparatus for converting the two way drive into one way including the lock relief device, the fixing shaft can be formed as a rotation shaft. In this instance, the prime gear and the ratchet wheel are rotatably engaged with the rotation shaft, and the ratchet wheel is formed with a cylindrical portion projecting in the identical axial way with the rotation shaft to engage with the planetary carrier.

Also, if the backward rotation of the ring gear which is output portion is required, the lever 22 can be forcibly unlocked from the ratchet wheel 21 by the outside manual operation at the rotation lock breaking state by removing the sub-gear 26 installed to one end of the lever 22 and installing a regulation device to form connection with the lever in the lock relief device 20, to thereby produce one way output in the output portion from the two ways driving, the idle rotation clutch state, and the backward breaking state, and it is possible to make the output portion rotate in the backward way concurrently.

FIG. 21 is a schematic view showing the lock relief device of the bicycle in which the automatic output apparatus for

converting the two ways driving into one way of the present invention.

The lock relief device shown in the drawing is adapted to unlock the backward breaking state automatically without any separate outside operation, the ratchet wheel 21 is fixed to the shafts 30, 40, and the lever 22 is tooth-engaged with the ratchet wheel, one end of the lever is hinge-engaged with the fixing support member 23, and the other end is engaged with the sub-gear 26 and the spring 257 by the one way bearing, and the other side of the spring is fixed to the fixing support member. The sub-gear 26 is tooth-engaged with the outside tooth gear 28 to rotate in one way, so that the outside tooth gear 28 rotates in the reverse direction and the sub-gear 26 tooth-engaged with the gear is pushed out in the reverse direction at the state securing to the lever when the output portion rotates in the reverse direction, and the lever 22 rotates in the reverse direction with centering the hinge by the reverse rotation power to break away from the ratchet wheel 21. Also, when the reverse rotation power is removed, the lever is engaged with the ratchet wheel 21 by means of the elasticity of the spring 257.

Further, FIG. 22 is a schematic view showing another embodiment of the lock relief device of the bicycle in which the automatic output apparatus for converting the two ways driving into one way of the present invention.

As shown in the drawing, the sub-gear is not tooth-engaged

with the outside tooth gear 28 as shown in FIG. 21, and is engaged with the ring gear or the the inside tooth gear to become rotated. In this instance, the sub-gear tooth-engaged with the the inside tooth gear is engaged with one end of the lever 22 by employing the sub-gear fixing support member 261. The support member is formed with a guide projection 262, so that the guide projection slides along a guiding curved surface 231, which is one side of the fixing support member, to enable the lever and the ratchet wheel to be engaged with each other and be separated.

The lever and the sub-gear fixing support member 261 are provided with a spring 263 retracting toward inside of the shaft so that the sub-gear is always made to be separated from the the inside tooth gear, and the lever is connected to the fixing support member and the spring 257 so that it can be always be pulled toward the axial way.

FIG. 23 is a schematic view showing the lock relief device adapted to be operated manually.

As shown in the drawing, if the backward rotation of the ring gear which is output portion is required, the lever 22 can be forcibly unlocked from the ratchet wheel 21 by the outside manual operation at the rotation lock breaking state by removing the sub-gear 26 installed to one end of the lever 22 and installing a regulation device to form connection with the lever in the lock relief device 20, to thereby produce one way output

in the output portion from the two ways driving, the idle rotation clutch state, and the backward breaking state, and it is possible to make the output portion rotate in the backward way concurrently.

FIG. 24 is a cross-sectional view showing the principal portion of the bicycle provided with the lock relief device and the automatic output apparatus for converting two way drive into one way at the rotation shaft formed integrally with the pedal according to a preferred embodiment of the present invention, FIGs. 25 and 26 are planar views showing the lock relief devices shown in FIG. 24, and FIG. 27 is an exploded perspective view of FIG. 24.

As shown, the prime gear 11 is formed integrally with the pedal rotation shaft 30 so that power can be transmitted directly from the pedal, one side of the rotation shaft 30 is engaged with a room disk plate 152 for forming the gear room 15, the other side is engaged with the ratchet wheel 21 formed with step portions of a different diameter by means of the bearing, the ratchet wheel is engaged with the planetary carrier 13 in the prime gear side by means of the carrier bearing 18, which is the one way bearing, a sprocket cover 153 is engaged with the ratchet wheel in the outside to include the prime gear and the planetary carrier to thereby be bolt-engaged with the room disk plate 152, the inner peripheral surface of the sprocket cover is formed with the inside tooth of the ring gear 14, and the

planetary gear 12 is installed to one side of the planetary carrier by the planetary bearing, which is the one way bearing, to be tooth-engaged with the prime gear and the ring gear.

Further, the rotation shaft 30 is engaged with the frame of the bicycle body by the bearing, and the fixing support member 23 is engaged with the bicycle body, and the lever 22 is engaged with the fixing support member 23. The lever 22 is formed with an engaging projection 221 at the inside to be tooth-engaged with the engaging groove 211 of the ratchet wheel, resulting in the fixing of the ratchet wheel.

Also, the ratchet wheel 21 is engaged with the rotation shaft by the bearing so that it can rotate, and it is engaged with the carrier bearing by means of a spline.

As shown in FIGs. 25 and 26, the levers 22 are formed to be one pair in which the engaging projections 221 are formed to be opposite, a long hole 222 is formed at upper side, and a short spring 257a and a long spring 257b are installed at the upper and lower portion.

Additionally, the lever 22 is installed to the fixing support member 23, and a projecting pin 241 is formed at one side of the support member, and the long hole 22 of the lever 22 is engaged with the projecting pin. Also, a gap lever 24 is provided between the two levers so that the interval between the respective lever whose upper and lower portion are engaged with each other by the short spring 257a and the long spring 257b. The gap lever 24 is installed to the fixing support member 23 so

that one side thereof is connected to a cable wire 50 to be rotated by the user's operation to thereby enlarge the spaced width between two levers. In this instance, the gap lever 24 is installed at a position spaced a predetermined distance downward from the projecting pin 241 fixing the lever, so that the lever can be separated to the left and right by the rotation power of the gap lever. In other words, when the gap lever rotates, the projecting pin 241 located in the outside of the long hole formed at the lever is moved to the inside of the long hole, and the lever portion to which the long spring is installed, is separated by the remained rotation power, so that the engaging projection 221 of the lever can be separated from the engaging groove 211 of the ratchet wheel.

Also, when the operation of the gap lever is stopped, the engaging projection of the lever is engaged with the engaging groove of the ratchet wheel by the restoring power of the short spring and the long spring to result in lock of the ratchet wheel. The power transmission system of the bicycle in which the lock relief device and the automatic output apparatus for converting two ways driving into one way output are installed to the rotation shaft integrally formed with the pedal is described as follows.

1) When the driving portion is driven in the forward direction: pedal →prime gear 11 →planetary gear 12 →ring gear 14 sprocket cover 153: the rotation shaft rotates at the locking state of the lock relief device,

2) When the driving portion is driven in the reverse direction: pedal →prime gear 11 →planetary gear 12 →ring gear 14 sprocket cover 153: the rotation shaft rotates at the locking state of the lock relief device,

3) When the output portion is driven in the forward direction: sprocket cover 153 → ring gear 14 →planetary gear 12 →planetary carrier 13: the rotation shaft rotates at the locking state of the lock relief device,

4) When the output portion is driven in the reverse direction: sprocket cover 153 →ring gear 14 →planetary gear 12 →planetary carrier 13: backward movement is possible by operation the lever in the lock relief device.

Further, the power transmission system of the lock relief device can be summarized as follows: Wire 50→ gap lever 24 → lever 22 →ratchet wheel 21, if the engaging projection 221 of the lever is separated from the engaging groove 211 of the ratchet wheel, the ratchet wheel 21 and the planetary carrier 13 can freely move in both way. The operation, rotating way and the results of the power transmission system is summarized in table 1.

FIG. 28 is a cross-sectional view showing the principal portion of the bicycle provided with the lock relief device and the automatic output apparatus for converting two ways drive into one way at the fixed shaft of a rear wheel according to

another embodiment of the present invention, FIG. 29 is an exploded perspective view of FIG. 28, and FIG. 30 is a perspective view showing the principal portion of the lock relief device.

As shown in the drawing, the planetary gear group 10 is installed within the wheel hub 16 of the rear wheel portion, and the prime gear 11 installed to the fixing shaft 40 is formed to be a tube shape so that its surface contacting with the shaft extends in the axial way, a wheel-hub cover 161 is engaged with one side of the outer peripheral surface of the extended tube by the bearing, the sprocket 19 is spline-engaged at the outside of the tube, and the body of the wheel-hub is engaged with a housing 25 of the lock relief device 20 installed integrally with the fixing shaft 40.

The sprocket 19 is formed with a plurality of gear teeth differing in their diameters, a well-known gear transmission device is installed at one side of the sprocket to enable the gear transmission, and it is preferable to make the sprocket rotate freely by the power transmitted after the sprocket is engaged with the fixing shaft 40 by the bearing.

Also, the power transmitted from the driving portion is transmitted to the fixing shaft 40 via the planetary gear 12 tooth-engaged with the prime gear 11. In this instance, the planetary gear 12 is installed at one side of the planetary carrier 13 by means of the planetary bearing 17, which is the one way bearing, to thereby transmit the power only in one way,

and the planetary carrier 13 is installed at an outer peripheral surface of a rotation clutch 251 secured to the fixing shaft 40 by the carrier bearing which is the one way bearing. As one side of the planetary gear 12 is engaged with the ring gear, which is the gear tooth formed at an inner peripheral surface of the wheel hub 16, so that the planetary gear 12 can tooth-engage with the prime gear 11 and the ring gear 14 concurrently.

Meanwhile, the housing 25 and its housing cap 25' of the lock relief device in which the wheel hub is engaged at the outer peripheral surface by the bearing, is engaged with the fixing shaft 40, and a spacing clutch 252 is installed to the fixing shaft 40 by a spline so that it can move slidably in the axial way and is tooth-engaged with the rotation clutch 251. The spacing clutch 252 received in the housing 25 is adapted to tooth-engage with the rotation clutch by the resilient power of the spring 257. The spacing clutch 252 is formed with a guide bar 253 inserted partially into the housing, and an engaging portion is integrally engaged with the inserted end, so that the locked rotation clutch can rotate in the backward way by moving the spacing clutch slidably in the axial way by means of the pulling lever 255 installed to the housing cap 25'. As shown in the drawings, the spacing clutch 252 is moved by operating the wire 50 so that the pulling lever 255 hinge-engaged with the bracket 256 can draw the engaging portion 254 toward one side.

Also, the rotation clutch 251 is engaged with the fixing shaft 40 via the bushing so as to reduce direct abrasion arising

from the rotation and to facilitate rotation, and the spring 257 can be further installed to the pulling lever connected to the wire in order to return the pulling lever 255 to its original position.

The power transmission system of the bicycle comprising the lock relief device and the automatic output apparatus for converting two ways driving into one way output installed to the fixing shaft of the rear wheel can be summarized as follows.

1) When the driving portion is driven in the forward direction: sprocket 19 →prime gear 11 →planetary gear 12 →ring gear 14 →wheel hub 16: the lock relief device is at locking state,

2) When the driving portion is driven in the reverse direction: sprocket 19 →prime gear 11 →planetary gear 12 → planetary carrier 13 →ring gear 14 →wheel hub 16: the lock relief device is at locking state,

3) When the output portion is driven in the forward direction: wheel hub 16 →ring gear 14 →planetary gear 12 → planetary carrier 13: the lock relief device is at locking state,

4) When the output portion is driven in the reverse direction: wheel hub 16 →ring gear 14 →planetary gear 12 → planetary carrier 13: manual backward movement of the lock relief device is possible.

Also, the power transmission system of the lock relief

device can be summarized as follows: wire 50 →pulling lever 255 → engaging portion 254 →guide bar 253 →spacing clutch 252 → rotation clutch 251. When the rotation clutch 251 is separated from the spacing clutch 252, the planetary carrier 13 can rotate in the two ways. The operation, rotation way, and results of the power transmission system are shown in table 1.

FIG. 31 is a cross-sectional view showing the principal portion of the bicycle provided with the automatic output apparatus for converting two way drive into one way within a gear room in a main body at the rotation shaft formed integrally with the pedal according to another embodiment of the present invention, FIG. 32 is a planar view showing the lock relief device shown in FIG. 31, and FIG. 33 is an exploded perspective view of FIG. 31.

As shown in the drawings, the prime gear 11 is integrally formed at the rotation shaft 30, and the ratchet wheel 21 is installed by using the bushing. The planetary carrier 13 is installed at the outer peripheral surface by the carrier bearing 18 which is the one way bearing, and the planetary gear 12 is installed at one side of the planetary carrier 13 by the planetary bearing 17 which is the one way bearing. The planetary gear 12 is engaged with the prime gear 11 in the inside axial way and is tooth-engaged with the ring gear 14 at the outside. Also, the inner peripheral surface of the ring gear 14 is engaged with the rotation shaft 30 by the bearing and the outer

peripheral surface thereof is formed to extend in the axial way and is formed with the gear tooth at the extended inner peripheral surface.

