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(54) **FAST MECHANISM APPARATUS FOR ON-LOAD TAP CHANGER**

(57) A quick-acting mechanism device (1) for an on-load tap changer, comprising a support mechanism (20), an energy storage mechanism (30), a driving mechanism (40), and a switching mechanism (50). The support mechanism (20) is enclosed to form an accommodation cavity. The energy storage mechanism (30) is accommodated in the accommodation cavity. The energy storage mechanism (30) can rotate relative to the support mechanism (20). The energy storage mechanism (30) is configured to store and release energy. The driving mechanism (40) is accommodated in the accommodation cavity. The driving mechanism (40) is disposed at an interval with the energy storage mechanism (30). The

driving mechanism (40) can rotate relative to the support mechanism (20). The driving mechanism (40) is configured, in cooperation with the energy storage mechanism (30), to drive the switching mechanism (50) to rotate. The switching mechanism (50) is accommodated in the accommodation cavity. The switching mechanism (50) can rotate relative to the support mechanism (20). The switching mechanism (50) is configured, in cooperation with the driving mechanism (40) and the energy storage mechanism (30), to switch an on-load tap changer. By providing the energy storage mechanism (30), the driving mechanism (40), and the switching mechanism (50), transformation of motion is reduced in a process of mo-

tion transmission, thereby improving transmission efficiency.

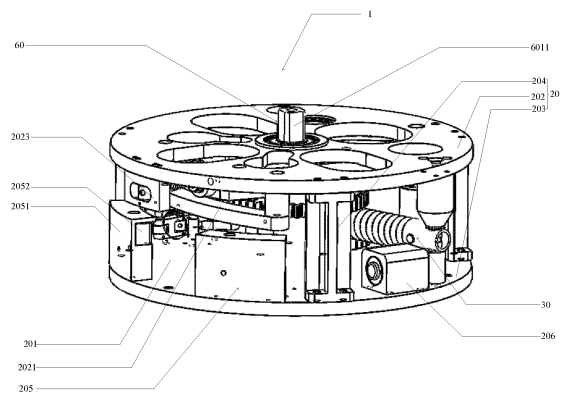


FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to the technical field of on-load tap changers, and in particular to a quick-acting mechanism device for an on-load tap changer.

BACKGROUND OF THE INVENTION

[0002] Currently, a switching action of an on-load tap changer mainly relies on the quick-acting mechanism device to complete. The quick-acting mechanism device is an actuating mechanism in which an on-load tap changer performs fast switching at a predetermined speed and timing. Generally, a spring is used for energy storage, so as to drive a rocker arm in the quick-acting mechanism device to rotate at a high speed, and then drive the on-load tap changer by a central shaft in the quick-acting mechanism device to complete one switching action.

[0003] However, the quick-acting mechanism device is usually a reciprocating gun-type quick-acting mechanism device. The gun-type quick-acting mechanism device has a complex structure and has a lot of friction components, and thus can easily cause a mechanical failure and increase manufacturing costs.

SUMMARY OF THE INVENTION

Technical problem

[0004] Regarding shortcomings of the prior art, an objective of the present invention is to provide a quick-acting mechanism device for an on-load tap changer, which has an advantage of reducing mechanical failures while reducing manufacturing costs.

Technical solutions

[0005] The foregoing objective of the present invention is implemented according to the following technical solutions. A quick-acting mechanism device for an on-load tap changer is provided, including a support mechanism, an energy storage mechanism, a driving mechanism, and a switching mechanism. The support mechanism is enclosed to form an accommodation cavity. The energy storage mechanism is accommodated in the accommodation cavity. The energy storage mechanism is connected to the support mechanism by a rotating-shaft mechanism. The energy storage mechanism can rotate relative to the support mechanism. The energy storage mechanism is configured to store and release energy. The driving mechanism is accommodated in the accommodation cavity. The driving mechanism is disposed at an interval with the energy storage mechanism. The driving mechanism is connected to the support mechanism by the rotating-shaft mechanism. The driving mechanism can rotate relative to the support mechanism. The driving

mechanism is configured, in cooperation with the energy storage mechanism, to drive the switching mechanism to rotate. The switching mechanism is accommodated in the accommodation cavity. One end of the switching mechanism is connected to the driving mechanism by the rotating-shaft mechanism. The switching mechanism can rotate relative to the support mechanism. The switching mechanism is configured, in cooperation with the driving mechanism and the energy storage mechanism, to switch an on-load tap changer.

[0006] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The support assembly includes a first support plate and a second support plate. The first support plate is disposed at an interval with the second support plate. At least one support column is disposed between the first support plate and the second support plate. A top end of the support column is detachably connected to the first support plate. A bottom end of the support column is detachably connected to the second support plate. The accommodation cavity is enclosed by the first support plate, the second support plate, and the support column. A retaining assembly is disposed on the second support plate. The retaining assembly is configured to prevent the switching mechanism from rotating.

[0007] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The retaining assembly includes two locking units and two stop blocks. One end of each of the two stop blocks is connected to the second support plate. The two stop blocks are disposed at an interval along an edge of the second support plate. One end of each of the two locking units is connected to the second support plate. The two locking units are located between the two stop blocks. The two locking units are disposed at an interval. Each locking unit is at a preset distance from an adjacent stop block.

[0008] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The locking unit includes a fixed block, a locking block, and a first elastic member. One end of the fixed block is connected to one side that is of the second support plate and that faces the first support plate. One side that is of the fixed block and that faces the rotating-shaft mechanism is provided with a through slot matching the locking block. The through slot extends along a first direction of the fixed block. The locking block is inserted in the through slot. The locking block is connected to the fixed block by a rotating shaft. The locking block can rotate relative to the fixed block. The first elastic member is inserted in the through slot. The first elastic member extends along a second direction of the fixed block. One end of the first elastic member is connected to an inner wall of the through slot. The other end of the first elastic member is connected to one side that is of the locking block and that faces away from the rotating-shaft mechanism. The locking block is configured to prevent the switching mechanism from rotating.

[0009] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The rotating-shaft mechanism includes a rotating-shaft assembly, a first rotating shaft, and a second rotating shaft disposed corresponding to the first rotating shaft. Both the rotating-shaft assembly and the second rotating shaft extend along a central-axis direction of the first rotating shaft. The rotating-shaft assembly is disposed at an interval with the first rotating shaft. The rotating-shaft assembly is disposed to pass through the support mechanism. A top end of the first rotating shaft is inserted on the first support plate. A bottom end of the first rotating shaft is accommodated in the accommodation cavity. A bottom end of the second rotating shaft is inserted on the second support plate. A top end of the second rotating shaft is accommodated in the accommodation cavity. The bottom end of the first rotating shaft is at a preset distance from the top end of the second rotating shaft.

[0010] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The energy storage mechanism includes a drive assembly, a first driving gear, a first driven gear meshing with the first driving gear, and an energy storage assembly. Both the drive assembly and the first driving gear are sleeved on the rotating-shaft assembly. The first driven gear is sleeved on the first rotating shaft. The first driving gear meshes with the first driven gear. One end of the energy storage assembly is connected to the first driven gear. The other end of the energy storage assembly is connected to the support mechanism. The drive assembly is configured to drive the first driving gear to rotate. The first driving gear drives the first driven gear to rotate. The first driven gear drives the energy storage assembly to rotate. The energy storage assembly is configured to achieve energy storage in cooperation with the first driven gear.

[0011] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The drive assembly includes a driving cam, a swing member, and a steering pin matching the swing member. The driving cam is sleeved on the rotating-shaft assembly. A protruding end of the driving cam abuts against the swing member. One end of the swing member is connected to the support assembly by a rotating rod. The swing member can rotate around the rotating rod. One end of the steering pin is connected to the first driving gear. An outer peripheral wall of the steering pin is in contact with the swing member. The driving cam is configured to drive the swing member to rotate. The steering pin is configured, in cooperation with the swing member, to drive the first driving gear to rotate.

[0012] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The energy storage assembly includes a first connector, an energy storage unit, and a second connector. The first connector is connected to one side that is of the first driven gear and that faces the second rotating shaft. The

second connector is located in the accommodation cavity. A top end of the second connector is connected to the first support plate. A bottom end of the second connector is connected to the second support plate. One end of the energy storage unit is articulated to the first connector. The other end of the energy storage unit is rotatably connected to the second connector. The energy storage unit can rotate relative to the second connector. The energy storage unit is configured to perform energy storage.

[0013] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The driving mechanism includes a second driving gear, a second driven gear meshing with the second driving gear, and a control member. The second driving gear is sleeved on the second rotating shaft. The second driving gear can rotate relative to the second rotating shaft. The control member is disposed on one side that is of the second driving gear and that faces a first gear. The control member is configured, in cooperation with the energy storage assembly, to drive the second driving gear to rotate. The second driven gear is sleeved on the rotating-shaft assembly. The second driving gear meshes with the second driven gear.

[0014] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The switching mechanism includes a rotation disk, a stop member, and an unlocking assembly. One end of the rotation disk is sleeved on the rotating-shaft assembly. The stop member is disposed at one end that is of the rotation disk and that is away from the rotating-shaft assembly. The stop member is configured, in cooperation with the support mechanism, to prevent the rotation disk from rotating. The unlocking assembly is disposed the rotation disk. The unlocking assembly is configured, in cooperation with the energy storage mechanism, to release the stop member, so as to enable the rotation disk to rotate.

[0015] Preferably, the present invention provides a quick-acting mechanism device for an on-load tap changer. The unlocking assembly includes a first unlocking unit, a second unlocking unit, and a second elastic member. Both the first unlocking unit and the second unlocking unit are connected to the rotation disk by a rotary shaft. Both the first unlocking unit and the second unlocking unit can rotate around the rotary shaft. The first unlocking unit is disposed to intersect with the second unlocking unit. One end of the second elastic member is connected to the first unlocking unit. The other end of the elastic member is connected to the second unlocking unit. The stop member is located between the first unlocking unit and the second unlocking unit.

Beneficial effects

[0016] In view of the above, beneficial technical effects of the present invention are as follows. This application provides a quick-acting mechanism device for an on-load

tap changer, including the support mechanism, the energy storage mechanism, the driving mechanism, and the switching mechanism. The support mechanism is enclosed to form the accommodation cavity. The energy storage mechanism is accommodated in the accommodation cavity. The energy storage mechanism is connected to the support mechanism by the rotating-shaft mechanism. The energy storage mechanism can rotate relative to the support mechanism. The energy storage mechanism is configured to store and release energy. The driving mechanism is accommodated in the accommodation cavity. The driving mechanism is disposed at an interval with the energy storage mechanism. The driving mechanism is connected to the support mechanism by the rotating-shaft mechanism. The driving mechanism can rotate relative to the support mechanism. The driving mechanism is configured, in cooperation with the energy storage mechanism, to drive the switching mechanism to rotate. The switching mechanism is accommodated in the accommodation cavity. One end of the switching mechanism is connected to the driving mechanism by the rotating-shaft mechanism. The switching mechanism can rotate relative to the support mechanism. The switching mechanism is configured, in cooperation with the driving mechanism and the energy storage mechanism, to switch an on-load tap changer. By providing the energy storage mechanism, the driving mechanism, and the switching mechanism are disposed, transformation of motion is reduced in a process of motion transmission, thereby improving transmission efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is an overall schematic structural diagram of a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention;

FIG. 2 is a schematic structural diagram 1 of a second support plate, a first driving gear, a first driven gear, a driving mechanism, and a switching mechanism in a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention;

FIG. 3 is a schematic structural diagram 2 of a second support plate, a first driving gear, a first driven gear, a driving mechanism, and a switching mechanism in a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention;

FIG. 4 is a schematic structural diagram of a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention, which is in an initial state;

FIG. 5 is a schematic structural diagram of a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present inven-

tion, which is in a state of completing a first energy storage;

FIG. 6 is a schematic structural diagram of a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention, which is in a state of completing a first energy release;

FIG. 7 is a schematic structural diagram of a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention, which is in a state of completing a second energy storage;

FIG. 8 is a schematic structural diagram of a locking unit in a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention; and

FIG. 9 is a schematic structural diagram of a second driving gear and a control member in a quick-acting mechanism device for an on-load tap changer according to an embodiment of the present invention.

