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Luo et al.

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(54) **WEIGHT ADJUSTABLE DUMBBELL**

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See application file for complete search history.

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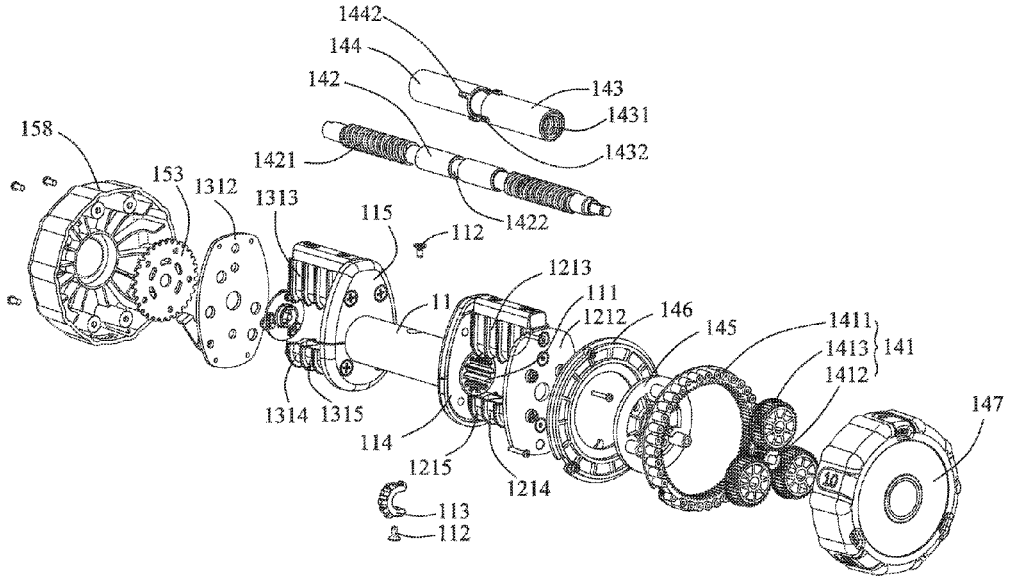
(57) **ABSTRACT**

A weight adjustable dumbbell includes a handle and a first counterweight part and a second counterweight part respectively arranged at two ends of the handle. Each of the first counterweight part and the second counterweight part includes a plurality of dumbbell pieces. Each dumbbell piece includes a mounting hole. The weight adjustable dumbbell further includes an adjusting mechanism. The adjusting mechanism includes a rotating mechanism, a transmission shaft, a first transmission sleeve and a second transmission sleeve. The transmission shaft can drive the first transmission sleeve and the second transmission sleeve to move axially along the transmission shaft and cause distal ends of the first transmission sleeve and the second transmission sleeve to insert into or leave the mounting holes of portion or all of the dumbbell pieces, whereby the dumbbell pieces are fixed on or detached from the first counterweight part and the second counterweight part.

19 Claims, 3 Drawing Sheets



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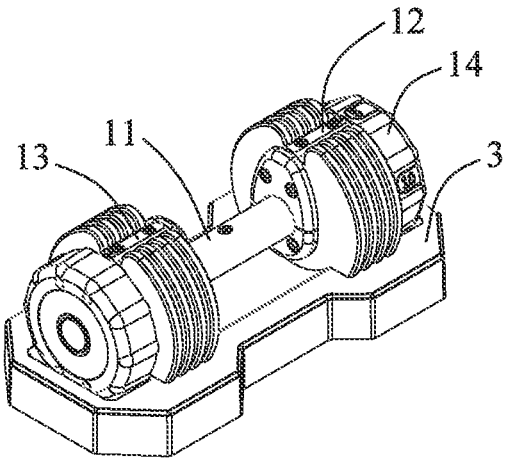