Such planetary gear group 10 is arranged within the gear room 15 formed integrally with the body of the bicycle to block flowing in of the outside impurities. The gear room is formed of a room body 151 and a room disk plate 152, and the room body 151 is engaged with the outer peripheral surface of the ring gear 14 by the bearing to allow it rotate freely. Also, the room disk plate 152 is engaged with the rotation shaft by the bearing and is thread-engaged with the room body, the engagement between the room body and the room disk plate can be accomplished by using various well-known engagement means in addition to the shown thread engagement.

The lock relief device 20 is further installed to the structure of the planetary gear group 10 and the gear room 15 in order to control the rotation of the backward way. The lock relief device 20 is comprised by engaging the fixing support member 23 with the room disk plate 152 and hinge-engaging the lever 22 with the fixing support member 23. In other words, the engaging projection 221 is formed at the inside of the lever 22 shaped as a curved surface, and the engaging groove 211 is formed at the ratchet wheel 21, and lock and relief of the device in the backward way can be produced by the engagement of them.

Accordingly, in the present embodiment, the sub-gear fixing

support member 261 is hinge-engaged with one side of the lever to rotate the lever 22, and the sub-gear 26 is installed at one side of the support member by using the one way bearing, and an the inside tooth gear 27 is engaged integrally with the ring gear the to rotate the lever by tooth-engagement of the sub-gear with the the inside tooth gear. Also, the lever and the support member is connected by the spring 257 so that the lever separated by outside force can be engaged with the ratchet wheel by the resilient force of the spring, and a retraction spring 263 is installed at a hinge-engagement portion between the lever and the support member to allow the sub-gear to be separated from the the inside tooth gear. The the inside tooth gear and the sub-gear can be made to be separated by using a tension spring instead of the retraction spring.

Additionally, the guide projection 262 is also formed at the sub-gear fixing support member 261 to move on the guiding curved surface 231 formed on the upper surface of the support member. Also, the guiding curved surface is formed in such a fashion as the radius and the center of the shaft are different from the center of the rotation shaft so that the guide projection can move slidably on the guiding curved surface to make the engaging projection to be engaged or separated from the engaging groove of the ratchet wheel.

Accordingly, the power transmission system of the bicycle including the automatic output apparatus for converting the two ways driving into one way output, installed to the rotation

shaft which is formed integrally with the pedal can be summarized as follows.

1) When the driving portion is driven in the forward direction: pedal →prime gear 11 →planetary gear 12 →ring gear 14 →sprocket 19: the lock relief device is at the locking state.

2) When the driving portion is driven in the reverse direction: pedal →prime gear 11 →planetary gear 12 →planetary carrier 13 →ring gear 14 →sprocket 19: the lock relief device is at the locking state.

3) When the driving portion is driven in the forward direction: sprocket 19 →ring gear 14 →planetary gear 12 →planetary carrier 13: the lock relief device is at the locking state.

4) When the driving portion is driven in the reverse direction: sprocket 19 →ring gear 14 →planetary gear 12 →planetary carrier 13: backward movement is possible as the lock relief device is relieved.

Also, the power transmission system of the lock relief device can be summarized as follows: The inside tooth gear 27 of the lock relief device →sub-gear 26 →sub-gear fixing support member 261 →fixing support member 23 and ratchet wheel 21. When the lever 22 is forcibly separated from the ratchet wheel 21, the ratchet wheel 21 and the planetary carrier 13 can rotate in both ways. The operation, rotation way and results of the power transmission system are compared and shown in table 1.

FIG. 34 is a cross-sectional view showing the principal portion of the bicycle provided with the lock relief device having an outside-tooth gear and the automatic output apparatus for converting two ways drive into one way at the rotation shaft according to another embodiment of the present invention, FIG. 35 is a planar view showing the lock relief device of FOG. 34, and FIG. 36 is an exploded perspective view of FIG. 34.

As shown in the drawings, the planetary gear group 10, the lock relief device 20 and the gear room 15 including these members are installed to the rotation shaft 30 with which the pedal is engaged.

The prime gear 11 of the planetary gear group 10 is directly engaged with the rotation shaft 30, and the planetary carrier 13 is installed to the outer peripheral surface of the ratchet wheel 21 which is engaged with the rotation shaft 30 by the carrier bearing which is the one way bearing. Also, the planetary gear 12 is installed at one side of the planetary carrier by using the one way planetary bearing 17 to be tooth-engaged with the prime gear 11.

The gear room 15 is composed of the sprocket cover 153 and the room disk plate 152 installed at one side of he sprocket cover. The sprocket cover 153 is engaged with the bicycle body 60 supporting the rotation shaft 30 by the bearing, and the room disk plate 152 is engaged with the rotation shaft 30 by the bearing to allow the gear room to rotate freely.

In such structure, the ring gear 14 is formed at the inner peripheral surface of the sprocket cover 153 to be tooth-engaged with the planetary gear 12 so that driving force can be transmitted to the sprocket cover 153.

Additionally, center portion of the sprocket cover 153 is formed to extend into the gear room, and the outside tooth gear 28 is formed at the extended outer peripheral surface. Also, the fixing support member 23 is engaged with the bicycle body 60, and the lever is hinge-engaged with the fixing support member to make the engaging projection of the lever be tooth-engaged with the engaging groove 211 of the ratchet wheel 21. Further, the lever and the fixing support member are connected by the spring 257, so that the engaging projection 221 of the lever is engaged with the engaging groove 211 of the ratchet wheel by the tensioning force of the spring.

The power transmission system of the bicycle in which the automatic output apparatus for converting the two ways driving into one way output and the lock relief device having the outside tooth gear 28 are installed to the rotation shaft 30 can be summarized as follows:

1) When the driving portion is driven in the forward direction: pedal →prime gear 11 →planetary gear 12 →ring gear 14 →sprocket cover 153: the lock relief device is at the locking state.

2) When the driving portion is driven in the reverse

direction: pedal →prime gear 11 →planetary gear 12 →ring gear 14 →sprocket cover 153: the lock relief device is locked by the rotation of the ring gear 14 in the forward direction.

3) When the output portion is driven in the forward direction: sprocket cover 153 →ring gear 14 →planetary gear 12 →planetary carrier 13: idle rotation clutch state, the lock relief device is locked by the rotation of the ring gear in the forward direction.

4) When the output portion is driven in the reverse direction: sprocket cover 153 →ring gear 14 →planetary gear 12 →planetary carrier 13 and the prime gear 11: the lock relief device can rotate by the relief of the locking as the ring gear rotates in the reverse direction.

Also, the power transmission system of the lock relief device can be summarized as follows: outside tooth gear 28 →sub-gear 26 →lever 22 →ratchet wheel 21. When the lever 22 is separated from the ratchet wheel 21, the planetary carrier 13 can rotate in both ways.

The rotation of the ring gear 14 in the reverse direction represents for the automatic backward movement for drawing the bicycle when the bicycle is located at a blocked road, at a narrow road, and a parking die, and is carried out automatically.

The operation, rotation way and results of the power transmission system are compared and shown in table 1.

While the present invention has been described with reference to the preferred embodiments, the present invention is not restricted by the embodiments. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention. However, such variations and modifications are all pertained to the scope of the present invention.

What is claimed is:

1. An automatic output apparatus for converting two way drive into one way, wherein a prime gear 11 is engaged with a fixing shaft 40 so that it can rotate freely, and a planetary carrier 13 is engaged with the fixing shaft 40 so that it can rotate in one way by installing a carrier bearing 18, which is one way bearing, at the center of the planetary carrier 13, and a planetary gear 12 with a planetary bearing 17, which is one way bearing, installed at the center thereof, is installed at one side of the planetary carrier 13 in such a fashion that the central shaft of the planetary bearing 17 is integrally engaged with to the planetary carrier 13, and the planetary gear 12 is tooth-engaged with inside teeth of a ring gear 14 rotatably installed at an identical shaft with that of the planetary carrier 13.

2. An automatic output apparatus for converting two ways drive into one way, wherein a prime gear 11 is installed integrally with a rotation shaft 30, a planetary carrier 13 is engaged with the rotation shaft 30 with a carrier bearing 18, which is one way bearing, installed at the center thereof, the center of the carrier bearing is fixed to an outside fixture to make the planetary carrier rotate in one way, a planetary gear 12 is engaged with one side of the planetary carrier 13 with a planetary bearing 17, which is one way bearing and the center shaft of which is integrally engaged with the planetary carrier

13, installed at the center of the planetary gear, and the planetary gear 12 is tooth-engaged with the inside teeth of a ring gear 14 rotatably installed at an identical shaft with that of the planetary carrier 13.

3. An automatic output apparatus for converting two ways drive into one way, wherein a prime gear 11 and a ratchet wheel 21 are rotatably engaged with a fixing shaft 40, the ratchet wheel is formed with a cylindrical portion 212 on its shaft identical with the fixing shaft with which a planetary carrier 13 is engaged by a carrier bearing 18, which is one way bearing, a planetary gear 12 provided with a planetary bearing 17, which is one way bearing, is engaged with one side of the planetary carrier to be tooth-engaged with the outside tooth of the prime gear 11, a cylindrical-shaped wheel hub 16 is rotatably engaged with the fixing shaft 40 to contain a gear group with forming a ring gear 14 at one side of an inner peripheral surface of its body so that the inside tooth of the ring gear 14 is tooth-engaged with the planetary gear 12, an outside tooth gear is further formed at one surface of the body, a fixing support member 23 provided with a guiding curved surface 231 at one side thereof is formed at the fixing shaft 40 adjacent to the outside tooth gear, a lever 22 formed with semi-circular curved surface portion is hinge-engaged with the fixing support member, a guide projection 262 is formed at one surface of the lever 22 so that it can slide reciprocally along the guiding curved surface 231

of the fixing support member 23 having a bigger diameter than that of the outside tooth gear 28, an engaging projection 221 is formed at the inside of the lever 22 so that it is tooth-engaged with an engaging groove 211 of the ratchet wheel 21, which is formed to have a wider size than that of the projection 221 of the lever 22 to form a separation gap, a sub-gear 26 tooth-engaged with the outside tooth gear 28 is engaged with one side of the lever 22 by using a sub-bearing 264, which is one way bearing, and a spring 257, one end of which is engaged with the lever 22 and the other end thereof is engaged with the fixing support member 23, is installed to return the lever 22 to its original position.

4. An automatic output apparatus for converting two ways drive into one way, wherein a prime gear 11 and a ratchet wheel 21 are rotatably engaged with a rotation shaft 30, the ratchet wheel is formed with a cylindrical portion 212 on its shaft identical with the rotation shaft with which a planetary carrier 13 is engaged by a carrier bearing 18, which is one way bearing so that the planetary carrier 13 can rotate in one way, a planetary gear 12 provided with a planetary bearing 17, which is one way bearing, is engaged with one side of the planetary carrier to be tooth-engaged with the outside tooth of the prime gear 11, a cylindrical-shaped wheel hub 16 is rotatably engaged with the rotation shaft 30 to contain a gear group with forming a ring gear 14 at one side of an inner peripheral surface of its

body so that the inside tooth of the ring gear 14 is tooth-engaged with the planetary gear 12, an outside tooth gear 28 is further formed at one surface of the body, a fixing support member 23 provided with a guiding curved surface 231 at one side thereof is formed at the rotation shaft 30 adjacent to the outside tooth gear, a lever 22 formed with semi-circular curved surface portion is hinge-engaged with the fixing support member, a guide projection 262 is formed at one surface of the lever 22 so that it can slide reciprocally along the guiding curved surface 231 of the fixing support member 23 having a bigger diameter than that of the outside tooth gear 28, an engaging projection 221 is formed at the inside of the lever 22 so that it is tooth-engaged with an engaging groove 211 of the ratchet wheel 21, which is formed to have a wider size than that of the projection 221 of the lever 22 to form a separation gap, a sub-gear 26 tooth-engaged with the outside tooth gear 28 is engaged with one side of the lever 22 by using a sub-bearing 264, which is one way bearing, and a spring 257, one end of which is engaged with the lever 22 and the other end thereof is engaged with the fixing support member 23, is installed to return the lever 22 to its original position.

5. The automatic output apparatus according to claim 2 or claim 4, wherein the prime gear 11 is rotatably installed to the rotation shaft 30, and the ring gear 14 is integrally engaged with the rotation shaft.

6. The automatic output apparatus according to claim 3 or claim 4, wherein a wire cable 922, one end of which is connected to an intermittence lever operated manually, is connected to the lever 22 so that the engaging projection 221 of the lever is separated from the engaging groove 211 of the ratchet wheel.

7. The automatic output apparatus according to any one from claim 1 to claim 4, wherein one or a plurality of the planetary gears 12 are engaged with the center shaft of the planetary carrier 13 at equal intervals.