[0018] List of reference numerals in the drawings:

1 Quick-Acting Mechanism Device
 20 Support Mechanism
 201 Accommodation Cavity
 202 First Support Plate
 2021 Slideway
 2022 Third Elastic Member
 2023 Connection Frame
 203 Second Support Plate
 204 Support Column
 205 Locking Unit
 2051 Fixed Block
 2052 Locking Block
 2053 First Elastic Member
 2054. Rotating Shaft
 206 Stop Block
 30 Energy Storage Mechanism
 301 Driving Cam
 302 Swing Member
 3021 Contact Portion
 3022 Connection Portion
 3023 Drive Port
 3024 Shoulder
 3025 Projection
 303 Steering pin
 304 First Driving Gear
 3041 First Lever
 3042 Second Lever
 305 First Driven Gear
 306 Energy Storage Assembly
 3061 First Connector
 3062 Second Connector
 3063 Support Rod
 3064 Base
 3065 Energy Storage Unit
 3066 Retainer Sleeve

3067 Slide Bar
 3068 Fourth Elastic Member
 3069 Sliding Sleeve
 40 Driving Mechanism
 401 Second Driving Gear
 402 Second Driven Gear
 403 Control Member
 50 Switching Mechanism
 501 Rotation Disk
 5011 Groove
 502 Stop Member
 5021 Fixed Base
 5022 Stopper
 503 Unlocking Assembly
 5031 First Unlocking Unit
 5032 Second Unlocking Unit
 5033 Second Elastic Member
 5034 Unlocking Block
 5035 Roller
 60 Rotating-Shaft Mechanism
 601 Rotating-Shaft Assembly
 6011 Third Rotating Shaft
 602 First Rotating Shaft

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] The present invention is further described in detail below with reference to the accompanying drawings.

[0020] FIG. 1 to FIG. 7 show a quick-acting mechanism device 1 for an on-load tap changer disclosed in the present invention, including a support mechanism 20, an energy storage mechanism 30, a driving mechanism 40, and a switching mechanism 50. The support mechanism 20 is enclosed to form an accommodation cavity 201. The energy storage mechanism 30 is accommodated in the accommodation cavity 201. The energy storage mechanism 30 is connected to the support mechanism 20 by a rotating-shaft mechanism 60. The energy storage mechanism 30 can rotate relative to the support mechanism 20. The energy storage mechanism 30 is configured to store and release energy. By providing the energy storage mechanism 30, during use, the energy storage mechanism 30 releases energy to implement switching of an on-load tap changer for one time.

[0021] For example, the support mechanism 20 includes a housing and a cover plate. The housing is enclosed to form the accommodation chamber 201 with an enclosed bottom end. The cover plate is covered on the top end of the housing, and is detachably connected to the housing. During use, the energy storage mechanism 30, the driving mechanism 40, and the switching mechanism 50 are all accommodated in the accommodation cavity 201.

[0022] In this embodiment, the support assembly includes a first support plate 202 and a second support plate 203. The first support plate 202 is disposed at an interval with the second support plate 203. At least one support column 204 is disposed between the first support

plate 202 and the second support plate 203. A top end of the support column 204 is detachably connected to the first support plate 202. A bottom end of the support column 204 is detachably connected to the second support plate 203. The accommodation cavity 201 is enclosed by the first support plate 202, the second support plate 203, and the support column 204. On one hand, the support column 204 is disposed, and the support column 204 is configured to support and fix the first support plate 202. On the other hand, both the first support plate 202 and the second support plate 203 are disposed to be detachably connected to the support column 204. In this way, maintenance of the energy storage mechanism 30, the driving mechanism 40, and the switching mechanism 50 is facilitated.

[0023] Specifically, taking an orientation shown in FIG. 1 as an example, the first support plate 202 is located at an upper portion, the second support plate 203 is located at a lower portion, and the first support plate 202 is disposed to be parallel to the second support plate 203. For example, the first support plate 202 can be circular. Certainly, the first support plate 202 can also be in a shape of a rectangle, an ellipse, or another polygon.

[0024] For the convenience of illustration, description is made below by an example in which the first support plate 202 is circular.

[0025] A shape of the second support plate 203 may be the same as or different from that of the first support plate 202. In this embodiment, the shape of the second support plate 203 is substantially the same as that of the first support plate 202. The shape of the second support plate 203 is not described in detail herein.

[0026] A central axis of the first support plate 202 is parallel to that of the second support plate 203. In some feasible implementations, the central axis of the first support plate 202 is disposed to be collinear with that of the second support plate 203.

[0027] In some embodiments, a plurality of support columns 204 can be disposed between the first support plate 202 and the second support plate 203. The plurality of support columns 204 are disposed on an edge of the first support plate 202 at intervals along a circumferential direction of the first support plate 202. One end of each of the plurality of support columns 204 is connected to a bottom surface of the first support plate 202. A bottom end of each of the plurality of support columns 204 is connected to a top surface of the second support plate 203. By providing a plurality of support columns 204, the connection firmness between the first support plate 202 and the second support plate 203 is improved.

[0028] Three support columns 204, four support columns 204, five support columns 204, or six support columns 204 may be provided between the first support plate 202 and the second support plate 203.

[0029] Specifically, taking a plane parallel to the central axis of the first support plate 202 as a cross section, a cross section of the support column 204 may be I-shaped, or the cross section of the support column 204 may also

be rectangular or be T-shaped.

[0030] The support column 204 may be connected to the first support plate 202 through bolting. The support column 204 may also be connected to the first support plate 202 through plugging. The support column 204 may also be connected to the first support plate 202 through clamping. This is not limited in this embodiment.

[0031] A connection manner between the support column 204 and the second support plate 203 is substantially the same as that between the support column 204 and the first support plate 202. Herein, the connection manner between the support column 204 and the second support plate 203 is not described in detail.

[0032] A retaining assembly configured to prevent the switching mechanism 50 from rotating is disposed on the second support plate 203. The retaining assembly is provided to stop the rotation of the switching mechanism 50.

[0033] In this embodiment, the retaining assembly includes two locking units 205 and two stop blocks 206. One end of each of the two stop blocks 206 is connected to the second support plate 203. The two stop blocks 206 are disposed at an interval along an edge of the second support plate 203. One end of each of the two locking units 205 is connected to the second support plate 203. The two locking units 205 are located between the two stop blocks 206. The two locking units 205 are disposed at an interval. Each locking unit 205 is at a preset distance from an adjacent stop block 206. On one hand, the stop block 206 and the locking unit 205 are provided to prevent the switching mechanism 50 from rotating. On the other hand, the preset distance is set between the locking unit 205 and the stop block 206, which facilitates simultaneously stopping of both sides of the switching mechanism 50 to avoid movement of the switching mechanism 50.

[0034] Referring to FIG. 8, in this embodiment, the locking unit 205 includes a fixed block 2051, a locking block 2052, and a first elastic member 2053. One end of the fixed block 2051 is connected to one side that is of the second support plate 203 and that faces the first support plate 202. One side of the fixed block 2051 facing the rotating-shaft mechanism 60 is provided with a through slot matching the locking block 2052. The through slot extends along a first direction of the fixed block 2051. The locking block 2052 is inserted in the through slot. The locking block 2052 is connected to the fixed block 2051 by a rotating shaft 2054. The locking block 2052 can rotate relative to the fixed block 2051. The locking block 2052 rotates by using a center line of the rotating shaft 2054 as an axis. The first elastic member 2053 is inserted in the through slot. The first elastic member 2053 extends along a second direction of the fixed block. One end of the first elastic member 2053 is connected to an inner wall of the through slot. The other end of the first elastic member 2053 is connected to one side that is of the locking block 2052 and that faces away from the rotating-shaft mechanism 60. The locking block 2052 is configured to prevent the switching mechanism 50 from rotating.

[0035] In an initial state, the first elastic member 2053 is in a natural extension state. One end that is of the locking block 2052 and that faces the stop block 206 protrudes out of the through slot. The protruding portion of the locking block 2052 extends outward along a length direction of the first elastic member 2053. The protruding portion of the locking block 2052 is configured to prevent the switching mechanism 50 from rotating. Taking an orientation shown in FIG. 8 as an example, the locking block 2052 is driven by an external force to rotate clockwise around the center line of the rotating shaft 2054. At the moment, the protruding portion of the locking block 2052 enters the through slot. The locking block 2052 compresses the first elastic member 2053, and the first elastic member 2053 provides resilience for the locking block 2052. After the switching mechanism 50 rotates and passes through the locking unit 205, the locking block 2052 rotates counterclockwise around the rotating shaft 2054 under the resilience of the first elastic member 2053, and the first elastic member 2053 is restored to a natural extension state. At the moment, the protruding portion of the locking block 2052 protrudes out of the through slot, and the locking block 2052 stops rotating.

[0036] The end that is of the locking block 2052 and that faces the stop block 206 is disposed to protrude out of the through slot. In this way, the switching mechanism 50 passes through the two locking units 205 quickly. During a process in which the switching mechanism 50 is shifted from one locking unit 205 to the other locking unit 205, the switching mechanism 50 can automatically push a protruding portion of the other locking block 2052 into the through slot, so that the switching mechanism 50 is locked between the other locking block 2052 and the stop block 206.

[0037] For example, a cross section of the fixed block 2051 may be in a shape of an arc. Certainly, the cross section of the fixed block 2051 may also be rectangular. In a feasible implementation that the cross section of the fixed block 2051 is in a shape of an arc, a radian of the fixed block 2051 matches that of an outer edge of the second support plate 203. The through slot extends along a circumferential direction of the fixed block 2051, and the locking block 2052 matches the through slot. In this way, on one hand, fit between the fixed block 2051 and the second support plate 203 is improved, thereby preventing the fixed block 2051 from partially protruding out of the second support plate 203. At the same time, a motion trajectory of the switching mechanism 50 is matched with, so that the switching mechanism 50 is excessively stable. On the other hand, aesthetics of the quick-acting mechanism device 1 are improved.