FIG. 1

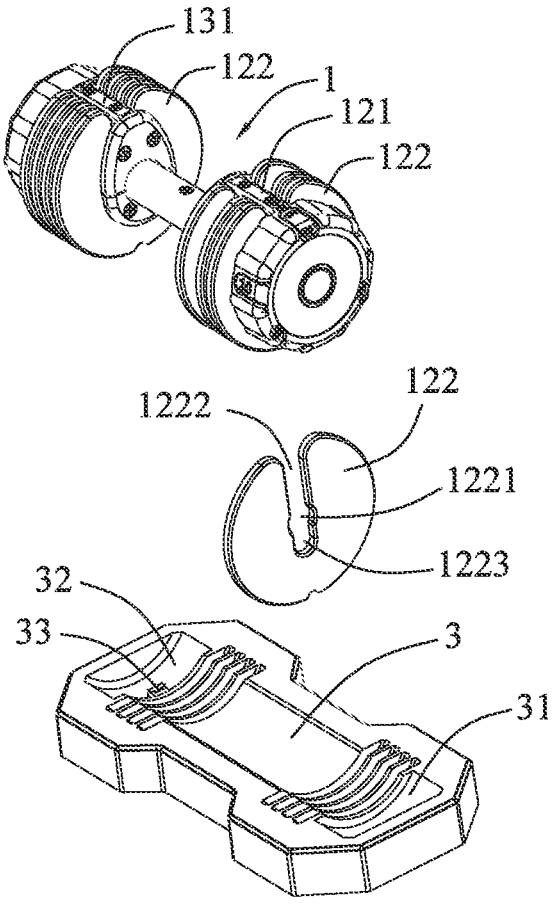

FIG. 2

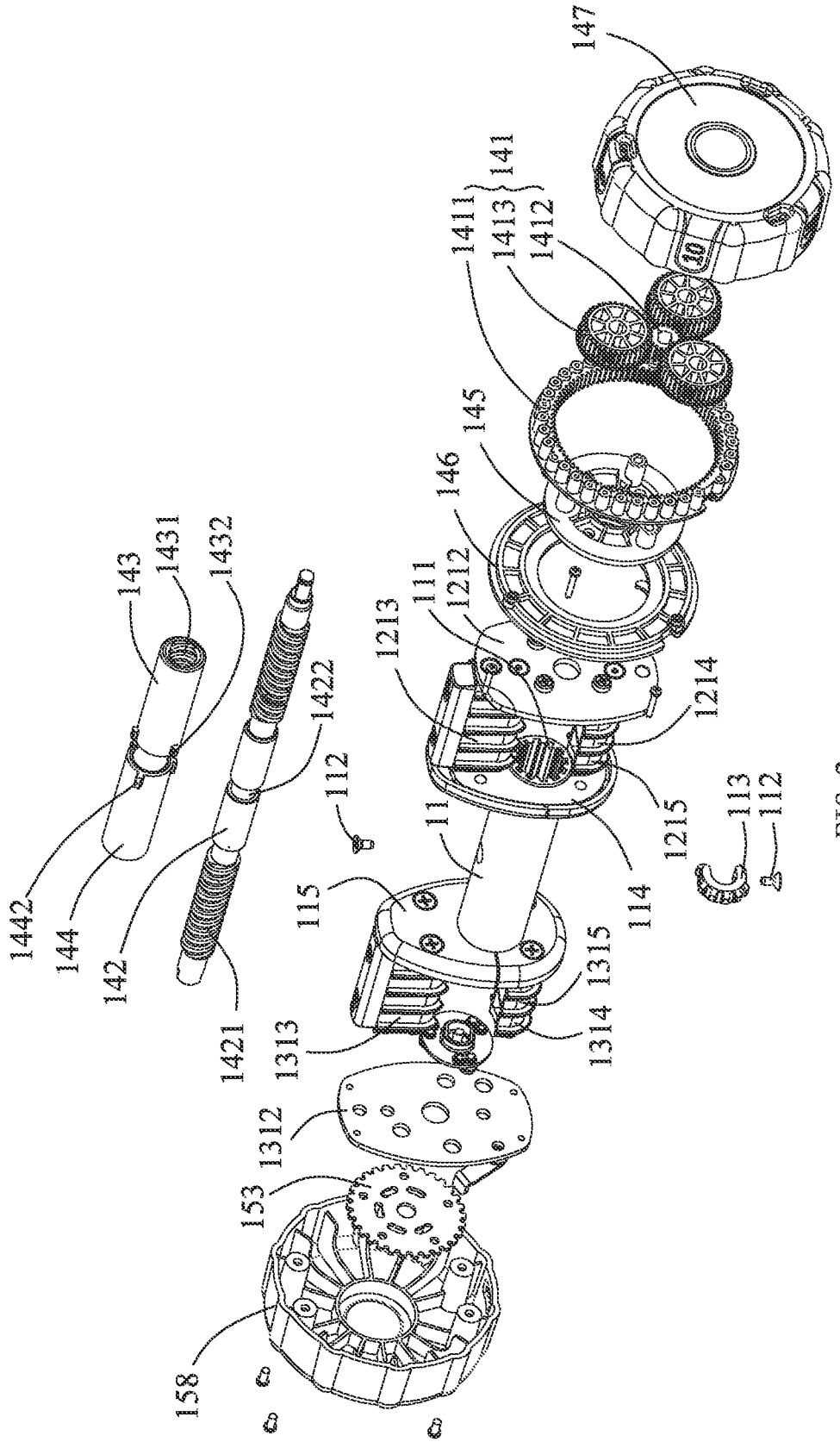
147
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FIG. 3