8. The automatic output apparatus according to claim 7, wherein the planetary bearing 17 and the carrier bearing 18 are adapted to be able to rotate in the clockwise forward direction.

9. The automatic output apparatus according to claim 7, wherein the planetary bearing 17 is adapted to be able to rotate in the clockwise forward direction, and the carrier bearing 18 is adapted to be able to rotate in the anti-clockwise reverse direction.

10. The automatic output apparatus according to claim 7, wherein the planetary bearing 17 is adapted to be able to rotate in the anti-clockwise reverse direction, and the carrier bearing 18 is adapted to be able to rotate in the clockwise forward

direction.

11. The automatic output apparatus according to claim 7, wherein the planetary bearing 17 and the carrier bearing 18 are adapted to be able to rotate in the anti-clockwise reverse direction.

12. A bicycle provided with an automatic output apparatus for converting two way drive into one way,

wherein a lock relief device 20, and a planetary gear group 10 comprising a prime gear 11, an one way bearing, a planetary gear 12, a planetary carrier 13, and a ring gear 14 are installed to a rotation shaft 30 to which a driving portion of the bicycle and a pedal, is installed, the lock relief device enabling the backward movement by attaching and detaching the lever installed to a ratchet wheel 21 and a fixing support member 23;

wherein the planetary gear group 10 is constructed such that, the prime gear 11 is engaged integrally with the rotation shaft 30 to be transmitted with the power directly, a room disk plate 152 is engaged with one side of the rotation shaft 30 to form a gear room 15 and a ratchet wheel 21 formed with a step portion at an outer peripheral surface is engaged with an other side of the rotation shaft by bearing, the planetary carrier 13 is engaged with the ratchet wheel in the prime gear side by the one way carrier bearing 18 and a sprocket cover 153 is engaged

with the ratchet wheel in the outside to contain the prime gear and the planetary carrier to be bolt-engaged with the room disk plate 152, an the inside tooth of the ring gear 14 is formed at an inner peripheral surface of the sprocket cover 153, and a planetary gear 12 is installed to one side of the planetary carrier by the one way planetary bearing 17 to be tooth-engaged with the prime gear 11 and the ring gear 14 concurrently;

wherein the lock relief device 20 is constructed such that, the ratchet wheel 21 is engaged with the rotation shaft 30 by the bearing, a fixing support member 23 is engaged with a bicycle body 60 supporting the rotation shaft, a pair of levers 22 formed with an engaging projection 221 tooth-engaged with an engaging groove 211 of the ratchet wheel 21 are installed to the fixing support member 23 to face to each other, a short spring 257a and a long spring 257b are respectively engaged with upper portion and lower portion of the two levers, and a spacing lever 24 is installed between the engaged levers to hinge rotate so that interval between the two levers can be broadened by pulling a cable wire 50 connected to the lever.

13. The bicycle provided with an automatic output apparatus according to claim 12, wherein the fixing support member 23 of the lock relief device is formed with a projecting pin 241 and an elongate hole 222 is formed at the lever 22 to thereby engage the projecting pin into the elongate hole, and the spacing lever 24 is installed at a low position away downward from the

projecting pin so that the upper portions and lower portions of the levers can be separated in sequence by the rotation of the levers.

14. A bicycle provided with an automatic output apparatus for converting two way drive into one way,

wherein a sprocket 19 connected to a driving portion of a pedal by a chain, a planetary gear group 10 comprising an one way bearing, a prime gear 11, a planetary gear 12, a planetary carrier 13, and a ring gear 14, and a lock relief device 20 enabling backward movement by attaching and detaching a rotation clutch 251 and a spacing clutch 252, are installed to a fixing shaft 30 constructing a rear wheel portion of the bicycle;

wherein the sprocket 19 is formed with a plurality of gear teeth having different diameters to enable gear transmission, and is rotatably engaged with the fixing shaft 40 by a bearing;

wherein the planetary gear group 10 is constructed such that, the prime gear 11 is engaged with the fixing shaft 40 by bearing, one side of the prime gear is spline-engaged with the sprocket 19 so that the power is transmitted directly, a planetary carrier 13 is installed at the outside of the rotation clutch 251 engaged with the fixing shaft 40 adjacent to the prime gear by using an one way carrier bearing 18, a planetary gear 12 is installed to one side of the planetary carrier by using an one way planetary bearing 17, one side of the planetary gear is adapted to tooth-engage with an outside tooth of the

prime gear, a wheel hub cover 161 is engaged with the outer peripheral surface of the prime gear 11 by bearing, a wheel hub 16 is engaged with the wheel hub cover 161 to include the prime gear, the planetary carrier, a ring gear 14 is formed at the inner peripheral surface of the wheel hub to tooth-engage with the planetary gear 12;

wherein the lock relief device 20 is constructed such that, a housing 25 with the wheel hub 16 engaged at an outer peripheral surface, and a housing cap 25' covering one side of the housing 25 is fixed to the fixing shaft 40, the spacing clutch 252 is spline-engaged with the fixing shaft within the wheel hub so that it can tooth-engage with the rotation clutch 251, the spacing clutch is forced to one side by a spring 257 installed between the spacing clutch and a housing of the lock relief device, a guide bar 253 is formed at the spacing clutch so that one end thereof is inserted into the housing 25, an engaging portion 254 formed with an engaging jaw is engaged with one end of the guide bar inserted into the housing, a pulling lever 22 is hinge-engaged with the housing cap 25' by using a bracket 256, the spacing clutch 252 is separated from the rotation clutch 251 by drawing the engaging portion to one side by using the pulling lever 255 rotated by the wire 50.

15. A bicycle provided with an automatic output apparatus for converting two way drive into one way,

wherein a rotation shaft 30 to which a driving portion, a

pedal, of the bicycle is installed, is engaged with a gear room 15 formed integrally with a bicycle body 60, and a lock relief device 20, and a planetary gear group 10 comprising a prime gear 11, an one way bearing, a planetary gear 12, a planetary carrier 13, and a ring gear 14 are installed to a rotation shaft 30 to which a driving portion of the bicycle, a pedal, is installed to the rotation shaft in the gear room, the lock relief device 20 enabling the backward movement by attaching and detaching the lever installed to a ratchet wheel 21 and a fixing support member 23;

wherein the planetary gear group 10 is constructed such that, the prime gear 11 is engaged integrally with the rotation shaft 30 so that the power can be transmitted, a ratchet wheel 21 formed with a step portion at an outer peripheral surface is engaged with one side of the rotation shaft, the planetary carrier 13 is engaged to the outer peripheral surface of the ratchet wheel by the one way carrier bearing 18, a planetary gear 12 is installed to one side of the planetary carrier by the one way planetary bearing 17 to be tooth-engaged with the prime gear 11 at the axial inside, and the ring gear 14 is engaged with the other side of the rotation shaft 30 by bearing to be tooth-engaged with the outside portion of the planetary gear 12.

wherein the gear room 15 is constructed by a room body 151 formed integrally with the bicycle body 60 and having a receiving space inside thereof and an opening at one side thereof, and is engaged with the outer peripheral surface of an

engaging portion of the ring gear 14 installed to the rotation shaft, and a room disk plate 152 thread-engaged with the room body to cover whole opened surface and engaged with the rotation shaft 30 directly by bearing;

wherein the lock relief device 20 is constructed such that, a fixing support member 23 is engaged with the room disk plate, curved lever 22 formed with engaging projection 221 is hinge-engaged with an inside of the fixing support member, a sub-gear fixing support member 261 is hinge-engaged with the other side of the lever, a sub-gear 26 is installed to one side of the sub-gear support member, an the inside tooth gear 27 is integrally engaged with the ring gear 14 to tooth-engage with the sub-gear, the lever and the fixing support member are connected by a spring 257 so that the engaging projection 221 of the lever and the engaging groove 211 of the ratchet wheel 21 can be tooth-engaged with each other.

16. The bicycle provided with an automatic output apparatus according to claim 15, wherein a guide projection 262 is also formed at the sub-gear fixing support member 261 of the lock relief device, and a guiding curved surface 231 having curvature radius and center of the shaft differing from those of the rotation shaft is formed at one side of the fixing support member 23 so that the engaging projection 221 of the lever is configured to separate from the engaging groove 211 of the ratchet wheel by moving the guide projection along with the

guiding curved surface.

17. The bicycle provided with the automatic output apparatus according to claim 16, a retraction spring 263 is installed at a hinge-engaging portion of the sub-gear fixing support member 261 and the lever 22 so that the sub-gear 26 is always separated from the inside tooth gear 27.

18. A bicycle provided with an automatic output apparatus for converting two way drive into one way,

wherein, a lock relief device 20, and a planetary gear group 10 comprising a prime gear 11, an one way bearing, a planetary gear 12, a planetary carrier 13, and a ring gear 14 are installed to a rotation shaft 30 to which a driving portion of the bicycle, a pedal, is installed, the lock relief device enabling the backward movement by attaching and detaching the lever 22 installed to a ratchet wheel 21 and a fixing support member 23;

wherein, the planetary gear group 10 is constructed such that, the prime gear 11 is engaged integrally with the rotation shaft 30 so that the power is transmitted directly from the pedal, a room disk plate 152 is engaged with one side of the rotation shaft 30 to form a gear room 15, a ratchet wheel 21 formed with a step portion at an outer peripheral surface and a sprocket cover 153 thread-engaged with a room disk plate formed with a plurality of sprocket at the outer peripheral surface are

engaged respectively with the other side of the rotation shaft by bearing and bushing, the planetary carrier 13 is engaged with the ratchet wheel in the prime gear side by the one way carrier bearing 18, a planetary gear 12 is engaged with one side of the planetary carrier 13 by an one way planetary bearing 17 so that it can tooth-engage with the prime gear 11 and the ring gear 14 concurrently;

wherein the lock relief device 20 is constructed such that, a fixing support member 23 installed to the bicycle body 60 is provide adjacent to the ratchet wheel 21 engaged with the rotation shaft 30, curved levers 22 formed with an engaging projection 221 at an inner peripheral surface is hinge-engaged with the fixing support member, the lever and the fixing support member are connected by a spring 257 so that the engaging projection 221 of the lever is tooth-engaged with the engaging groove 211 of the ratchet wheel by the resilient force, a sub-gear 26 is engaged with the other side of the lever by the one way bearing, the sprocket cover 153 engaged with the rotation shaft is formed with a step portion extending into the gear room and an outside tooth gear 28 is formed at outer peripheral surface of the step portion, and the outside tooth gear is tooth-engaged with the sub-gear 26 so that the engaging projection 221 of the lever is separated from the engaging groove 211 of the ratchet wheel by the rotation of the outside tooth gear.