[0038] It should be noted that, the first direction of the fixed block 2051 is a length direction of the fixed block 2051, and the second direction of the fixed block 2051 is a width direction of the fixed block 2051. In a feasible implementation that the cross section of the fixed block 2051 is in a shape of an arc, the first direction of the fixed block 2051 is the circumferential direction of the fixed

block 2051.

[0039] In the initial state, one end that is of the locking block 2052 and that is away from the first elastic member 2053 is accommodated in the through slot, a central axis of the rotating shaft 2054 is parallel to that of the second support plate 203, and the end that of the locking block 2052 away from the first elastic member 2053 is rotatably connected to the fixed block 2051 by the rotating shaft 2054.

[0040] For example, the first elastic member 2053 may be a spiral spring. Certainly, the first elastic member 2053 may also be an elastic sleeve or the like.

[0041] Further, in this embodiment, the stop block 206 is provided with a vibration absorber on a side facing the locking unit 205. During use, after the switching mechanism 50 partially passes through the locking unit 205, the vibration absorber provides a suction force for the switching mechanism 50. In this way, a rotational speed of the switching mechanism 50 is increased, and at the same time, the vibration absorber can make the switching mechanism 50 closely fit with the stop block 206.

[0042] In this embodiment, one side that is of the first support plate 202 and that faces the second support plate 203 is provided with a slideway 2021 for guiding and supporting the energy storage mechanism 30 and a third elastic member 2022. Two ends of the slideway 2021 are respectively connected to the first support plate 202 by a first fixed rod and a second fixed rod. One end of the first fixed rod is connected to a bottom end of the first support plate 202, and the other end of the first fixed rod is connected to a first end of the slideway 2021. One end of the second fixed rod is connected to the bottom end of the first support plate 202, and the other end of the second fixed rod is connected to a second end of the slideway 2021. Both a central axis of the first fixed rod and a central axis of the second fixed rod are parallel to the central axis of the first support plate 202. The slideway 2021 extends along a rotational trajectory of the energy storage mechanism 30. The slideway 2021 is parallel to the first support plate 202, and is disposed at an interval with the first support plate 202. In this way, the energy storage mechanism 30 is in contact with the slideway 2021.

[0043] One end of the third elastic member 2022 is connected to the first support plate 202 by a connection frame 2023, and the other end of the third elastic member 2022 is connected to the energy storage mechanism 30. For example, the connection frame 2023 may be in a shape of a cuboid. Certainly, the connection frame 2023 may also be I-shaped, T-shaped, Z-shaped, or U-shaped. In a feasible implementation that the connection frame 2023 is in a shape of a cuboid, one end of the connection frame 2023 is connected to the side that is of the first support plate 202 and that faces the second support plate 203. The connection frame 2023 is provided with a mounting hole. One end of the third elastic member 2022 is inserted in the mounting hole. The third elastic member 2022 is connected to the connection

frame 2023 by a bolt. The other end of the third elastic member 2022 is connected to the energy storage mechanism 30. By providing the third elastic member 2022, during use, the third elastic member 2022 provides resilience for the energy storage mechanism 30, thereby reducing a rotational speed of the energy storage mechanism 30.

[0044] For example, the third elastic member 2022 may be a spiral spring. Certainly, the third elastic member 2022 may also be an elastic sleeve or the like.

[0045] Further, in this embodiment, the rotating-shaft mechanism 60 includes a rotating-shaft assembly 601, a first rotating shaft 602, and a second rotating shaft disposed corresponding to the first rotating shaft 602. Both the rotating-shaft assembly 601 and the second rotating shaft extend along a central-axis direction of the first rotating shaft 602. The rotating-shaft assembly 601 is disposed at an interval with the first rotating shaft 602. The rotating-shaft assembly 601 is disposed to pass through the support mechanism 20. A top end of the first rotating shaft 602 is inserted on the first support plate 202. A bottom end of the first rotating shaft 602 is accommodated in the accommodation cavity 201. A bottom end of the second rotating shaft is inserted on the second support plate 203. A top end of the second rotating shaft is accommodated in the accommodation cavity 201. The bottom end of the first rotating shaft 602 is at a preset distance from the top end of the second rotating shaft. By setting preset distance, the energy storage mechanism 30 is thus facilitated to store energy; and meanwhile, it is convenient for the energy storage mechanism 30 to drive the driving mechanism 40 to rotate.

[0046] Specifically, an extension direction of the rotating-shaft assembly 601 is parallel to a central-axis direction of the first support plate 202 / the second support plate 203. Taking an orientation shown in FIG. 2 as an example, the first rotating shaft 602 is above the second rotating shaft. A central axis of the first rotating shaft 602 is parallel to that of the second rotating shaft. In some feasible implementations, the central axis of the first rotating shaft 602 is disposed to be collinear with that of the second rotating shaft, and the first rotating shaft 602 is at a preset distance from the second rotating shaft.

[0047] Further, in this embodiment, the rotating-shaft assembly 601 includes three rotating shafts, and the three rotating shafts are sequentially disposed along the central-axis direction of the first support plate 202. Central axes of the three rotating shafts are all parallel to the central axis of the first support plate 202. In some feasible implementations, the central axes of the three rotating shafts are all disposed to be collinear with the central axis of the first support plate 202.

[0048] Referring to FIG. 2 again, the three rotating shafts include a third rotating shaft 6011, a fourth rotating shaft, and a fifth rotating shaft. The fourth rotating shaft is located between the third rotating shaft 6011 and the fifth rotating shaft. A bottom end of the third rotating shaft 6011 passes through the first support plate 202 and is

inserted in the accommodation cavity 201. A top end of the fifth rotating shaft passes through the second support plate 203 and is inserted in the accommodation cavity 201. The third rotating shaft 6011 is connected to the fourth rotating shaft by a first coupling. The fourth rotating shaft is connected to the fifth rotating shaft by a second coupling. It should be noted that the third rotating shaft 6011, the fourth rotating shaft, and the fifth rotating shaft can rotate without interfering with each other.

[0049] The energy storage mechanism 30 is sleeved on the third rotating shaft 6011 and the fourth rotating shaft. Both the driving mechanism 40 and the switching mechanism 50 are sleeved on the fifth rotating shaft. During use, the driving mechanism 40 rotates to drive the switching mechanism 50 to rotate.

[0050] For example, the rotating-shaft assembly 601 includes a main shaft and three connection bearings sleeved on the main shaft. The three connection bearings are sequentially disposed along a central-axis direction of the main shaft, and are all located in the accommodation cavity 201. During use, a central axis of the main shaft is parallel to that of the first support plate 202. In some feasible implementations, the central axis of the main shaft is disposed to be collinear with that of the first support plate 202. One end of the main shaft sequentially passes through the first support plate 202 and the second support plate 203. The three connection bearings include a first connection bearing, a second connection bearing, and a third connection bearing. Apart of the energy storage mechanism 30 is rotatably connected to the main shaft by the first connection bearing. The driving mechanism 40 is rotatably connected to the main shaft by the third connection bearing. The switching mechanism 50 is rotatably connected to the main shaft by the second connection bearing. A bottom end of the switching mechanism 50 is connected to the driving mechanism 40, so that the switching mechanism 50 is driven to rotate by the driving mechanism 40.

[0051] Referring to FIG. 2 to FIG. 7 again, in this embodiment, the energy storage mechanism 30 includes a drive assembly, a first driving gear 304, a first driven gear 305 meshing with the first driving gear 304, and an energy storage assembly 306. Both the drive assembly and the first driving gear 304 are sleeved on the rotating-shaft assembly 601. The first driven gear 305 is sleeved on the first rotating shaft 602. The first driving gear 304 meshes with the first driven gear 305. One end of the energy storage assembly 306 is connected to the first driven gear 305. The other end of the energy storage assembly 306 is connected to the support mechanism 20. The drive assembly is configured to drive the first driving gear 304 to rotate. The first driving gear 304 drives the first driven gear 305 to rotate. The first driven gear 305 drives the energy storage assembly 306 to rotate. The energy storage assembly 306 is configured, in cooperation with the first driven gear 305, to achieve energy storage. By providing the energy storage assembly 306, during use, the energy storage assembly 306 releases

energy to drive the driving mechanism 40 to rotate quickly, and the driving mechanism 40 drives the switching mechanism 50 to rotate, thereby implementing one switching action of the on-load tap changer.

[0052] Specifically, in this embodiment, the drive assembly is sleeved on an extending end that is of the third rotating shaft 6011 and that extends into the accommodation cavity 201. The first driving gear 304 is sleeved on the fourth rotating shaft. The first driven gear 305 is sleeved on the first rotating shaft 602. The first driving gear 304 meshes with the first driven gear 305. The third rotating shaft 6011 is connected to an output end of an external motor. During use, the external motor drives the third rotating shaft 6011 to rotate, the third rotating shaft 6011 drives the drive assembly to rotate, the drive assembly drives the first driving gear 304 to rotate, the first driving gear 304 drives the first driven gear 305 to rotate, and the first driven gear 305 drives the energy storage assembly 306 to rotate. The energy storage assembly 306 performs energy storage, and the energy storage is completed when the energy storage assembly 306 rotates to a dead point position. The energy storage assembly 306 continues to rotate beyond the dead point position for a preset angle, and after that, the energy storage assembly 306 is in contact with the driving mechanism 40. Meanwhile, the energy storage assembly 306 releases energy to drive the driving mechanism 40 to rotate, and the driving mechanism 40 drives the switching mechanism 50 to rotate.

[0053] Further, in this embodiment, the drive assembly includes a driving cam 301, a swing member 302, and a steering pin 303 matching the swing member 302. The driving cam 301 is sleeved on the rotating-shaft assembly 601. A protruding end of the driving cam 301 abuts against the swing member 302. One end of the swing member 302 is connected to the support assembly by a rotating rod. The swing member 302 can rotate around the rotating rod. One end of the steering pin 303 is connected to the first driving gear 304. An outer peripheral wall of the steering pin 303 is in contact with the swing member 302. The driving cam 301 is configured to drive the swing member 302 to rotate. The steering pin 303 is configured, in cooperation with the swing member 302, to drive the first driving gear 304 to rotate.

[0054] Specifically, a central axis of the rotating rod is parallel to that of the first rotating shaft 602. The rotating rod is disposed at an interval with the rotating-shaft assembly 601. The rotating rod is located in the accommodation cavity 201. One end of the rotating rod is connected to the first support plate 202, and other end of the rotating rod is connected to the second support plate 203. One end of the swing member 302 is sleeved on the rotating rod. The swing member 302 can rotate by using a center line of the rotating rod as an axis.

[0055] Referring to FIG. 4, in this embodiment, the driving cam 301 is sleeved on the extending end of the third rotating shaft 6011, and the driving cam is accommodated in the swing member 302. During use, the third rotating

shaft drives the driving cam 301 to rotate, the driving cam 301 drives the swing member 302 to rotate, the swing member 302 drives the steering pin 303 to rotate, and the steering pin 303 drives the first driving gear 304 to rotate. In this way, there is no sliding friction during movement transmission, thereby improving transmission efficiency.

[0056] The swing member 302 includes a contact portion 3021 and a connection portion 3022. The contact portion 3021 is in a shape of a plate, and is parallel to a horizontal plane. One end of the connection portion 3022 is sleeved on the rotating rod, and the other end of the connection portion 3022 is connected to an outer wall of the contact portion 3021.