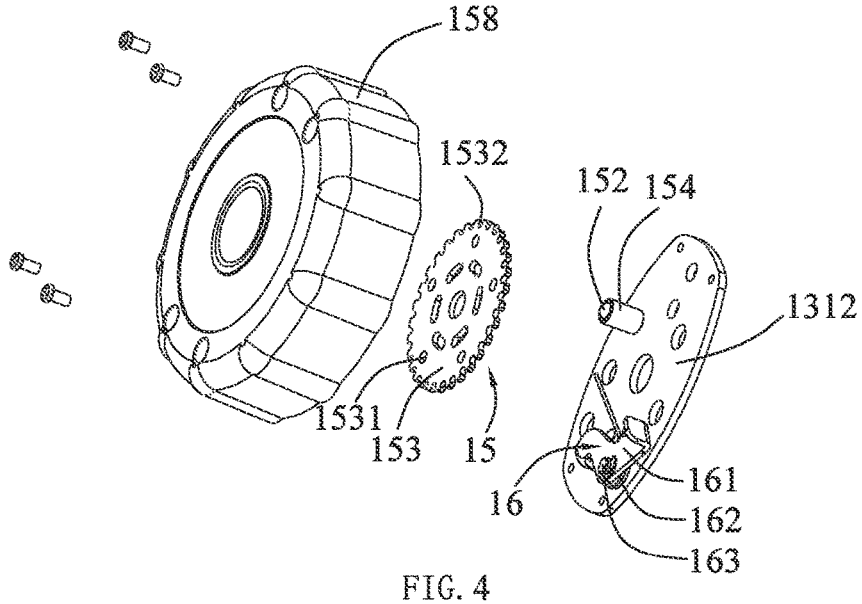

FIG. 4

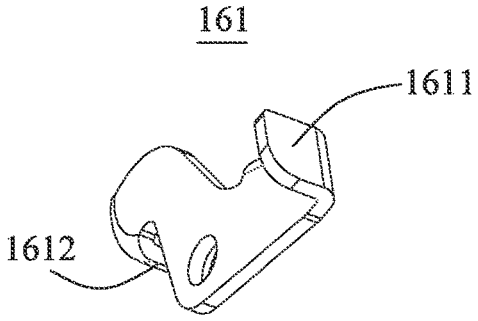

FIG. 5

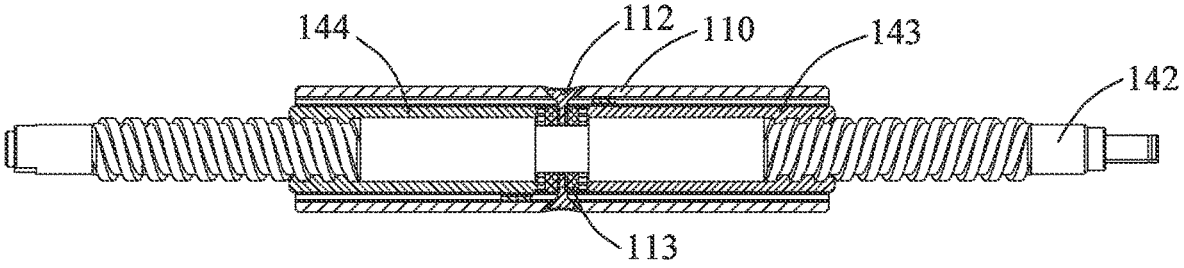

FIG. 6

WEIGHT ADJUSTABLE DUMBBELL

CROSS-REFERENCE TO RELATED APPLICATIONS

The present invention is based on and claims the priority of Chinese patent application Nos. 202110883244.9, 202121786687.8, 202121786582.2 and 202121786570.X, which are filed on Aug. 2, 2021. The contents of the above-identified applications are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to the technical field of fitness articles, and in particular, to a weight adjustable dumbbell.

BACKGROUND OF THE INVENTION

Currently, there are some weight adjustable dumbbells on the market, which can solve the problem that the weight of the previous integrated dumbbell cannot be adjusted. However, at present, the operation of these weight adjustable dumbbells is cumbersome, which cannot satisfy the user and has a poor use experience.

The foregoing description is intended to provide general background information and does not necessarily constitute the prior art.

SUMMARY OF THE INVENTION

In view of the above, the present invention provides a weight adjustable dumbbell, which is convenient for operation by the user.