Fig. 1

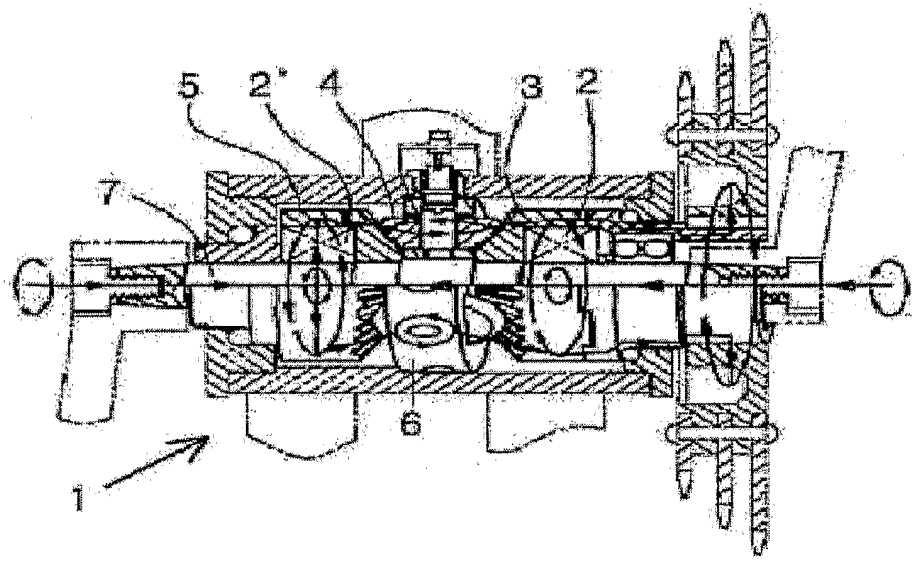


Fig. 2

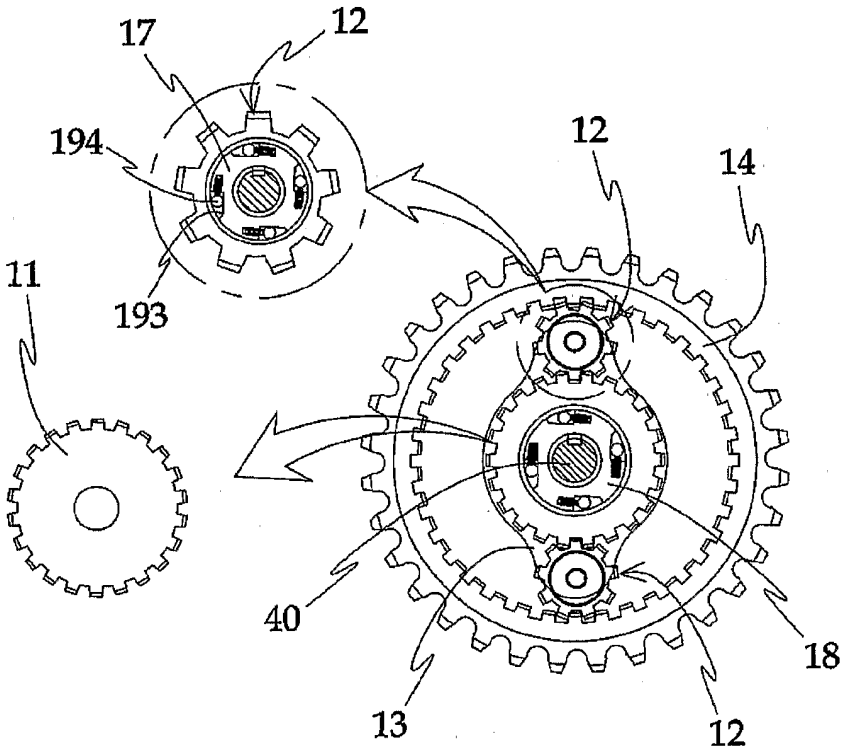


Fig. 3

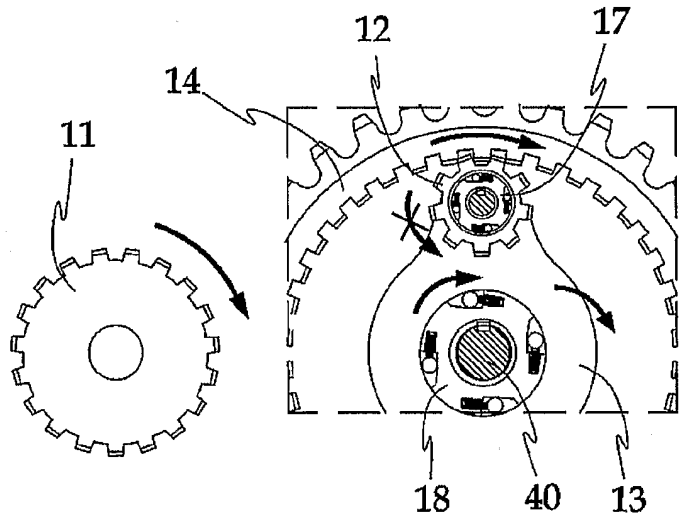


Fig. 4

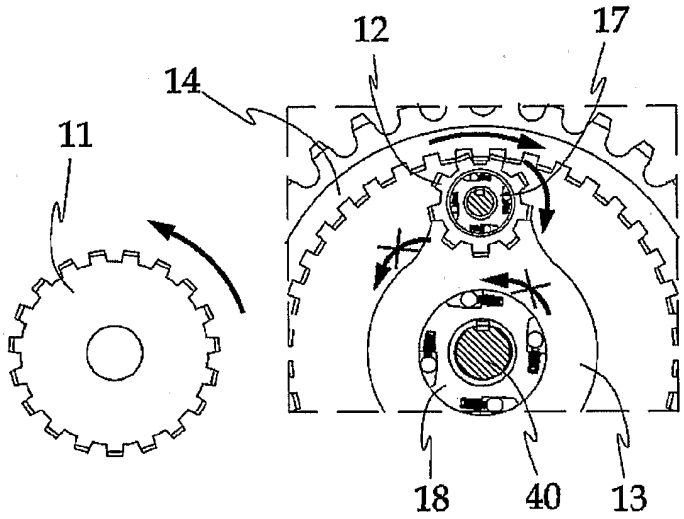


Fig. 5

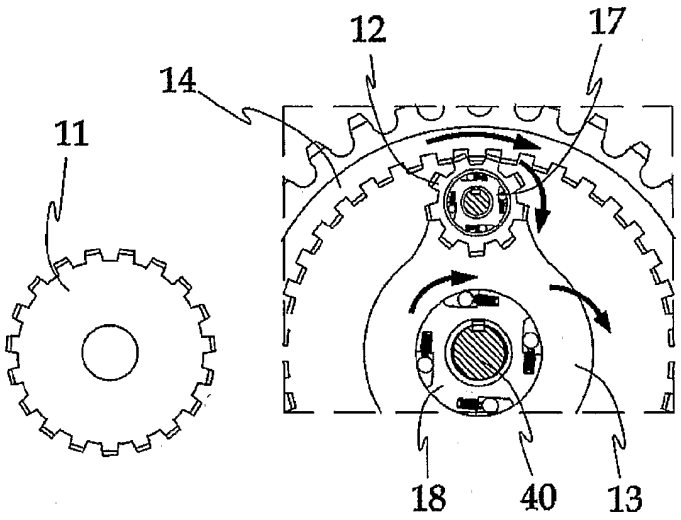


Fig. 6

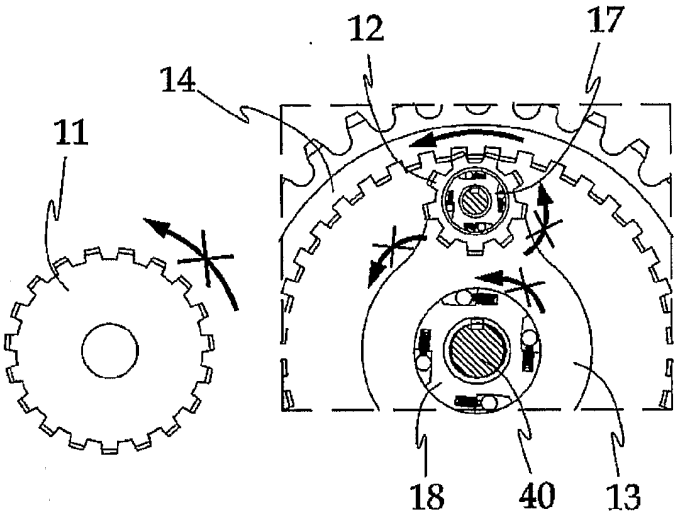


Fig. 7

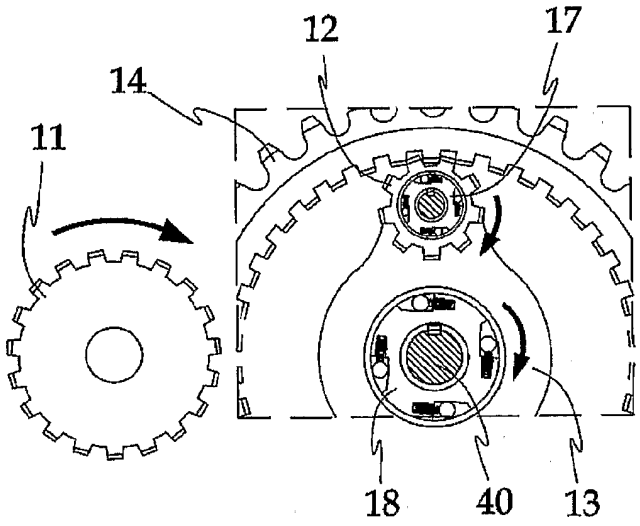


Fig. 8

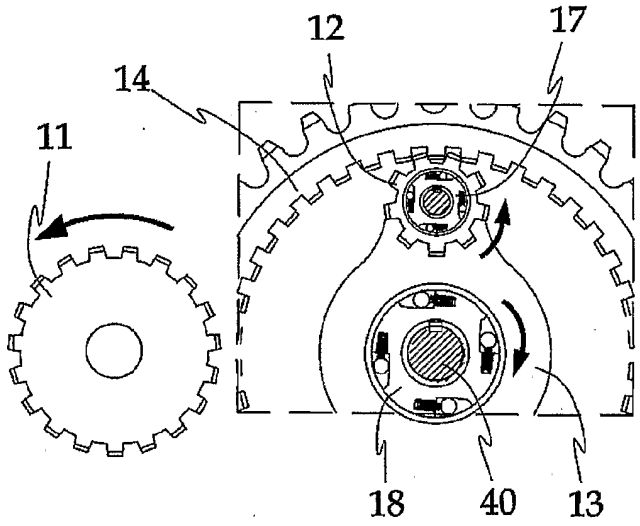


Fig. 9