[0057] In the foregoing embodiments, the contact portion 3021 is provided with a first notch matching the driving cam 301 and a second notch matching the steering pin 303. The first notch communicates with the second notch. The first notch and the second notch jointly form a drive port 3023. Inner walls on two opposite sides of the second notch are provided with shoulders 3024 that extend inward. In an initial state, the outer peripheral wall of the steering pin 303 abuts against the shoulder 3024, and the shoulder 3024 serves as a stopper for the steering pin 303. The driving cam 301 is accommodated in the first notch. The protruding end of the driving cam 301 abuts against an inner wall of the first notch. The steering pin 303 extends along the central-axis direction of the first support plate 202. The steering pin 303 is accommodated in the second notch. The outer peripheral wall of the steering pin 303 is in contact with an inner peripheral wall of the second notch. During rotation, the steering pin 303 moves along a circumferential direction of the second notch. By providing the second notch, the second notch provides guidance for the steering pin 303.

[0058] During use, the third rotating shaft 6011 rotates to drive the driving cam 301 to rotate; the driving cam 301 drives the swing member 302 to rotate; the swing member 302 drives the steering pin 303 to move along a circumferential direction of the second notch; the steering pin 303 drives the first driving gear 304 to rotate; and the first driving gear 304 drives the first driven gear 305 to rotate.

[0059] For example, the swing member 302 may be in a shape of an elliptical plate. The swing member 302 is provided with an opening matching the driving cam 301 and the steering pin 303. The swing member 302 is parallel to the horizontal plane. One end of the swing member 302 is rotatably connected to the rotating rod.

[0060] Further, one end that is of the contact portion 3021 and that faces away from the connection portion 3022 is connected to one end that is of the third elastic member 2022 and that faces away from connection frame 2023. One end that is of the contact portion 3021 and that faces away from the connection portion 3022 is provided with a projection 3025. The projection 3025 extends outward. During use, one end that is of the projection 3025 and that faces away from the contact portion

3021 is in contact with the slideway 2021. In a process in which the swing member 302 rotates around the rotating rod, the projection 3025 slides along the slideway 2021. By providing the projection 3025, the projection 3025 is in contact with the slideway 2021, so that the slideway 2021 supports the swing member 302, thereby preventing the swing member 302 from being separated from the driving cam 301.

[0061] The slideway 2021 is in a shape of an arc, and a radian of the slideway 2021 is consistent with a motion trajectory of the swing member 302. Therefore, the projection 3025 is always in contact with the slideway 2021.

[0062] Further, in this embodiment, the energy storage assembly 306 includes a first connector 3061, an energy storage unit 3065, and a second connector 3062. The first connector 3061 is connected to one side that is of the first driven gear 305 and that faces the second rotating shaft. The second connector 3062 is located in the accommodation cavity 201. A top end of the second connector 3062 is connected to the first support plate 202. A bottom end of the second connector 3062 is connected to the second support plate 203. One end of the energy storage unit 3065 is articulated to the first connector 3061. The other end of the energy storage unit 3065 is rotatably connected to the second connector 3062. The energy storage unit 3065 can rotate relative to the second connector 3062. The energy storage unit 3065 is configured to perform energy storage. By providing the first connector 3061, during use, the first connector 3061 rotates to enable the energy storage unit 3065 to perform energy storage.

[0063] Specifically, the energy storage unit 3065 includes a fixed sleeve 3066, a slide bar 3067, and a fourth elastic member 3068. One end of the slide bar 3067 is inserted in the fixed sleeve 3066. The slide bar 3067 can slide along the fixed sleeve 3066. One end that is of the slide bar 3067 and that faces away from the fixed sleeve 3066 is articulated to the first connector 3061. One end that is of the fixed sleeve 3066 and that faces away from the slide bar 3067 is rotatably connected to the second connector 3062. One end that is of the fixed sleeve and that faces away from the second connector 3062 is provided with an opening that extends along a central-axis direction of the fixed sleeve. The opening extends perpendicular to a central axis and penetrates a side wall of the fixed sleeve. A sliding sleeve 3069 is sleeved on the fixed sleeve. The sliding sleeve 3069 can slide along the fixed sleeve, and is connected to the slide bar 3067 by a connection rod. The connection rod extends along a radial direction of the fixed sleeve. One end of the connection rod sequentially passes through the sliding sleeve 3069, the opening, and the slide bar 3067. The fourth elastic member 3068 is sleeved on an outer peripheral wall of the fixed sleeve. One end of the fourth elastic member 3068 is connected to a top end of the fixed sleeve, and the other end of the fourth elastic member 3068 is connected to one end that is of the sliding sleeve 3069 and that faces away from the second con-

connector 3062. During use, the slide bar 3067 drives the sliding sleeve 3069 and the connection rod to slide along an extension direction of the notch, and the sliding sleeve 3069 compresses the fourth elastic member 3068. In this case, the fourth elastic member 3068 performs energy storage. The fourth elastic member 3068 finishes the energy storage when the first connector 3061 rotates to a dead point position.

[0064] The fourth elastic member 3068 may be an energy storage spring, or may be an elastic sleeve.

[0065] For example, the first connector 3061 may be U-shaped. One side of the first connector 3061 is connected to a bottom end of the first driven gear 305. One end that is of the slide bar 3067 and that faces away from the fixed sleeve is inserted in the first connector 3061 and is articulated to the first connector 3061. During use, the first driven gear 305 drives the first connector 3061 to rotate, and the first connector 3061 drives the slide bar 3067 to slide along the fixed sleeve 3066. In this case, a sliding sleeve compresses the fourth elastic member 3068, and the fourth elastic member 3068 performs energy storage.

[0066] Referring to FIG. 2 again, in this embodiment, the second connector 3062 includes a support rod 3063 and a base 3064. For example, the base 3064 may be in a shape of a cylinder. Certainly, the base 3064 may also be in a shape of a cuboid. In a feasible implementation that the base 3064 is in a shape of a cylinder, both a central axis of the base 3064 and a central axis of the support rod 3063 are parallel to the central axis of the first support plate 202. In some feasible implementations, the central axis of the base 3064 is disposed to be collinear with that of the support rod 3063. A diameter of the base 3064 is greater than that of the support rod 3063.

[0067] A top end of the base 3064 is connected to a bottom end of the support rod 3063. One end that is of the base 3064 and that faces away from the support rod 3063 is connected to the second support plate 203. One end that is of the support rod 3063 and that faces away from the base 3064 is connected to the first support plate 202. The fixed sleeve is provided with a rotating hole that extends along a radial direction of the fixed sleeve. One end of the support rod 3063 passes through the rotating hole. An outer peripheral wall of the fixed sleeve abuts against the top end of the base 3064. The fixed sleeve rotates by using a center line of the support rod 3063 as an axis. By providing the base 3064, the base 3064 supports the fixed sleeve 3066, thereby preventing the fixed sleeve from sliding along the support rod 3063.

[0068] Referring to FIG. 5 and FIG. 7, specifically, during use, the first driven gear drives the first connector 3061 to rotate, the first connector 3061 drives the slide bar 3067 to slide along the fixed sleeve, the slide bar 3067 drives the sliding sleeve 3069 to slide, the sliding sleeve 3069 compresses the fourth elastic member 3068, and the fourth elastic member 3068 performs energy storage. In this case, the fixed sleeve rotates around the support rod 3063, and the first connector 3061 is not in

contact with the driving mechanism 40. The fourth elastic member 3068 finishes the energy storage when the first connector 3061 rotates to the dead point position. After the first connector 3061 continues to rotate beyond the dead point position by a preset angle, the first connector 3061 is in contact with the driving mechanism 40. In this case, under resilience, the fourth elastic member 3068 releases energy and drives the driving mechanism 40 to rotate.

[0069] After the first connector 3061 rotates beyond the dead point position by the preset angle, the first connector 3061 is in contact with the driving mechanism 40. In this way, it is ensured that the first connector 3061 releases energy in a predetermined direction, thereby preventing the first connector 3061 from rebounding under a collision force.

[0070] In this embodiment, the driving mechanism 40 is accommodated in the accommodation cavity 201. The driving mechanism 40 is disposed at an interval with the energy storage mechanism 30. The driving mechanism 40 is connected to the support mechanism 20 by the rotating-shaft mechanism 60. The driving mechanism 40 can rotate relative to the support mechanism 20. The driving mechanism 40 is configured, in cooperation with the energy storage mechanism 30, to drive the switching mechanism 50 to rotate.

[0071] During use, the energy storage mechanism 30 drives the driving mechanism 40 to rotate, and the driving mechanism 40 drives the switching mechanism 50 to rotate, thereby implementing a switching action of the on-load tap changer.

[0072] Referring to FIG. 2 to FIG. 7 again, in this embodiment, the driving mechanism 40 includes a second driving gear, a second driven gear meshing with the second driving gear, and a control member 403. The second driving gear is sleeved on the second rotating shaft. The second driving gear 401 can rotate relative to the second rotating shaft. The control member 403 is disposed on one side that is of the second driving gear 401 and that faces a first gear. The control member 403 is configured, in cooperation with the energy storage assembly 306, to drive the second driving gear 401 to rotate. The second driven gear 402 is sleeved on the rotating-shaft assembly 601. The second driving gear 401 meshes with the second driven gear 402. By providing the control member 403, movement transmission of "rotation-rotation" is realized, and movement conversion is reduced. In this way, transmission efficiency is improved.

[0073] Specifically, the second driven gear 402 is sleeved on the fifth rotating shaft, the second driven gear 402 meshes with the second driving gear 401, and the second driven gear 402 is disposed at an interval with the first driving gear 304.

[0074] Referring to FIG. 9, specifically, the control member 403 is in a shape of an arc, and a central axis of the control member 403 is parallel to that of the second driving gear 401. In some feasible implementations, the central axis of the control member 403 is disposed to be

collinear with that of the second driving gear 401. Both ends of the control member 403 are provided with fixed portions matching the first connector 3061. The fixed portion extends outward. During use, the first connector 3061 is in contact with the fixed portion. Meanwhile, the fourth elastic member 3068 releases energy to drive the control member 403 to rotate, the control member 403 drives the second driving gear 401 to rotate, and the second driving gear 401 drives the second driven gear 402 to rotate.

[0075] The second driving gear 401 can be connected to the control member 403 through welding, or the second driving gear 401 can be connected to the control member 403 through bolting, or the second driving gear 401 can be integrally formed with the control member 403 through casting. This is not limited in this embodiment.

[0076] In this embodiment, the switching mechanism 50 is accommodated in the accommodation cavity 201. One end of the switching mechanism 50 is connected to the driving mechanism 40 by the rotating-shaft mechanism 60. The switching mechanism 50 can rotate relative to the support mechanism 20. The switching mechanism 50 is configured, in cooperation with the driving mechanism 40 and the energy storage mechanism 30, to switch the on-load tap changer.