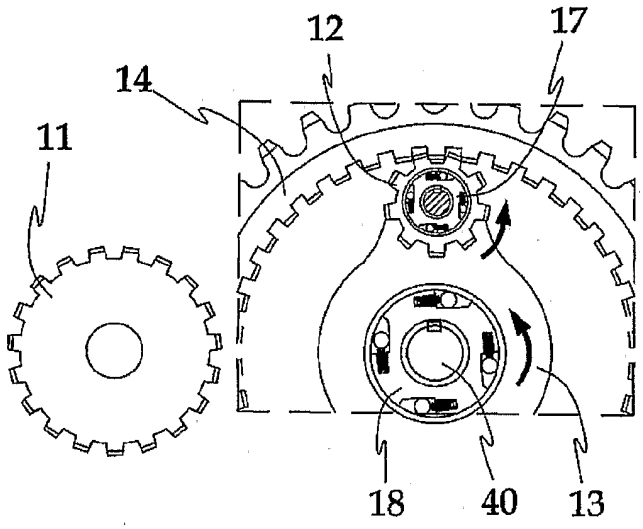


Fig. 10

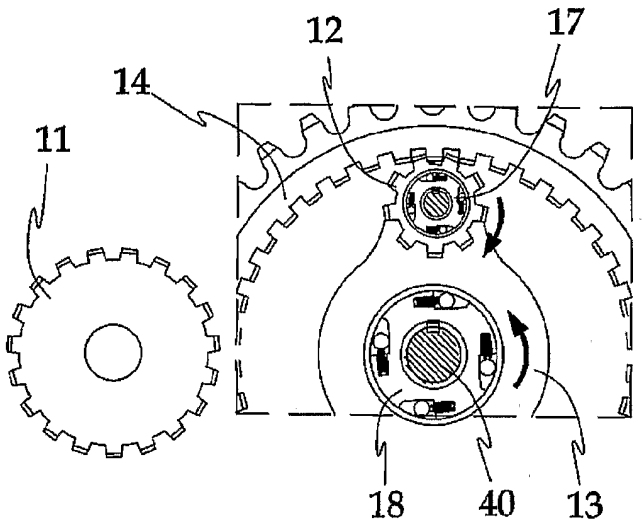


Fig. 11

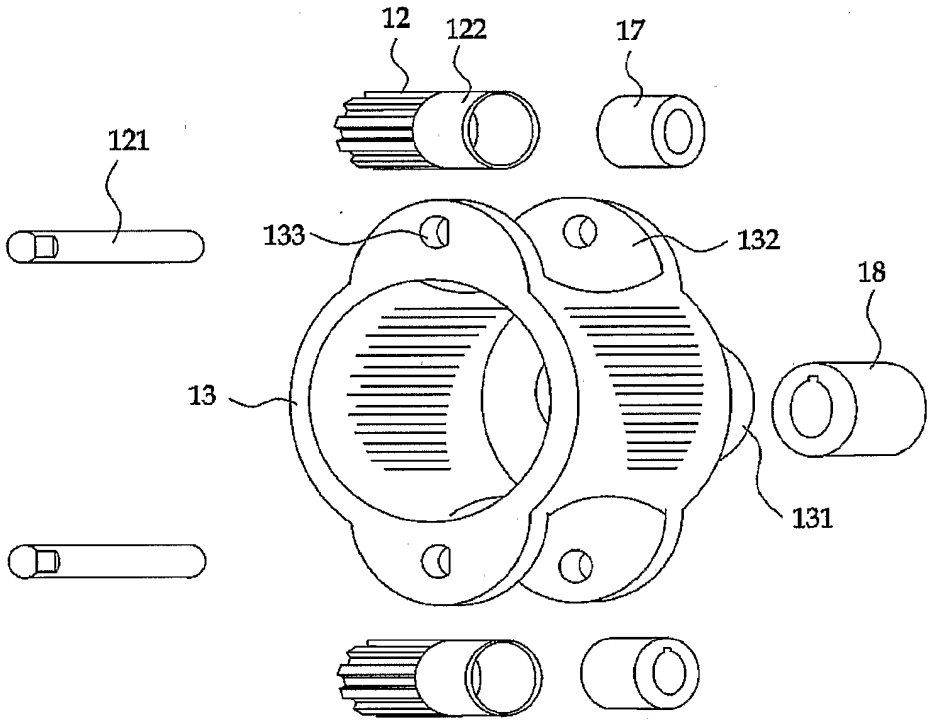


Fig. 12

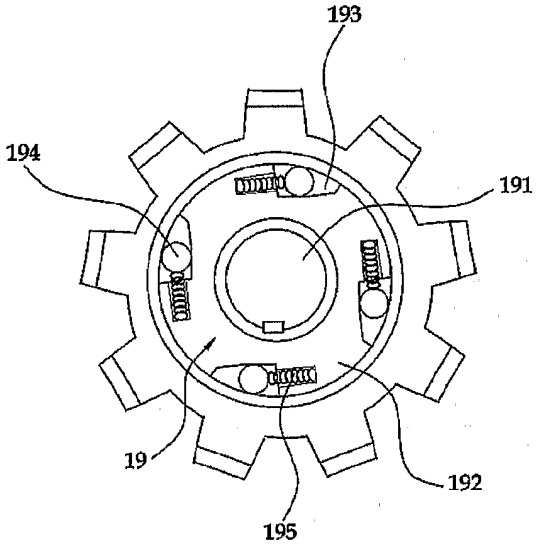


Fig. 13

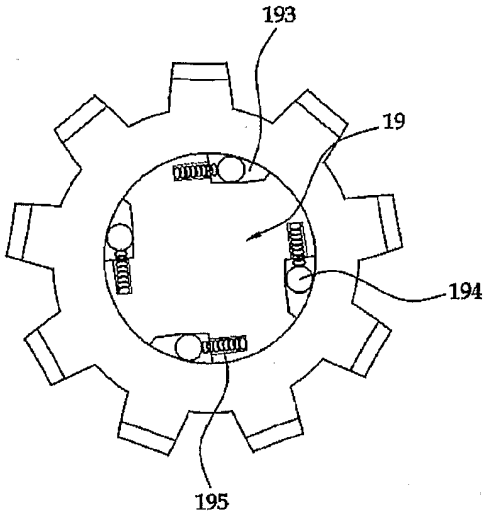


Fig. 14

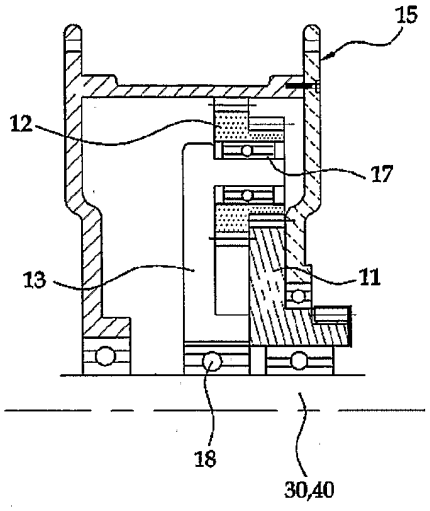


Fig. 15

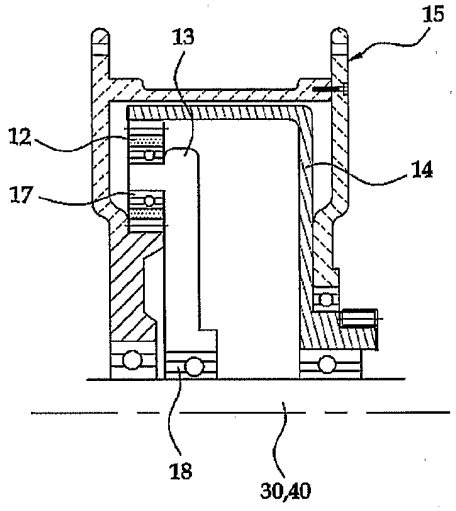


Fig. 16

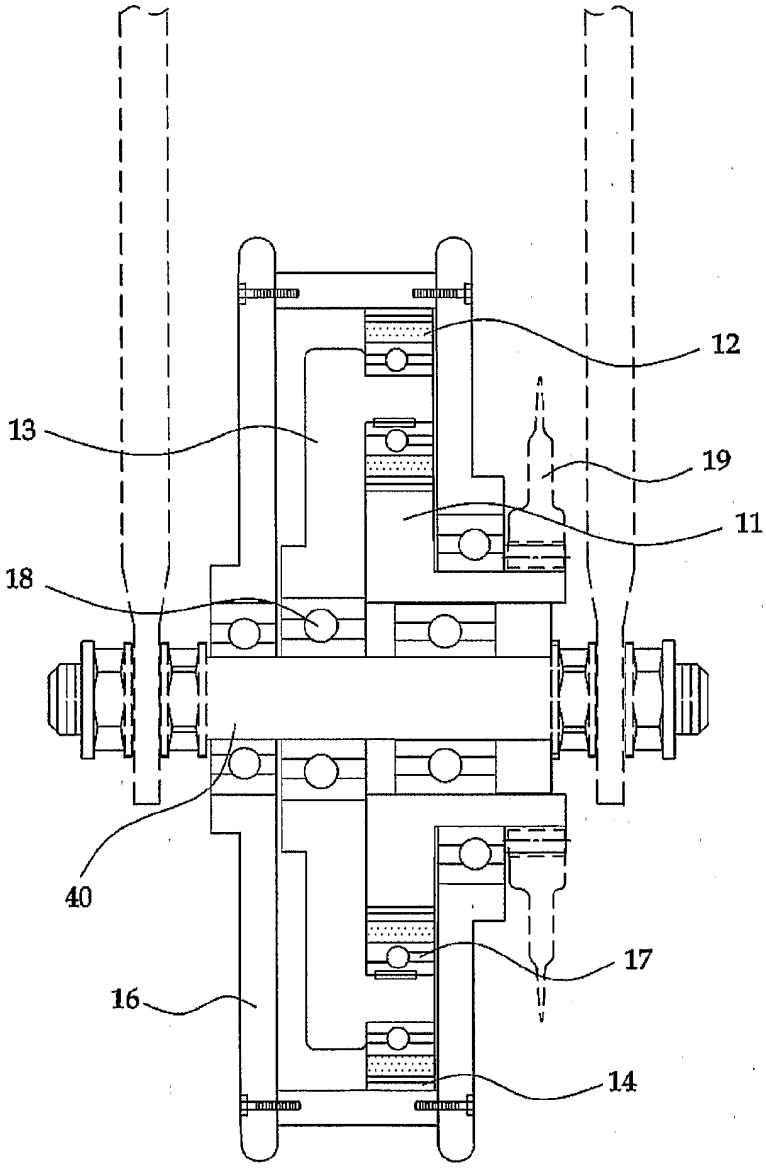


Fig. 17