[0077] Further, in this embodiment, the switching mechanism 50 includes a rotation disk 501, a stop member 502, and an unlocking assembly 503. One end of the rotation disk 501 is sleeved on the rotating-shaft assembly 601. The stop member 502 is disposed at one end that is of the rotation disk 501 and that is away from the rotating-shaft assembly 601. The stop member 502 is configured, in cooperation with the support mechanism 20, to prevent the rotation disk 501 from rotating. The unlocking assembly 503 is disposed the rotation disk 501. The unlocking assembly 503 is configured, in cooperation with the energy storage mechanism 30, to release the stop member 502, to enable the rotation disk 501 to rotate.

[0078] Specifically, the rotation disk 501 is sleeved on the fifth rotating shaft. The rotation disk 501 is located between the first driving gear 304 and the second driven gear 402. A bottom end of the rotation disk 501 is connected to a top end of the second driven gear 402. The rotation disk 501 is fan-shaped, and is parallel to the horizontal plane. Two opposite sides of the rotation disk 501 are provided with fitting surfaces matching the stop block 206. When the stop member 502 abuts against the protruding portion of one of the locking blocks 2052, one side of the stop block 206 that is adjacent to the locking block 2052 is in contact with the fitting surface of the rotation disk 501. In this case, the switching mechanism 50 is in a static state.

[0079] The stop member 502 includes a fixed base 5021 and a stopper 5022. The stopper 5022 extends along the central-axis direction of the first support plate 202. A bottom end of the stopper 5022 is connected to a top end of the fixed base 5021. The stopper 5022 is

configured to abut against a protruding portion of the locking block 2052. One end that is of the rotation disk 501 and that faces away from the rotating-shaft assembly 601 is provided with a groove 5011. The fixed base 5021 is inserted in the groove 5011, and the stopper 5022 protrudes out of the groove 5011.

[0080] For example, stop member 502 may be in a shape of a plate. The stop member 502 extends along a radial direction of the first support plate 202. During use, the stop member 502 is parallel to the central axis of the first support plate 202. The stop member 502 is inserted on the rotation disk 501. One side of the stop member 502 is in contact with the protruding portion of the locking block 2052, to prevent the rotation disk 501 from rotating.

[0081] Further, in this embodiment, the unlocking assembly 503 includes a first unlocking unit 5031, a second unlocking unit 5032, and a second elastic member 5033. Both the first unlocking unit 5031 and the second unlocking unit 5032 are connected to the rotation disk 501 by rotary shafts. Both the first unlocking unit 5031 and the second unlocking unit 5032 can rotate around the rotary shafts. The first unlocking unit 5031 is disposed to intersect with the second unlocking unit 5032. One end of the second elastic member 5033 is connected to the first unlocking unit 5031, and the other end of the elastic member is connected to the second unlocking unit 5032. The stop member 502 is located between the first unlocking unit 5031 and the second unlocking unit 5032. On one hand, by providing the second elastic member 5033, the second elastic member 5033 is stretched after the first unlocking unit 5031 or the second unlocking unit 5032 rotates. In this case, the second elastic member 5033 provides resilience for the first unlocking unit 5031 or the second unlocking unit 5032. On the other hand, the stop member 502 is disposed between the first unlocking unit 5031 and the second unlocking unit 5032, and in this way, when the locking block 2052 is unlocked, a rotation angle of the first unlocking unit 5031/the second unlocking unit 5032 is reduced.

[0082] Specifically, a top end of the rotation disk 501 is provided with a first limit post and a second limit post. Both a central axis of the first limit post and a central axis of the second limit post are parallel to the central axis of the first support plate 202. The first limit post is located on one side that is of the first unlocking unit 5031 and that faces away from the second unlocking unit 5032. After the first unlocking unit 5031 rotates for a certain angle, an outer peripheral wall of the first limit post abuts against the first unlocking unit 5031. In this way, the first limit post is configured to limit the rotation angle of the first unlocking unit 5031. The second limit post is located on one side that is of the second unlocking unit 5032 and that faces away from the first unlocking unit 5031. After the second unlocking unit 5032 rotates for a certain angle, an outer peripheral wall of the second limit post abuts against the second unlocking unit 5032. The second limit post configured to limit the rotation angle of the second unlocking unit 5032.

[0083] The first unlocking unit 5031 includes an unlocking block 5034 and a roller 5035. An extension direction of the unlocking block 5034 is parallel to the horizontal plane. One end that is of the unlocking block 5034 and that faces away from the rotating-shaft assembly 601 is provided with a notch. The roller 5035 is inserted in the notch. The roller 5035 is connected to the unlocking block 5034 by a fixed shaft. The roller 5035 can rotate relative to the unlocking block 5034. Both a central axis of the roller 5035 and a central axis of the fixed shaft are parallel to the central axis of the first support plate 202. In some feasible implementations, the central axis of the roller 5035 is disposed to be collinear with that of the central axis. During use, the roller 5035 is in contact with the protruding portion of one of the locking blocks 2052. While rotating around the fixed shaft, the roller 5035 drives the locking block 2052 to rotate around the rotating shaft 2054. The protruding portion of the locking block 2052 extends into the through slot. In this case, the second driven gear 402 drives the fifth rotating shaft to rotate, and the fifth rotating shaft drives the rotation disk 501 to rotate quickly to be between the other locking block 2052 and the stop block 206.

[0084] Further, one end that is of the unlocking block 5034 and that is away from the notch is provided with a plate-shaped rotating handle. The rotating handle is parallel to the horizontal plane. The rotating handle extends along a length direction of the unlocking block 5034. The rotating handle is located on a same plane with a top end of the unlocking block 5034. The rotating handle is provided with a connection hole that extends along the central-axis direction of the first support plate 202. One end that is of the rotary shaft and that faces away from the rotation disk 501 is inserted in the connection hole. The rotating handle rotates by using a center line of the rotary shaft as an axis. The rotating handle rotates to drive the unlocking block 5034 to rotate. One end of the second elastic member 5033 is connected to the unlocking block 5034.

[0085] Except that a rotating handle in the second unlocking unit 5032 is located on a same plane with a bottom end of the unlocking block 5034 in the second unlocking unit 5032, the remaining structure of the second unlocking unit 5032 is basically the same as a structure of the first unlocking unit 5031. The structure of the second unlocking unit 5032 is not described in detail herein. The rotating handle in the second unlocking unit 5032 flushes with the bottom end of the unlocking block 5034 in the second unlocking unit 5032. In this way, the first unlocking unit 5031 and the second unlocking unit 5032 are disposed to intersect with each other, and do not interfere with each other during rotation.

[0086] Specifically, a rotating handle in the first unlocking unit 5031 is at a preset distance from the rotating handle in the second unlocking unit 5032, thereby avoiding interference during rotation between the first unlocking unit 5031 and the second unlocking unit 5032.

[0087] The first driving gear 304 is provided with a first

lever 3041 of the steering pin 303 and a second lever 3042 of the steering pin 303. Both the first lever 3041 of the steering pin 303 and the second lever 3042 of the steering pin 303 are disposed at a bottom end of the first driving gear 304. The first lever 3041 of the steering pin 303 and the second lever 3042 of the steering pin 303 are disposed at an interval along a central-axis direction of the first driving gear 304. The first lever 3041 of the steering pin 303 is located at an upper end of the second lever 3042 of the steering pin 303. The first lever 3041 of the steering pin 303 is disposed corresponding to the rotating handle in the first unlocking unit 5031. The first lever 3041 of the steering pin 303 is configured to drive the rotating handle in the first unlocking unit 5031 to rotate. The second lever 3042 of the steering pin 303 is disposed corresponding to the rotating handle in the second unlocking unit 5032. The second lever 3042 of the steering pin 303 is configured to drive the rotating handle in the second unlocking unit 5032 to rotate. The preset distance between the rotating handle in the first unlocking unit 5031 and the rotating handle in the second unlocking unit 5032 is greater than a thickness of the second lever 3042 of the steering pin 303. In this way, it is convenient for the second lever 3042 of the steering pin 303 to pass between the rotating handle in the first unlocking unit 5031 and the rotation disk 501.

[0088] The first lever 3041 of the steering pin 303 extends along a radial direction of the first driving gear 304. For example, the first lever 3041 of the steering pin 303 may be z-shaped, or certainly, the first lever 3041 of the steering pin 303 may be T-shaped.

[0089] A structure of the second lever 3042 of the steering pin 303 is basically the same as that of the first lever 3041 of the steering pin 303. The structure of the second lever 3042 of the steering pin 303 is not described in detail in this embodiment.

[0090] The working principle of the quick-acting mechanism device 1 for an on-load tap changer provided in the embodiments is as follows. The external motor drives the third rotating shaft 6011 to rotate; the third rotating shaft 6011 drives the driving cam 301 to rotate; the driving cam 301 drives the swing member 302 to rotate; the swing member 302 drives the steering pin 303 to rotate; the steering pin 303 drives the first driving gear 304 to rotate; and the first driving gear 304 drives the first driven gear 305 to rotate. Meanwhile, the first driving gear 304 drives the first lever 3041 and the second lever 3042 to rotate; the first driven gear 305 drives the first connector 3061 to rotate; and the first connector 3061 drives the energy storage unit 3065 to perform energy storage. The fourth elastic member 3068 finishes the energy storage when the first connector 3061 rotates to the dead point position. During this process, the first connector 3061 is not in contact with the driving mechanism 40. After the first connector 3061 continues to rotate beyond the dead point position by a preset angle, the first connector 3061 is in contact with the driving mechanism 40. The fourth elastic member 3068 releases energy. The first connec-

tor 3061 drives the driving mechanism 40 to rotate. At the moment, the first lever 3041 is in contact with the rotating handle. The first driving gear 304 drives the first lever 3041 to continue to rotate. The first lever 3041 drives the first unlocking unit 5031 to rotate around the rotary shaft. The first unlocking unit 5031 drives the locking block 2052 to rotate. The protruding portion of the locking block 2052 enters the through slot. At the moment, the stop member 502 is separated from the locking block 2052. The driving mechanism 40 drives the switching mechanism 50 to rotate quickly to be between the other locking unit 205 and the stop block 206. At the moment, the protruding portion of the locking block 2052 is in contact with the stop member 502, and the driving mechanism 40 stops rotating. In this way, one-time switching of the on-load tap changer is completed, thereby achieving on-load transition of current.

[0091] This application provides a quick-acting mechanism device 1 for an on-load tap changer, including the support mechanism 20, the energy storage mechanism 30, the driving mechanism 40, and the switching mechanism 50. The support mechanism 20 is enclosed to form the accommodation cavity 201. The energy storage mechanism 30 is accommodated in the accommodation cavity 201. The energy storage mechanism 30 is connected to the support mechanism 20 by the rotating-shaft mechanism 60. The energy storage mechanism 30 can rotate relative to the support mechanism 20. The energy storage mechanism 30 is configured to store and release energy. The driving mechanism 40 is accommodated in the accommodation cavity 201. The driving mechanism 40 is disposed at an interval with the energy storage mechanism 30. The driving mechanism 40 is connected to the support mechanism 20 by the rotating-shaft mechanism 60. The driving mechanism 40 can rotate relative to the support mechanism 20. The driving mechanism 40 is configured, in cooperation with the energy storage mechanism 30, to drive the switching mechanism 50 to rotate. The switching mechanism 50 is accommodated in the accommodation cavity 201. One end of the switching mechanism 50 is connected to the driving mechanism 40 by the rotating-shaft mechanism 60. The switching mechanism 50 can rotate relative to the support mechanism 20. The switching mechanism 50 is configured, in cooperation with the driving mechanism 40 and the energy storage mechanism 30, to switch the on-load tap changer. By providing the energy storage mechanism 30, the driving mechanism 40, and the switching mechanism 50, transformation of motion is reduced in a process of motion transmission, thereby improving the transmission efficiency.