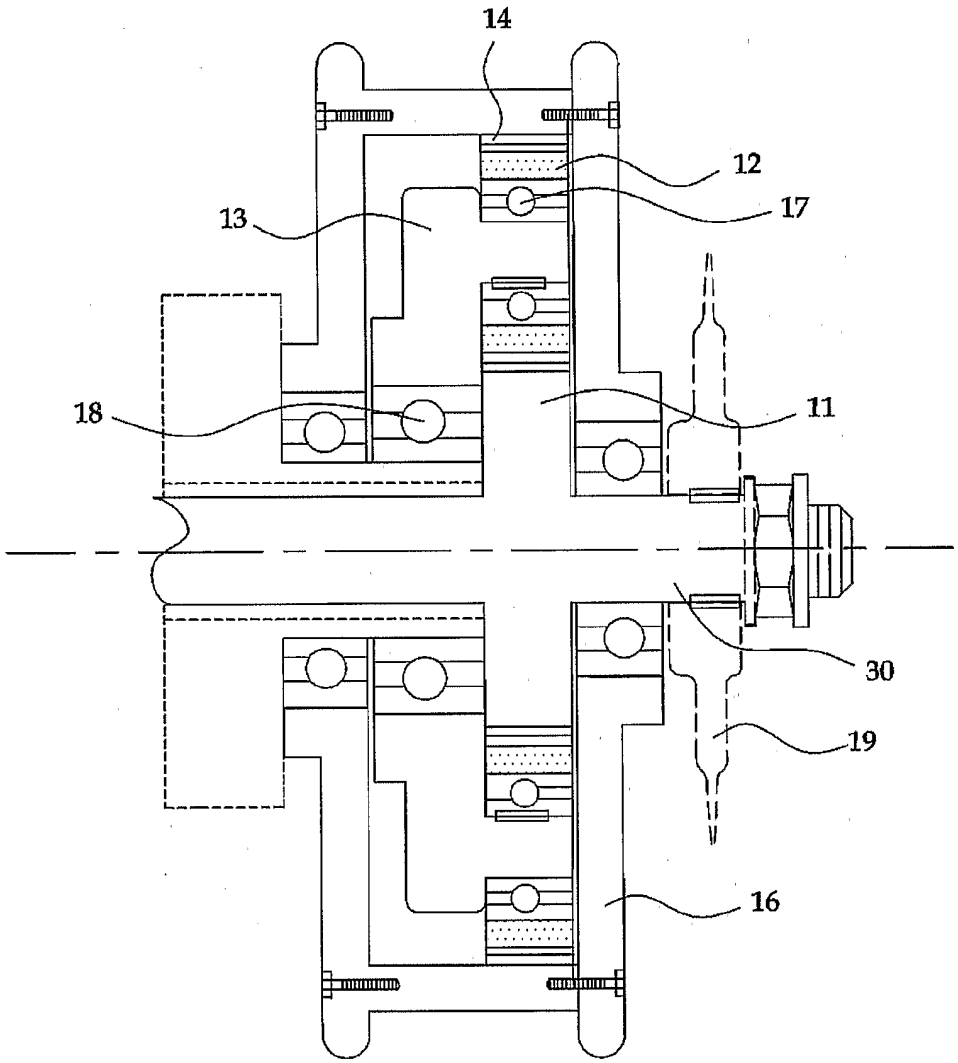


Fig. 18

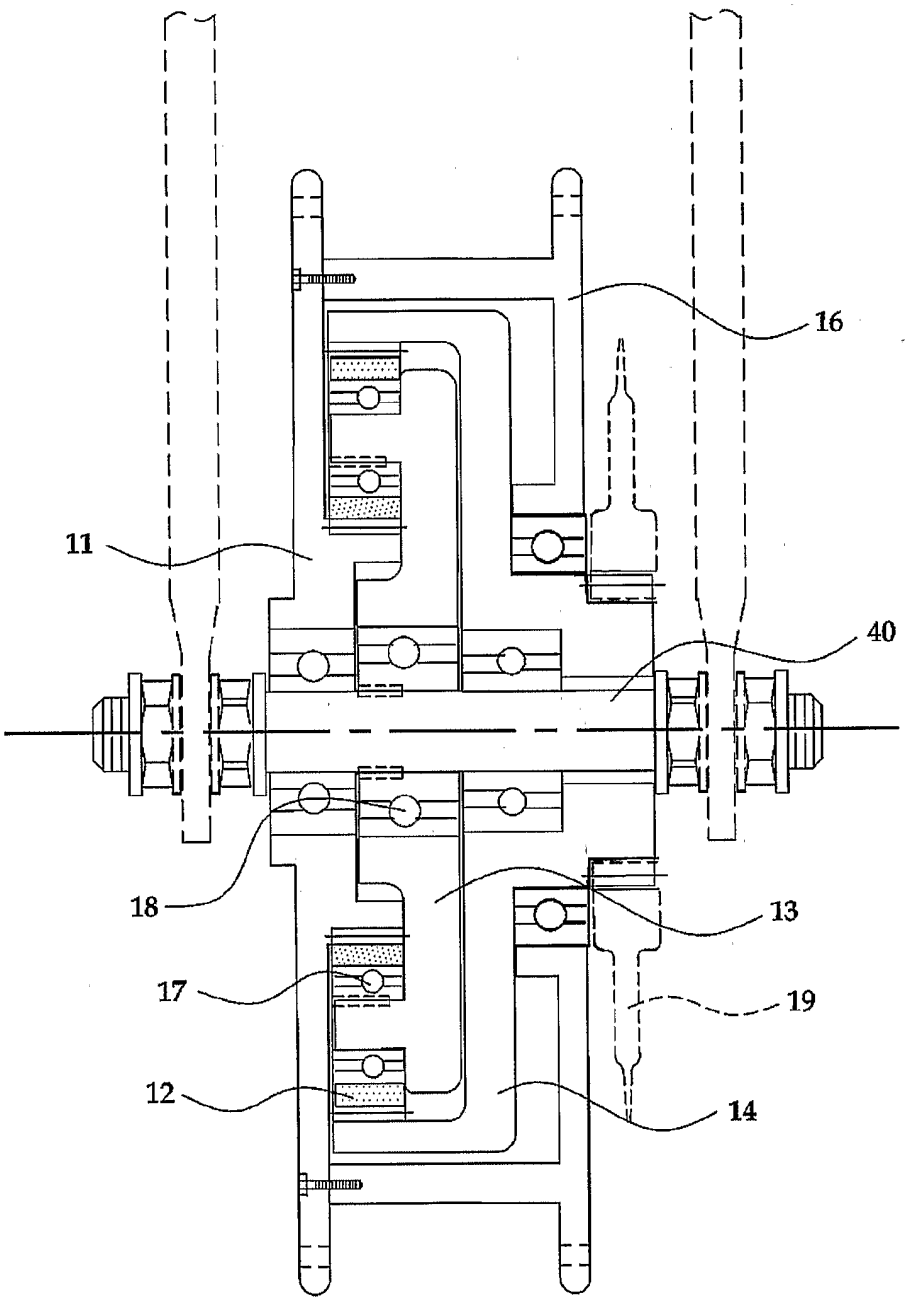


Fig. 19

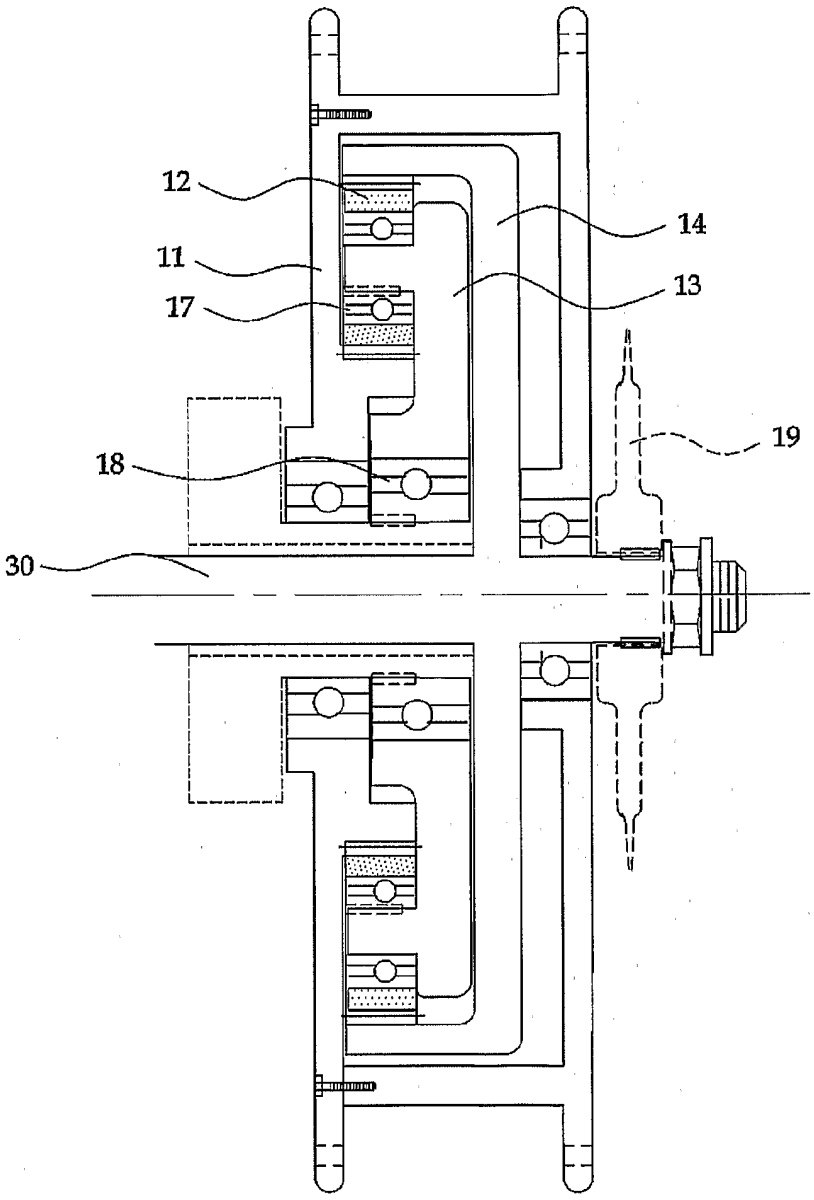


Fig. 20

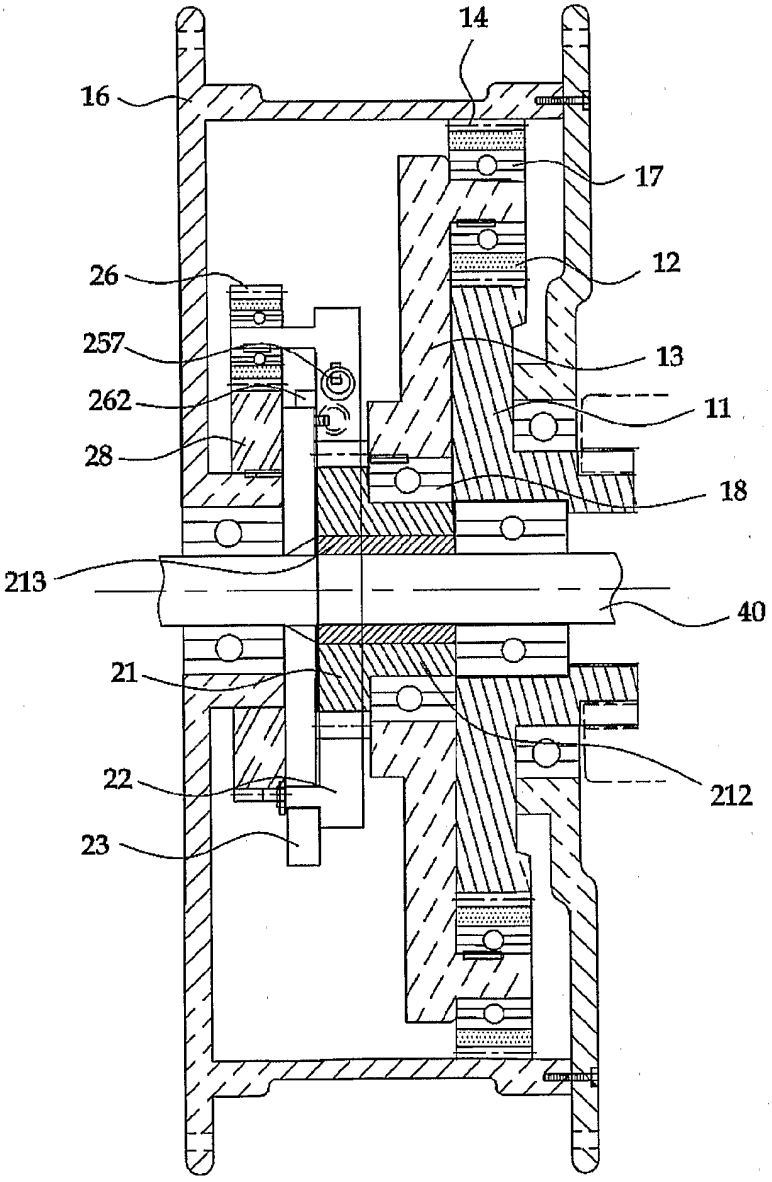


Fig. 21

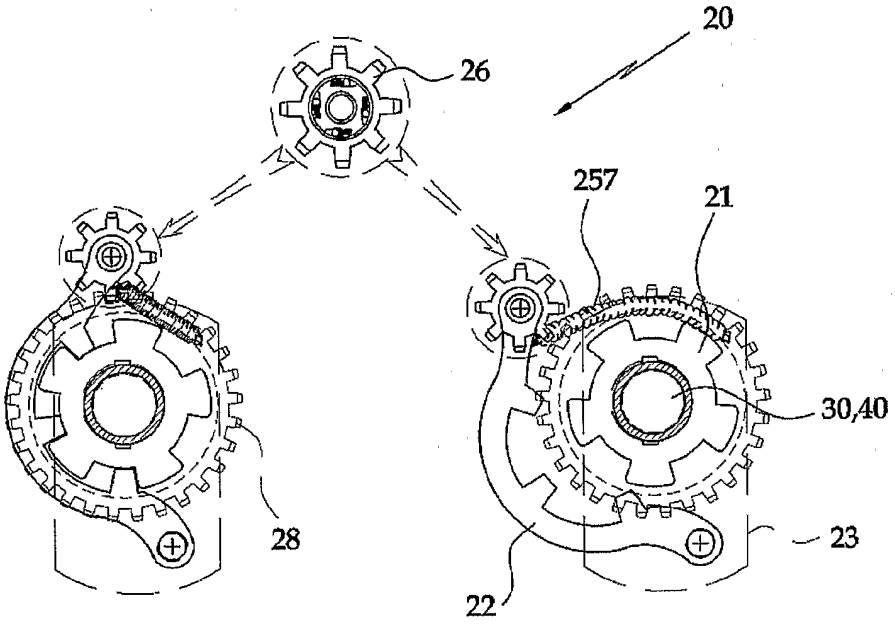


Fig. 22

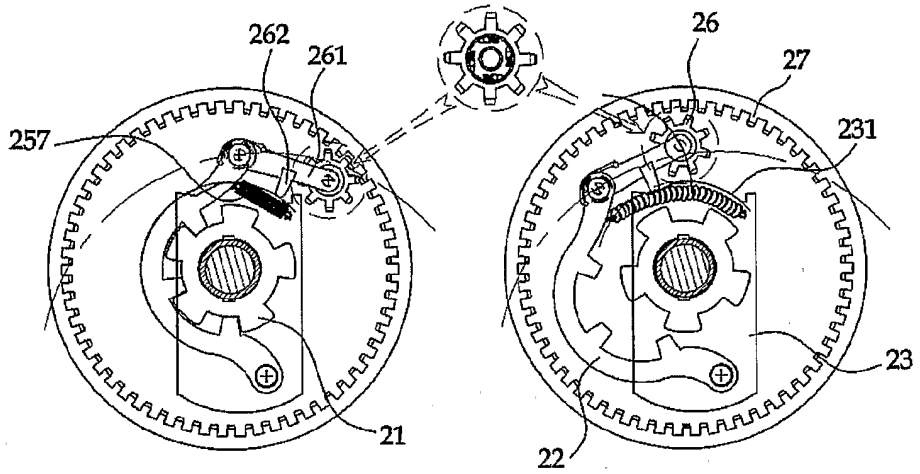


Fig. 23

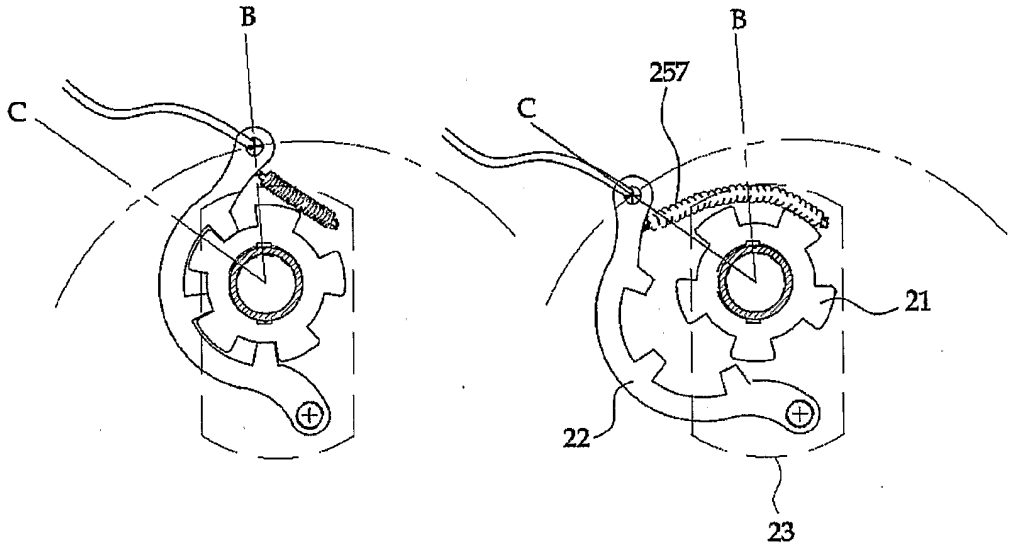


Fig. 24

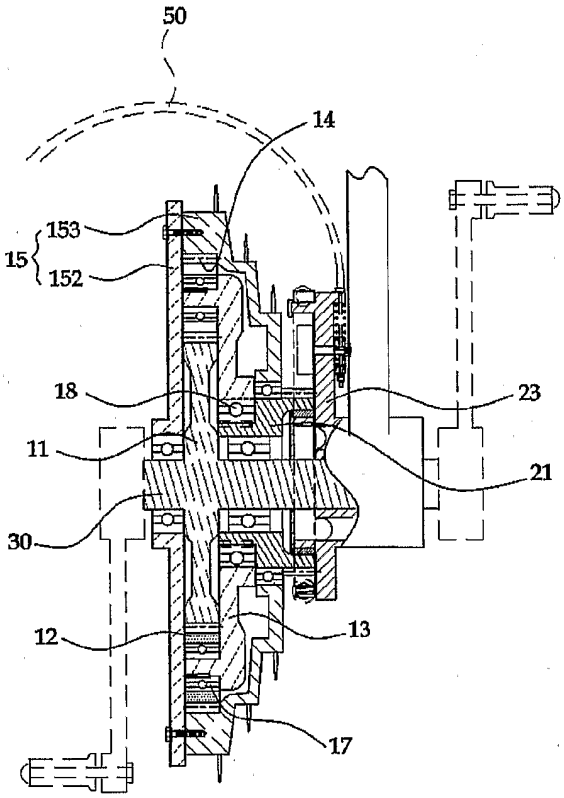


Fig. 25