[0092] The quick-acting mechanism device 1 provided in the present invention has the following advantages: the apparatus has a simple structure and is easy for manufacturing, and manufacturing costs are reduced.

[0093] It should be noted that in this specification, relationship terms such as first and second are merely used to distinguish one entity or operation from another entity

or operation, and do not necessarily require or imply any actual relationship or sequence between these entities or operations. Moreover, terms "comprise", "include", or any other variation thereof are intended to cover non-exclusive inclusion, so that a process, a method, an article, or a device that includes a series of elements not only includes these elements, but also includes other elements that are not explicitly listed, or also includes elements inherent in such a process, method, article, or device. Without further restrictions, elements defined by the statement "including a..." do not exclude existence of other identical elements in the process, method, article, or device that includes the elements.

[0094] Finally, it should be noted that the foregoing embodiments are merely examples for clearly describing the present invention, and are not a limitation to the implementations. For a person skilled in the art, other different forms of changes or variations can be made based on the foregoing description. It is not necessary and it is impossible to enumerate all implementations herein. Obvious changes or variations that arise therefrom still fall within the protection scope of the present invention.

Claims

1. A quick-acting mechanism device for an on-load tap changer, comprising a support mechanism, an energy storage mechanism, a driving mechanism, and a switching mechanism,

wherein the support mechanism is enclosed to form an accommodation cavity, the energy storage mechanism is accommodated in the accommodation cavity, the energy storage mechanism is connected to the support mechanism by a rotating-shaft mechanism, the energy storage mechanism can rotate relative to the support mechanism, and the energy storage mechanism is configured to store and release energy; the driving mechanism is accommodated in the accommodation cavity, the driving mechanism is disposed at an interval with the energy storage mechanism, the driving mechanism is connected to the support mechanism by the rotating-shaft mechanism, the driving mechanism can rotate relative to the support mechanism, and the driving mechanism is configured, in cooperation with the energy storage mechanism, to drive the switching mechanism to rotate; and the switching mechanism is accommodated in the accommodation cavity, one end of the switching mechanism is connected to the driving mechanism by the rotating-shaft mechanism, the switching mechanism can rotate relative to the support mechanism, and the switching mechanism is configured, in cooperation with the driving mechanism and the energy storage

mechanism, to switch an on-load tap changer.

2. The quick-acting mechanism device for an on-load tap changer according to claim 1, wherein the support assembly comprises a first support plate and a second support plate; the first support plate is disposed at an interval with the second support plate; at least one support column is disposed between the first support plate and the second support plate; a top end of the support column is detachably connected to the first support plate; a bottom end of the support column is detachably connected to the second support plate; the accommodation cavity is enclosed by the first support plate, the second support plate, and the support column; and a retaining assembly is disposed on the second support plate, and the retaining assembly is configured to prevent the switching mechanism from rotating.
3. The quick-acting mechanism device for an on-load tap changer according to claim 2, wherein the retaining assembly comprises two locking units and two stop blocks; one end of each of the two stop blocks is connected to the second support plate; the two stop blocks are disposed at an interval along an edge of the second support plate; one end of each of the two locking units is connected to the second support plate; the two locking units are located between the two stop blocks; the two locking units are disposed at an interval; and each locking unit is at a preset distance from an adjacent stop block.
4. The quick-acting mechanism device for an on-load tap changer according to claim 3, wherein the locking unit comprises a fixed block, a locking block, and a first elastic member; one end of the fixed block is connected to one side that is of the second support plate and that faces the first support plate; one side that is of the fixed block and that faces the rotating-shaft mechanism is provided with a through slot matching the locking block; the through slot extends along a first direction of the fixed block; the locking block is inserted in the through slot; the locking block is connected to the fixed block by a rotating shaft; the locking block can rotate relative to the fixed block; the first elastic member is inserted in the through slot; the first elastic member extends along a second direction of the fixed block; one end of the first elastic member is connected to an inner wall of the through slot; the other end of the first elastic member is connected to one side that is of the locking block and that faces away from the rotating-shaft mechanism; and the locking block is configured to prevent the switching mechanism from rotating.

5. The quick-acting mechanism device for an on-load

tap changer according to claim 2, wherein the rotating-shaft mechanism comprises a rotating-shaft assembly, a first rotating shaft, and a second rotating shaft disposed corresponding to the first rotating shaft; both the rotating-shaft assembly and the second rotating shaft extend along a central-axis direction of the first rotating shaft; the rotating-shaft assembly is disposed at an interval with the first rotating shaft;

the rotating-shaft assembly is disposed to pass through the support mechanism; a top end of the first rotating shaft is inserted on the first support plate; a bottom end of the first rotating shaft is accommodated in the accommodation cavity; a bottom end of the second rotating shaft is inserted on the second support plate; a top end of the second rotating shaft is accommodated in the accommodation cavity; and the bottom end of the first rotating shaft is at a preset distance from the top end of the second rotating shaft.

6. The quick-acting mechanism device for an on-load tap changer according to claim 5, wherein the energy storage mechanism comprises a drive assembly, a first driving gear, a first driven gear meshing with the first driving gear, and an energy storage assembly; both the drive assembly and the first driving gear are sleeved on the rotating-shaft assembly; the first driven gear is sleeved on the first rotating shaft; the first driving gear meshes with the first driven gear; one end of the energy storage assembly is connected to the first driven gear; the other end of the energy storage assembly is connected to the support mechanism;

the drive assembly is configured to drive the first driving gear to rotate; the first driving gear drives the first driven gear to rotate; the first driven gear drives the energy storage assembly to rotate; and the energy storage assembly is configured, in cooperation with the first driven gear, to achieve energy storage.

7. The quick-acting mechanism device for an on-load tap changer according to claim 6, wherein the drive assembly comprises a driving cam, a swing member, and a steering pin matching the swing member; the driving cam is sleeved on the rotating-shaft assembly; a protruding end of the driving cam abuts against the swing member; one end of the swing member is connected to the support assembly by a rotating rod; the swing member can rotate around the rotating rod; one end of the steering pin is connected to the first driving gear; an outer peripheral wall of the steering pin is in contact with the swing member;

the driving cam is configured to drive the swing

member to rotate; and
the steering pin is configured, in cooperation with the swing member, to drive the first driving gear to rotate.

8. The quick-acting mechanism device for an on-load tap changer according to claim 7, wherein the energy storage assembly comprises a first connector, an energy storage unit, and a second connector; the first connector is connected to one side that is of the first driven gear and that faces the second rotating shaft; the second connector is located in the accommodation cavity; a top end of the second connector is connected to the first support plate; a bottom end of the second connector is connected to the second support plate; one end of the energy storage unit is articulated to the first connector; the other end of the energy storage unit is rotatably connected to the second connector; the energy storage unit can rotate relative to the second connector; and the energy storage unit is configured to perform energy storage.
9. The quick-acting mechanism device for an on-load tap changer according to claim 5, wherein the driving mechanism comprises a second driving gear, a second driven gear meshing with the second driving gear, and a control member; the second driving gear is sleeved on the second rotating shaft; the second driving gear can rotate relative to the second rotating shaft; the control member is disposed on one side that is of the second driving gear and that faces the first gear; the control member is configured, in cooperation with the energy storage assembly, to drive the second driving gear to rotate; and the second driven gear is sleeved on the rotating-shaft assembly, and the second driving gear meshes with the second driven gear.
10. The quick-acting mechanism device for an on-load tap changer according to claim 5, wherein the switching mechanism comprises a rotation disk, a stop member, an a unlocking assembly; one end of the rotation disk is sleeved on the rotating-shaft assembly; the stop member is disposed at one end that is of the rotation disk and that is away from the rotating-shaft assembly; the stop member is configured, in cooperation with the support mechanism, to prevent the rotation disk from rotating; and the unlocking assembly is disposed the rotation disk, and the unlocking assembly is configured, in cooperate with the energy storage mechanism, to release the stop member, so as to enable the rotation disk to rotate.
11. The quick-acting mechanism device for an on-load tap changer according to claim 10, wherein the unlocking assembly comprises a first unlocking unit, a

second unlocking unit, and a second elastic member; both the first unlocking unit and the second unlocking unit are connected to the rotation disk by rotary shafts; both the first unlocking unit and the second unlocking unit can rotate around the rotary shafts; the first unlocking unit is disposed to intersect with the second unlocking unit; one end of the second elastic member is connected to the first unlocking unit; the other end of the elastic member is connected to the second unlocking unit; and the stop member is located between the first unlocking unit and the second unlocking unit.

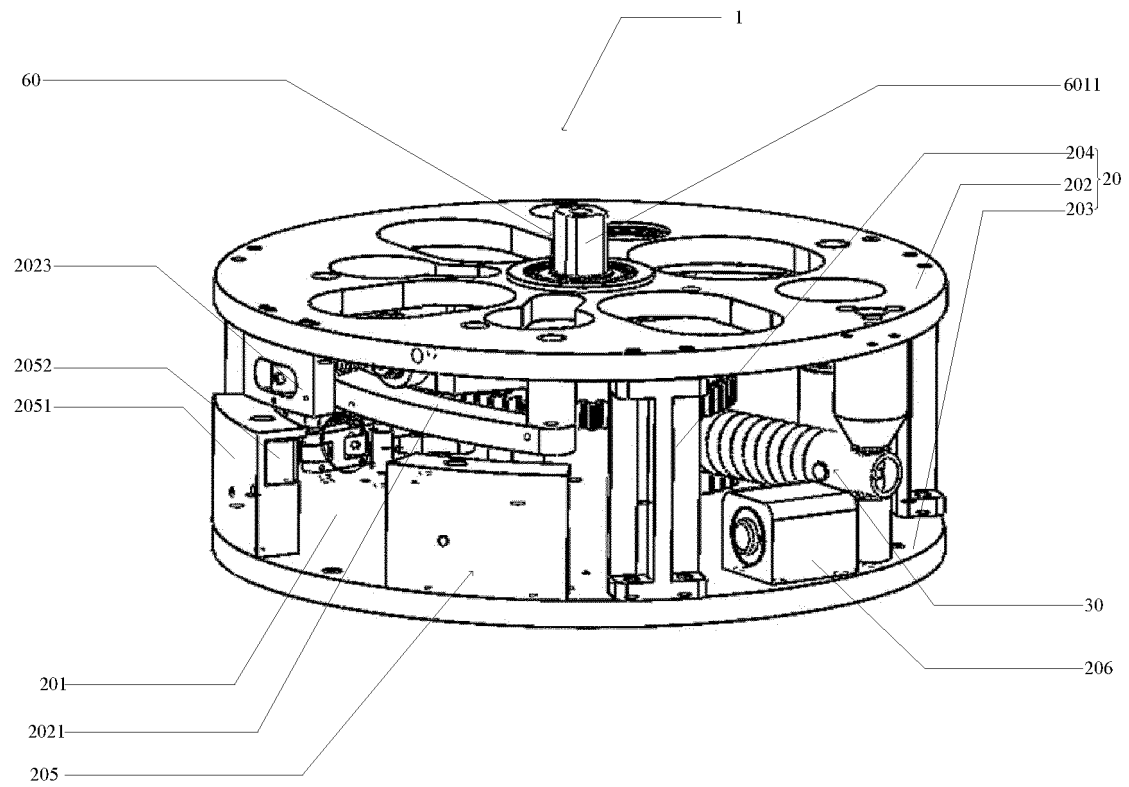


FIG. 1

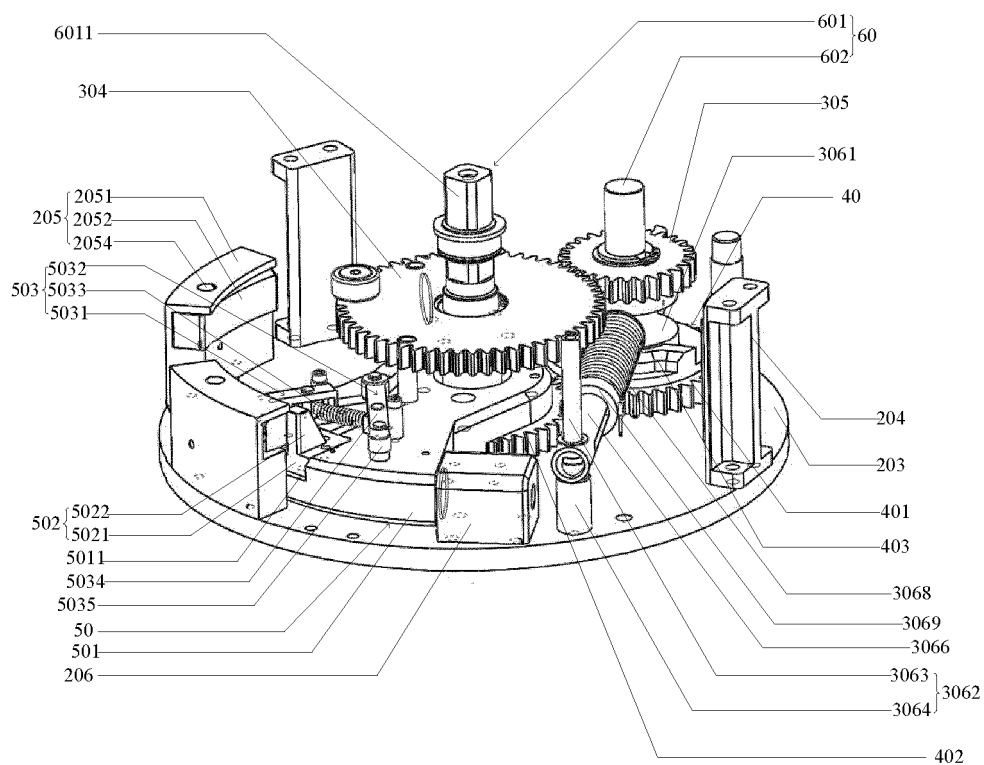


FIG. 2

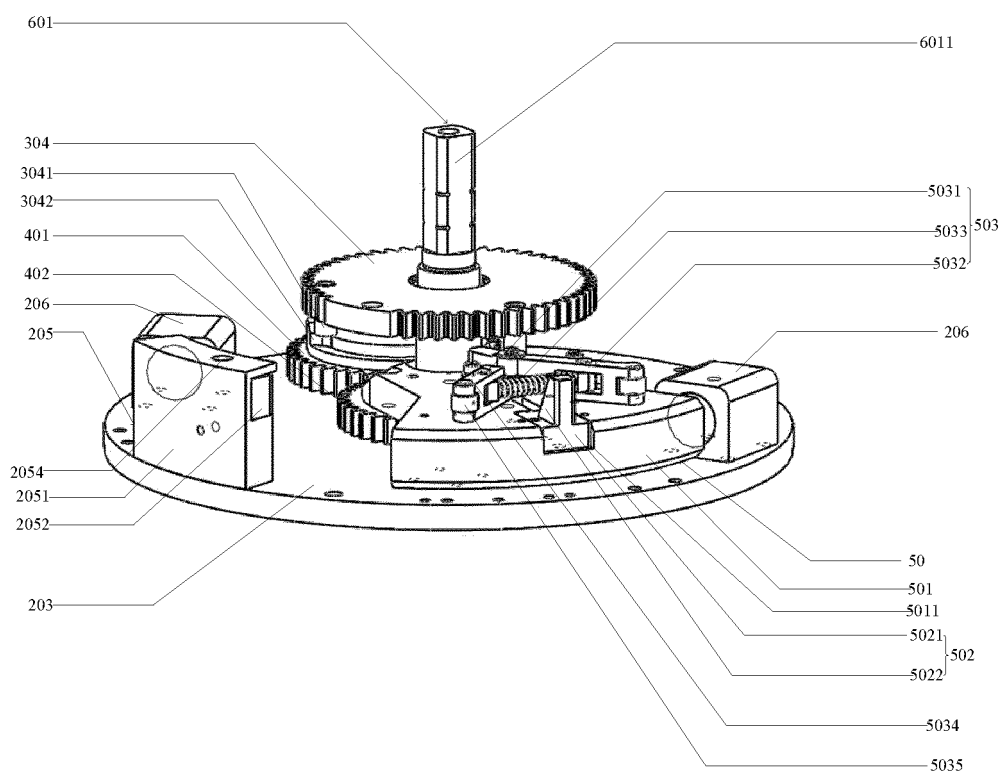


FIG. 3

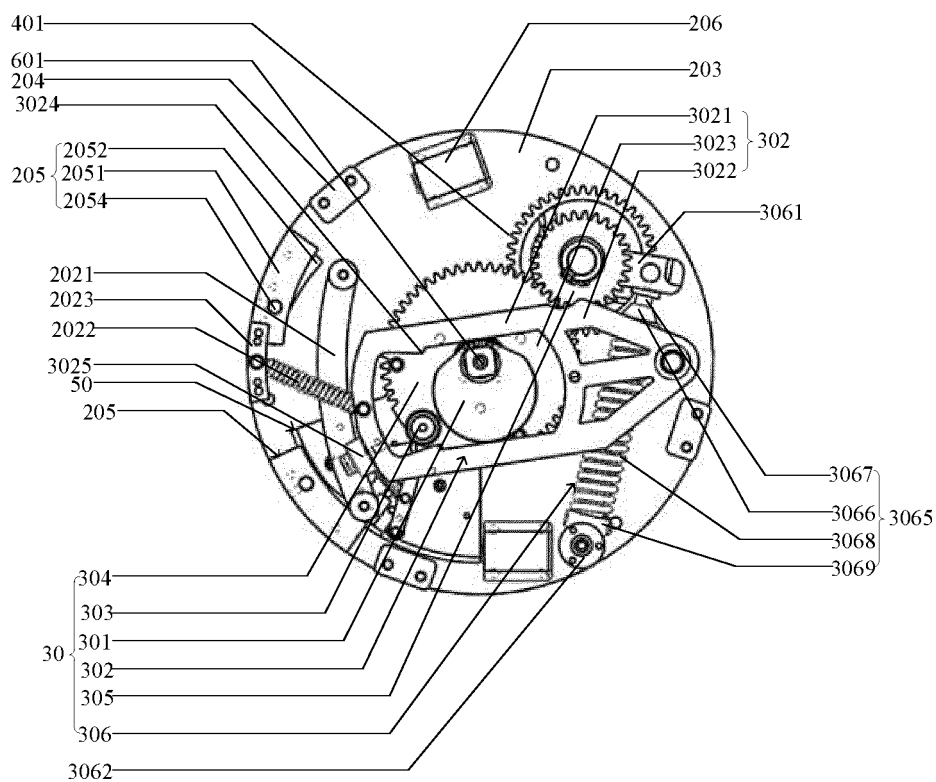


FIG. 4

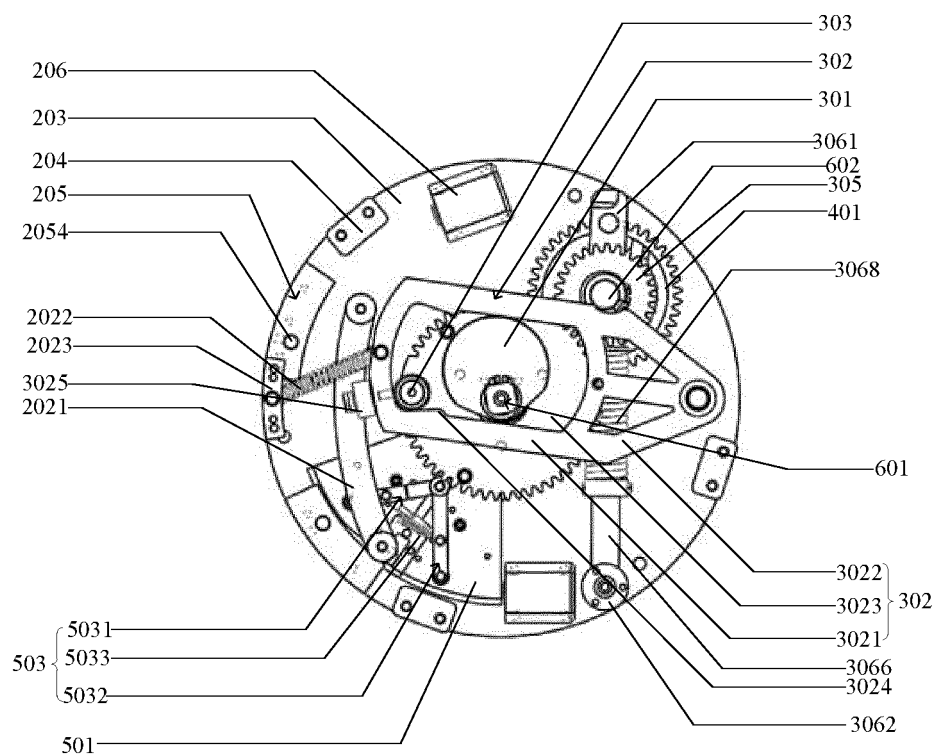


FIG. 5

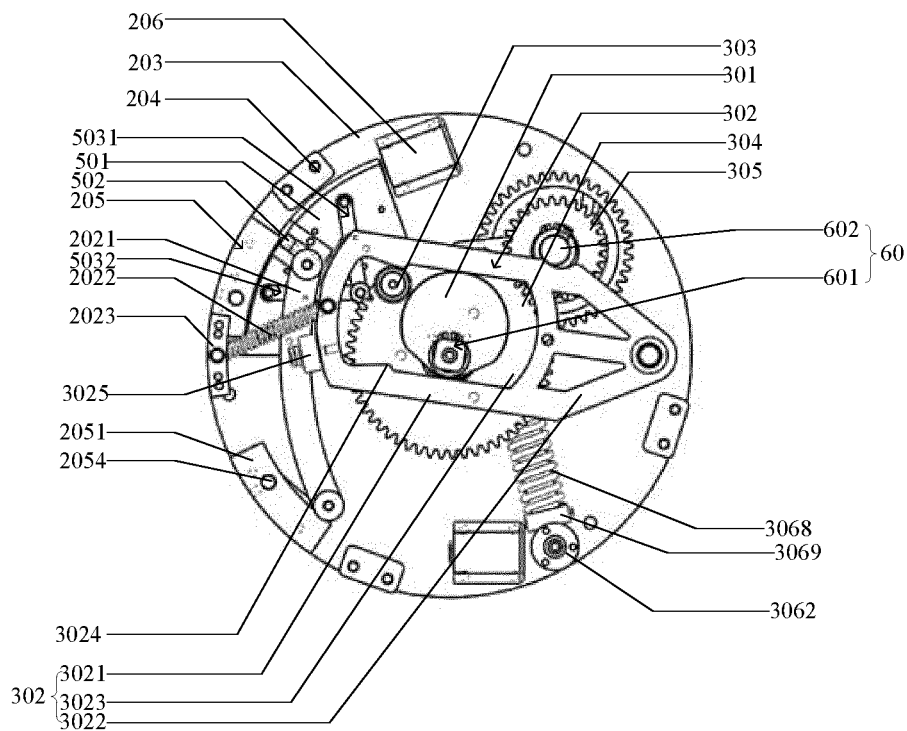


FIG. 6

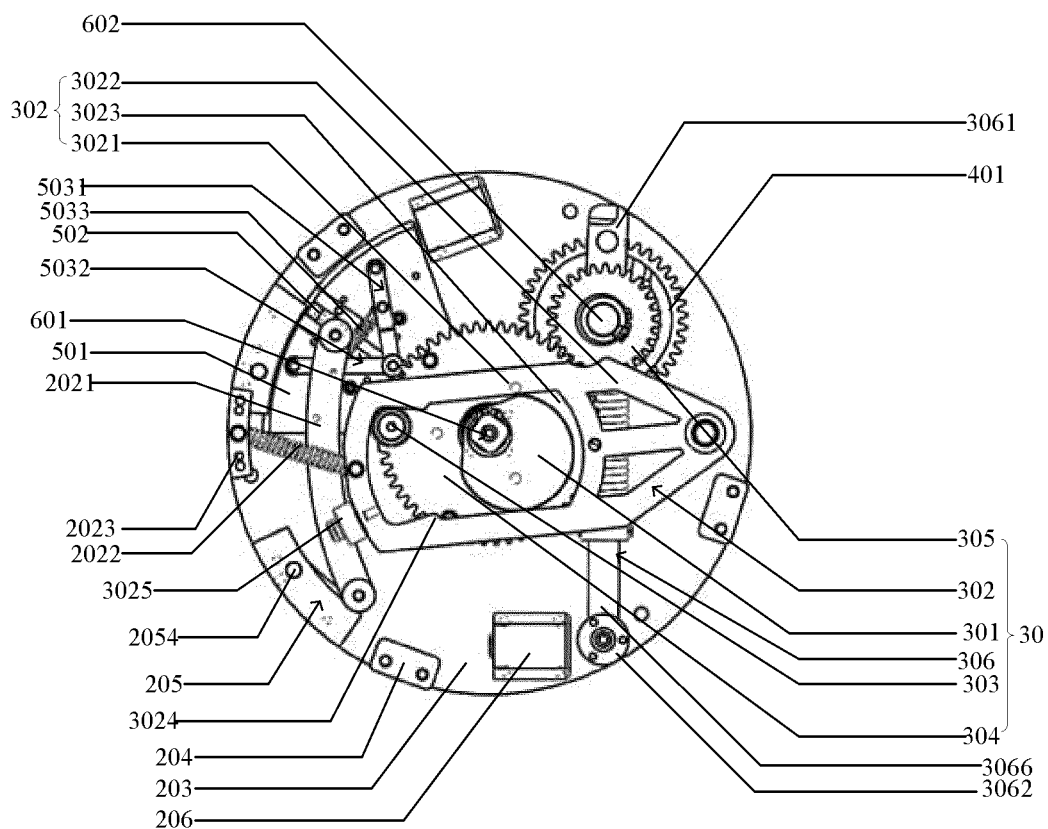


FIG. 7

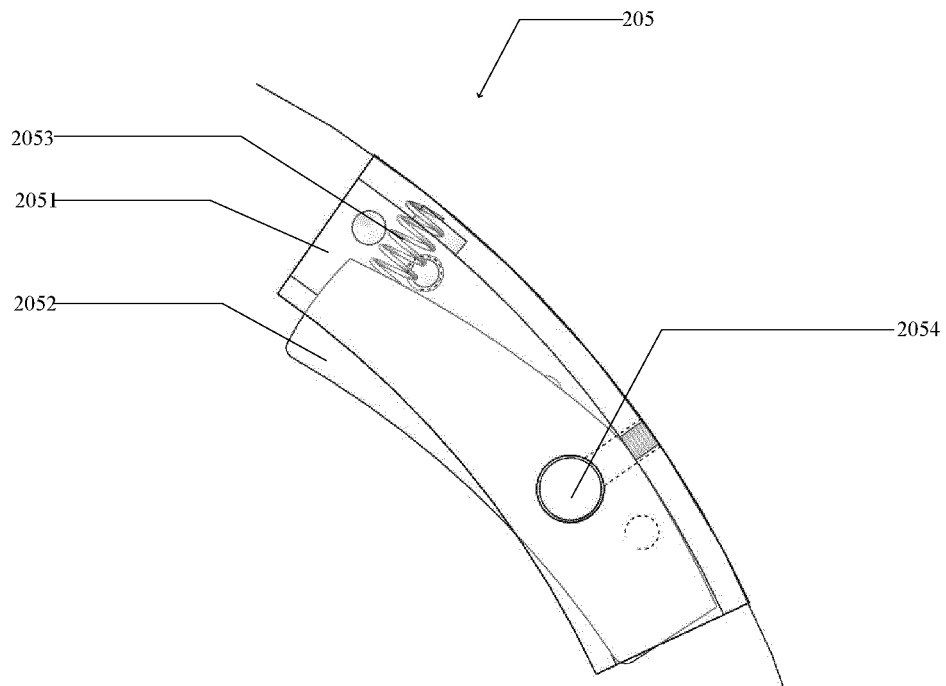


FIG. 8

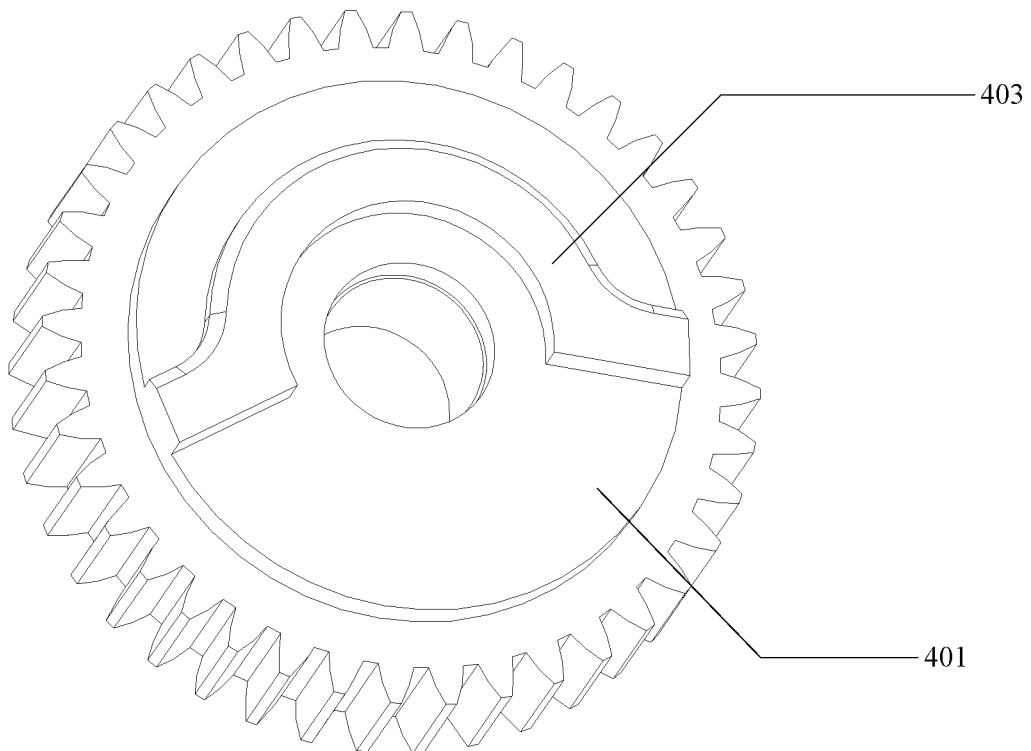


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/095535

A. CLASSIFICATION OF SUBJECT MATTER H01H 3/32(2006.01)i 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) H01H Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNABS, CNTXT, VEN, CNKI, 超星读秀, DUXIU: 分接, 开关, 支撑, 支撑, 壳体, 储能, 驱动, 切换, 容置, 空腔, 转轴, 能量, 齿轮, 主动, 从动, 臂, 摆动, 锁定, 解锁, tap, branch, connect, switch, support, shell, housing, power, storage, deposited, drive, contain, opening, cavum, shaft, gear, initiative, driven, arm, flirt, swing, lock																		
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>JP 2003319609 A (NAKAGAWA DENKI KOGYO) 07 November 2003 (2003-11-07) description, paragraphs 9-72, and figures 1-3</td> <td>1-3, 5, 10</td> </tr> <tr> <td>A</td> <td>CN 101409148 A (SHANGHAI HUAMING POWER EQUIPMENT CO., LTD. et al.) 15 April 2009 (2009-04-15) entire document</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>US 2005044977 