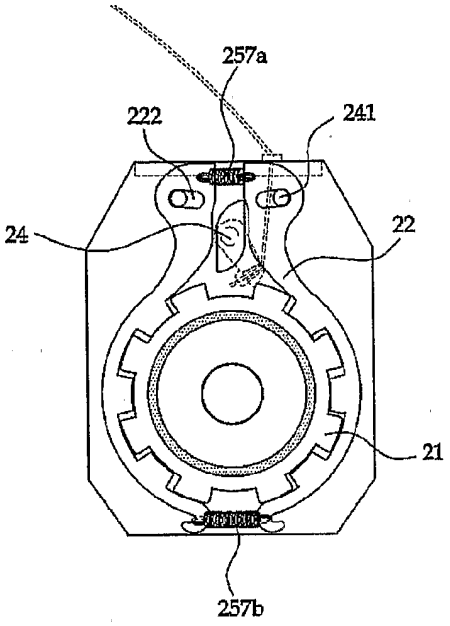
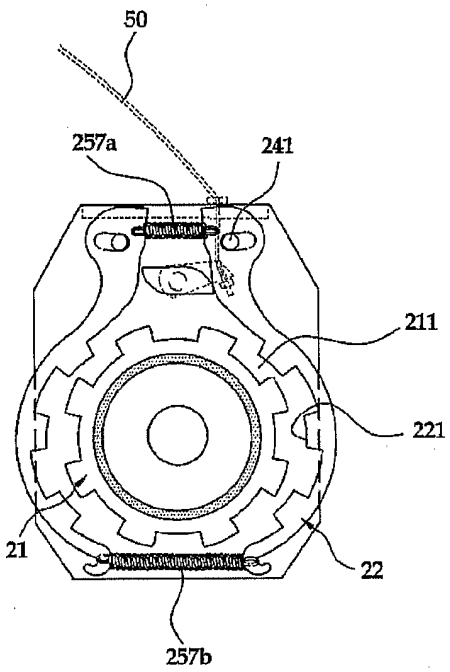


Fig. 26



[Fig. 27]

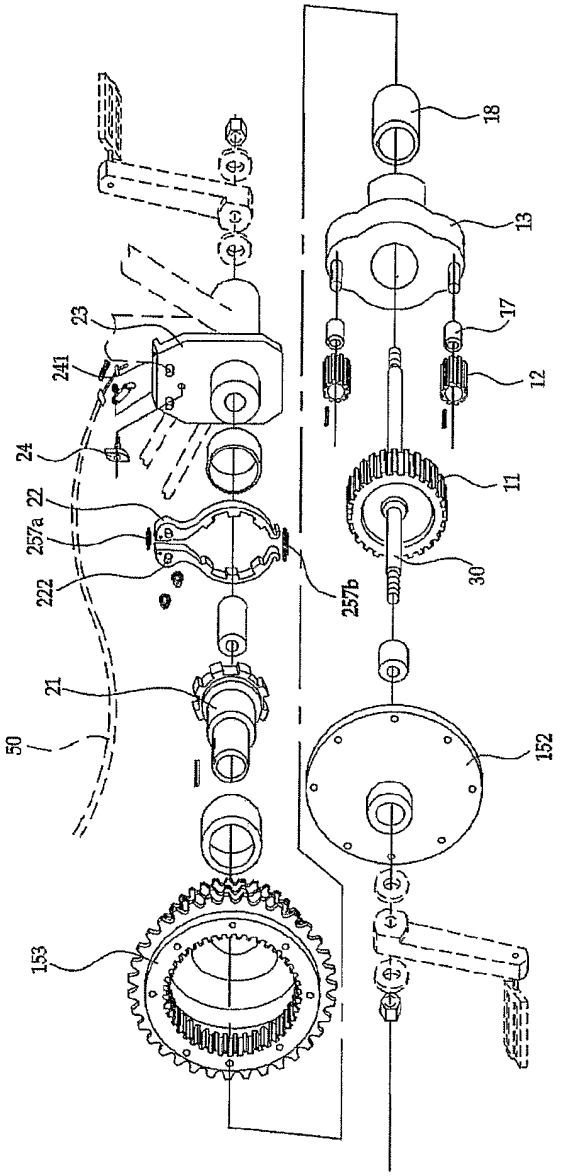
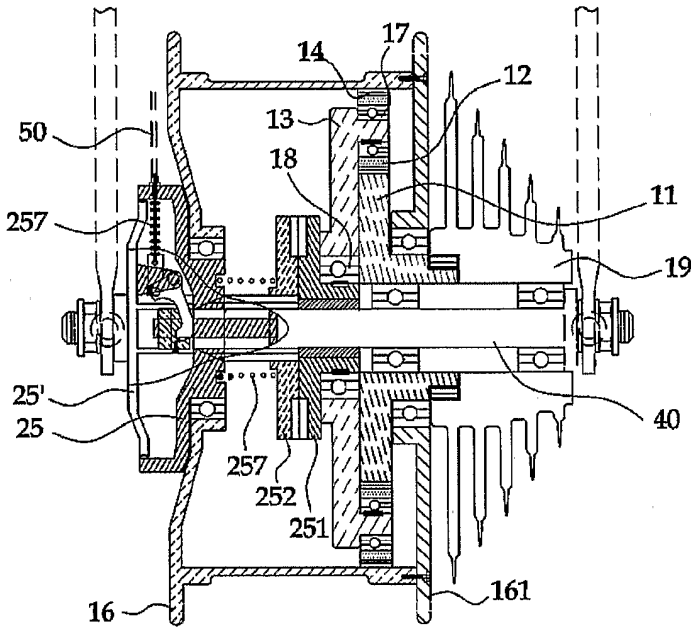


Fig. 28



[Fig. 29]

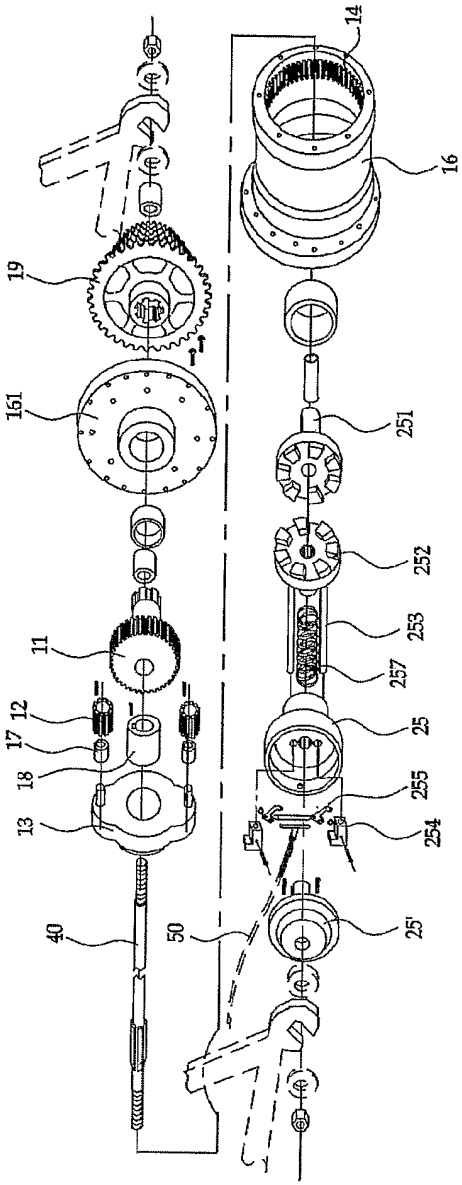


Fig. 30

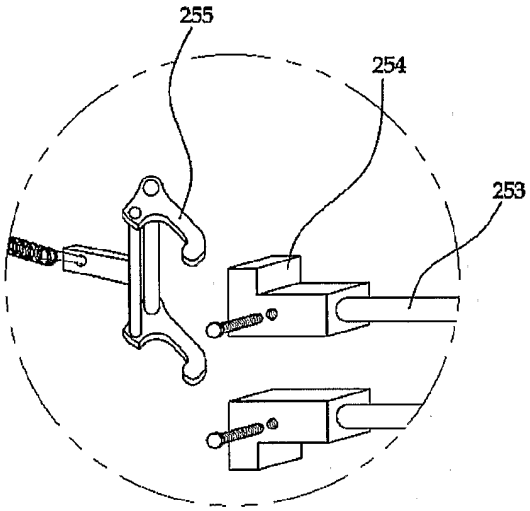


Fig. 31

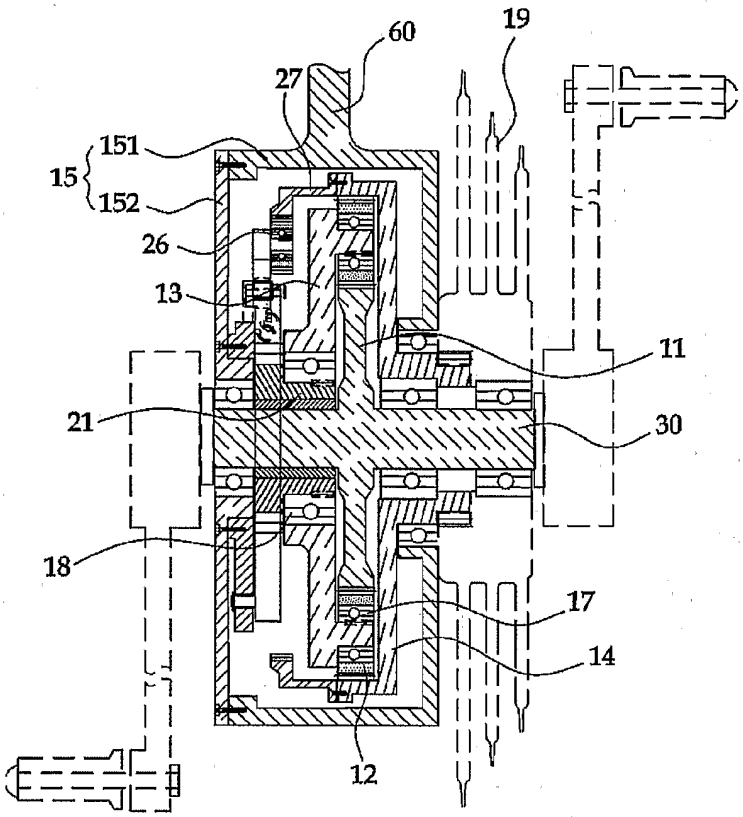
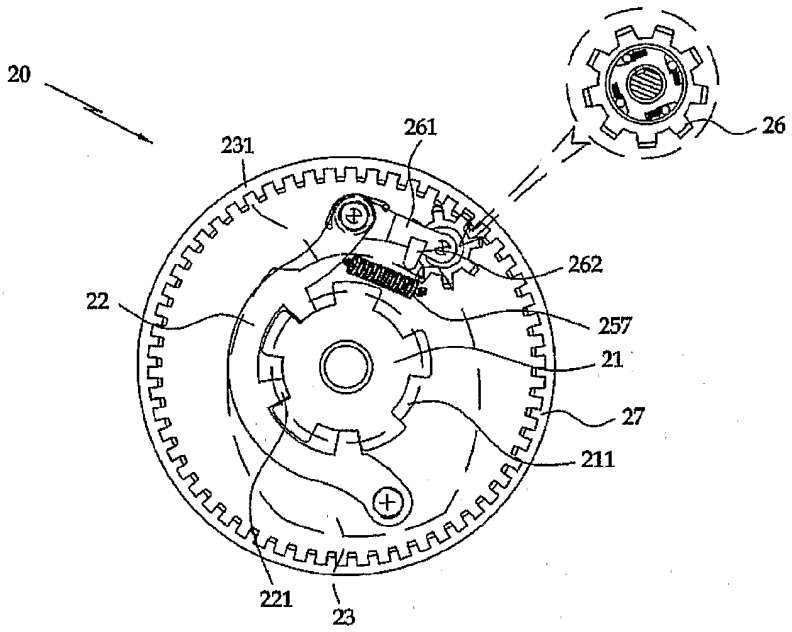


Fig. 32



[Fig. 33]