A1 (TANASHIN DENKI CO., LTD.) 03 March 2005 (2005-03-03) entire document</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>WO 2012038030 A1 (REINHAUSEN MASCHF SCHEUBECK et al.) 29 March 2012 (2012-03-29) entire document</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>US 2016240330 A1 (SIEMENS AKTIENGESELLSCHAFT) 18 August 2016 (2016-08-18) entire document</td> <td>1-11</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	JP 2003319609 A (NAKAGAWA DENKI KOGYO) 07 November 2003 (2003-11-07) description, paragraphs 9-72, and figures 1-3	1-3, 5, 10	A	CN 101409148 A (SHANGHAI HUAMING POWER EQUIPMENT CO., LTD. et al.) 15 April 2009 (2009-04-15) entire document	1-11	A	US 2005044977 A1 (TANASHIN DENKI CO., LTD.) 03 March 2005 (2005-03-03) entire document	1-11	A	WO 2012038030 A1 (REINHAUSEN MASCHF SCHEUBECK et al.) 29 March 2012 (2012-03-29) entire document	1-11	A	US 2016240330 A1 (SIEMENS AKTIENGESELLSCHAFT) 18 August 2016 (2016-08-18) entire document	1-11
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Date of the actual completion of the international search 07 July 2022	Date of mailing of the international search report 02 August 2022																	
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																	

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2022/095535

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