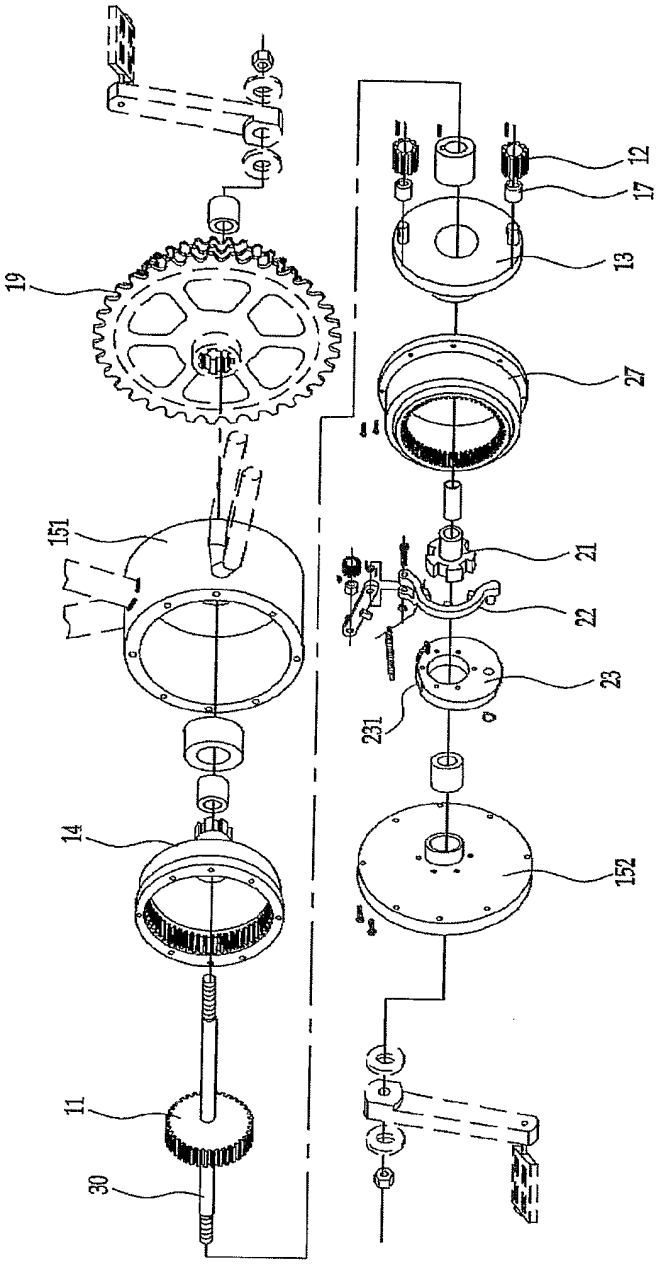


Fig. 34

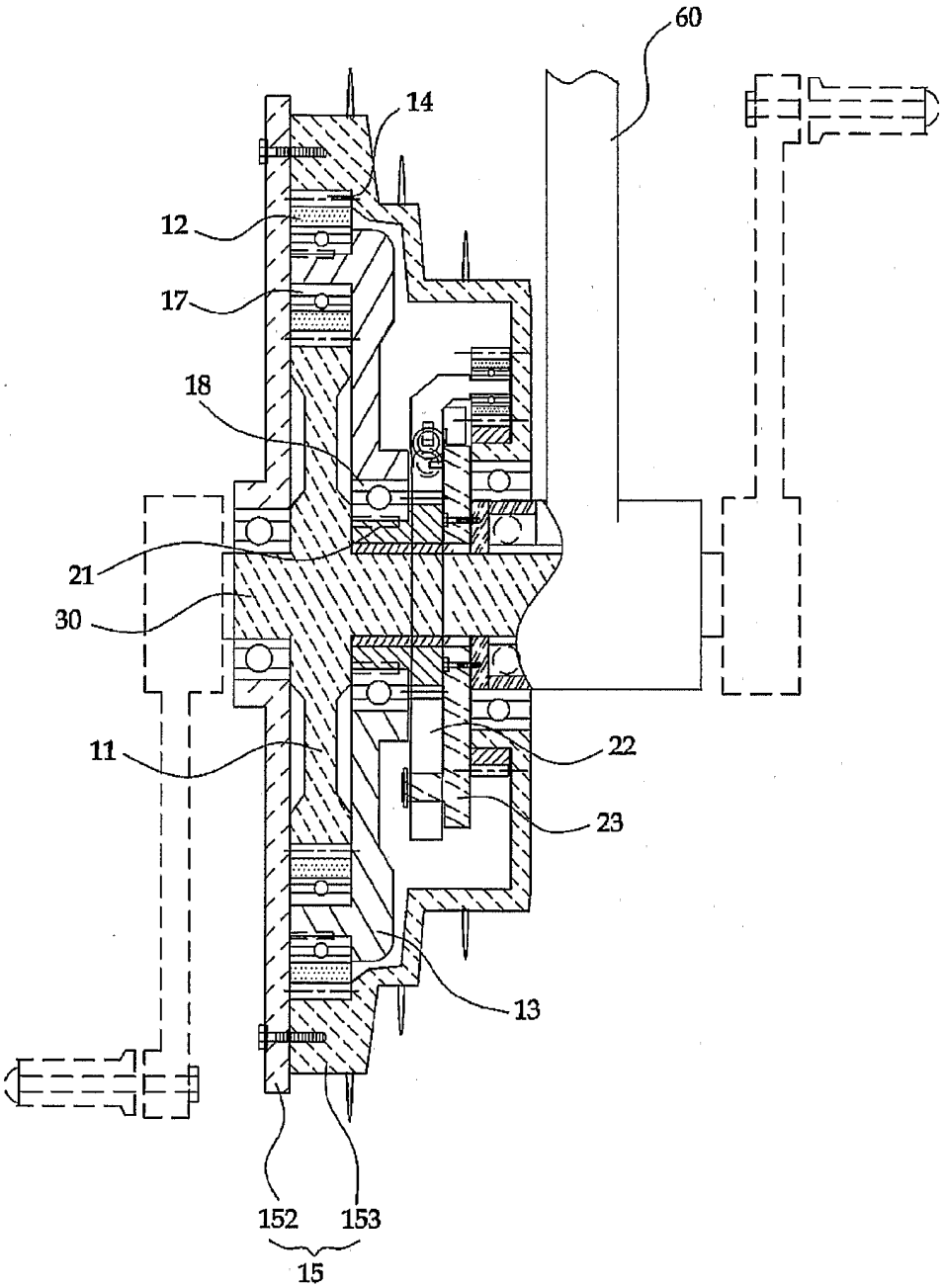
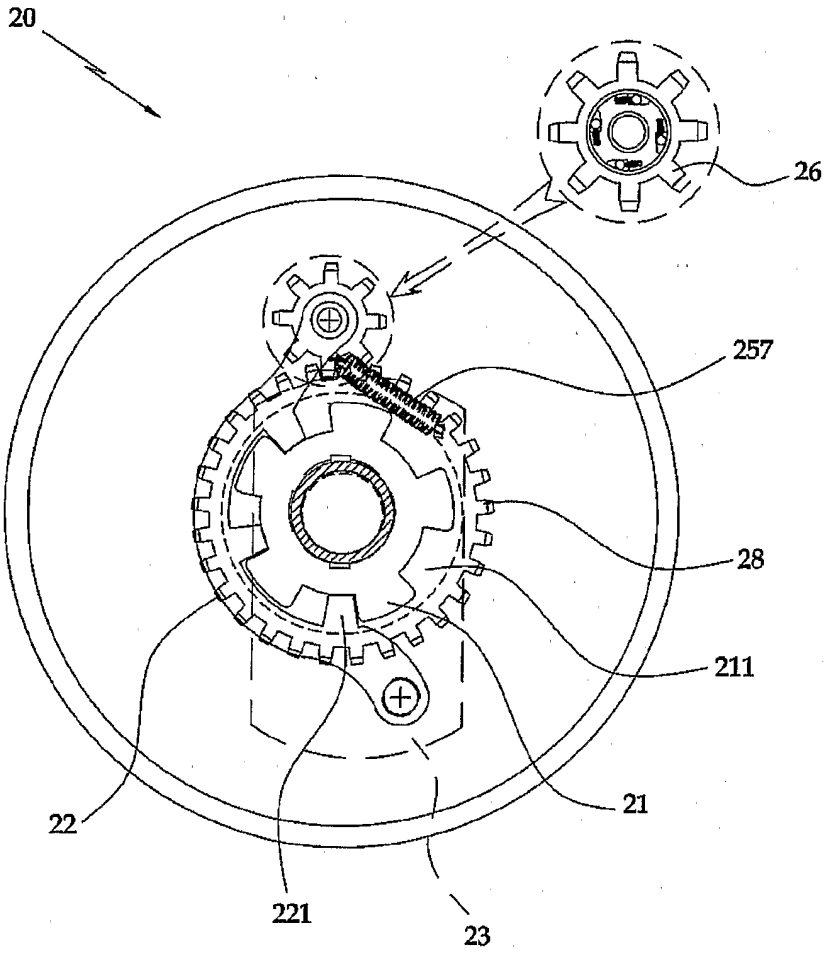
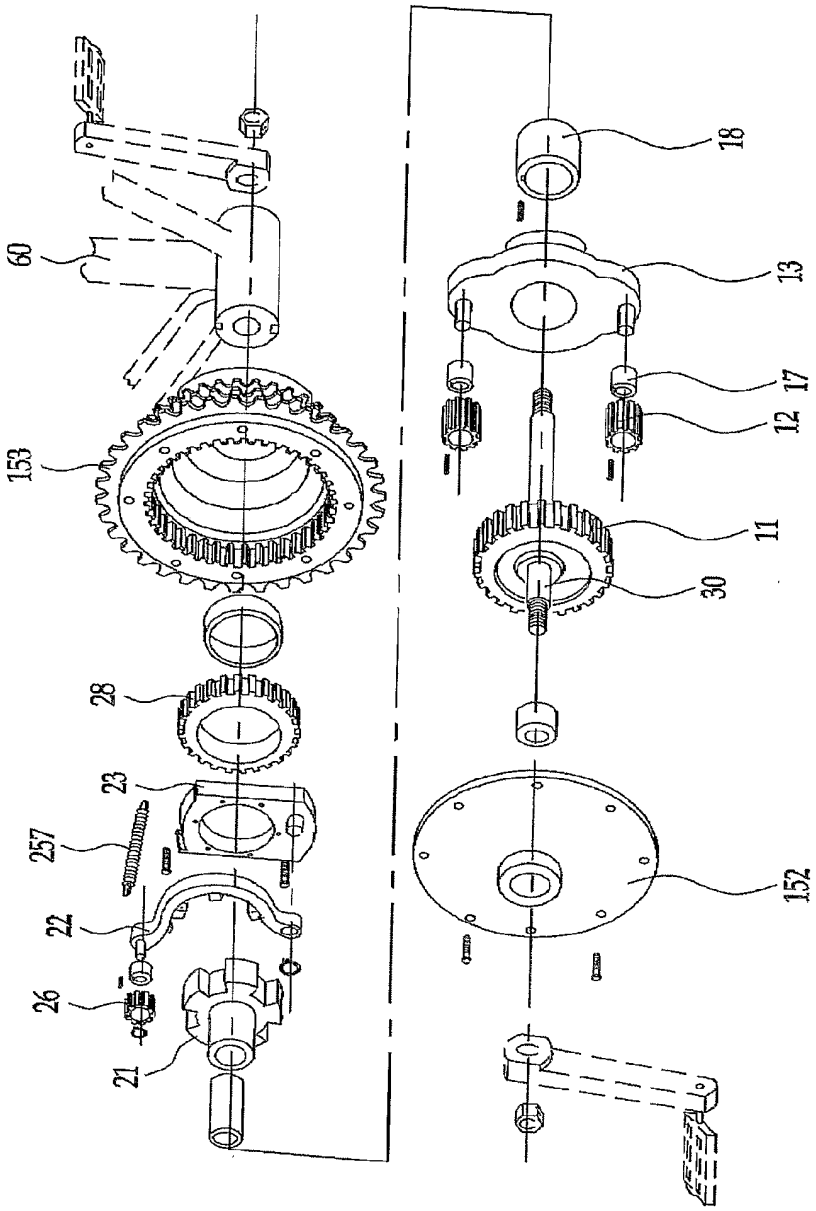


Fig. 35



[Fig. 36]



PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
SB05-09		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/KR2005/003090	**16 SEPTEMBER 2005 (16.09.2005)**	20 SEPTEMBER 2004 (20.09.2004)

Applicant

CHOI, Hong-Gon

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
      ☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
   b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 2
      ☐ as suggested by the applicant.
      ☒ because the applicant failed to suggest a figure.
      ☐ because this figure better characterizes the invention.
   b. ☐ none of the figure is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2005/003090

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 B62M 11/14

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 B62M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
kR, JP : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
KIPN NPS system : "gear', "direction", "sun", "planerary"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,127,883 A (WEN) 7 JULY 1992 (See whole document)	1-18
A	US 6,383,108 B1 (YOO) 7 MAY 2002 (See whole document)	1-18
A	US 6,048,287 A (ROHLOFF) 11 APRIL 2000 (See whole document)	1-18

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 DECEMBER 2005 (22.12.2005)	**23 DECEMBER 2005 (23.12.2005)**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea	JANG, GI JEONG
Facsimile No. 82-42-472-7140	Telephone No. 82-42-481-8141

Form PCT/ISA/210 (second sheet) (April 2005)