The present invention provides a weight adjustable dumbbell comprising a handle assembly, wherein the handle assembly comprises a handle and a first counterweight part and a second counterweight part respectively arranged at two ends of the handle, each of the first counterweight part and the second counterweight part comprises a plurality of dumbbell pieces, each dumbbell piece comprises a mounting hole and an open groove extending from the mounting hole to an edge of the dumbbell piece, a width of the open groove is less than a diameter of the mounting hole;

the weight adjustable dumbbell further comprises an adjusting mechanism, the adjusting mechanism comprises a rotating mechanism, a transmission shaft, a first transmission sleeve and a second transmission sleeve, the rotating mechanism is arranged on an outer side of the first counterweight part, the rotating mechanism is fixedly connected with the transmission shaft to drive the transmission shaft to rotate; and

an outer diameter of the first transmission sleeve and the second transmission sleeve is greater than the width of the open groove but less than the diameter of the mounting hole, the first transmission sleeve and the second transmission sleeve are sleeved on the transmission shaft, and the transmission shaft is meshed with the first transmission sleeve and the second transmission sleeve, such that the transmission shaft can drive the first transmission sleeve and the second transmission sleeve to move axially along the transmission shaft and cause distal ends of the first transmission sleeve and the second transmission sleeve to insert into or leave the mounting holes of portion or all of the dumbbell pieces, whereby the dumbbell pieces are fixed on or detached from the first counterweight part and the second counterweight part.

Further, the transmission shaft is a screw rod, the first transmission sleeve and the second transmission sleeve are screw nuts respectively, two ends of the screw rod are provided with an external thread, an interior of each of the screw nuts is provided with an internal thread matched with the external thread, wherein the thread directions of the two internal threads are opposite.

Further, a planetary gear transmission mechanism is used as the rotating mechanism, the planetary gear transmission mechanism comprises a ring gear, a sun gear and a planetary gear which are meshed with each other, the ring gear is used for operating, the sun gear is fixedly connected with the transmission shaft, such that the ring gear drives the transmission shaft to rotate through the sun gear.

Further, the adjusting mechanism further comprises an operating member, the operating member is fixedly connected with the ring gear, such that the ring gear is driven to rotate by rotating the operating member.

Further, an outer periphery of the operating member is provided with a plurality of scales to indicate the dumbbell weights corresponding to different positions of the operating member.

Further, the ring gear rotates one turn, the first transmission sleeve and the second transmission sleeve axially move multiples of a distance between the centers of two adjacent dumbbell pieces.

Further, the handle is a hollow structure, the transmission shaft, the first transmission sleeve and the second transmission sleeve are located inside the handle.

Further, the first transmission sleeve and the second transmission sleeve are provided with an anti-rotation structure, such that when driven by the transmission shaft, the first transmission sleeve and the second transmission sleeve can move only axially along the transmission shaft due to the limitation of the anti-rotation structure.

Further, the anti-rotation structure comprises anti-rotation strips respectively provided on an outer periphery of the first transmission sleeve and the second transmission sleeve, the handle is internally provided with anti-rotation grooves, the first transmission sleeve and the second transmission sleeve are prevented from rotating with the transmission shaft through the cooperation between the anti-rotation grooves and the anti-rotation strips.

Further, an annular groove is provided at a middle position of the transmission shaft, a stopper is fixed to the handle, and the stopper is engaged in the annular groove, such that the transmission shaft can rotate relative to the handle but cannot move axially.

Further, the weight adjustable dumbbell further comprises a prompt mechanism arranged on an outer side of the second counterweight part, the prompt mechanism comprises a fixed element, an elastic element, a ball and a rotating element, the rotating element is fixed to the transmission shaft and rotates with the transmission shaft, the rotating element is provided with a plurality of holes, the ball is located on a rotation path of the holes, the ball is pushed by the elastic element and movably installed on the fixed element, when the dumbbell is adjusted to a predetermined weight, the ball is pushed into one of the holes by the elastic element.

Further, the fixed element is fixedly provided with a tube, the ball is installed to an outer end of the tube, the elastic element is received in the tube and located between the ball and the fixed element, and pushes the ball to move outward

from the outer end of the tube, such that the ball is movably installed on the fixed element.

Further, the weight adjustable dumbbell further comprises a base seat for placing the handle assembly and a self-locking mechanism arranged on an outer side of the second counterweight part, the self-locking mechanism comprises a rotating element, a locking member and an elastic member, the rotating element is fixed to the transmission shaft and rotates with the transmission shaft, the rotating element is a circular plate with a plurality of locking grooves distributed around a periphery thereof, the locking member comprises an upper locking portion and a lower resisting portion, the locking member is rotatably mounted on a fixed element, the elastic member is arranged between the locking member and the fixed element, such that the elastic member can drive the upper locking portion to rotate inward to be engaged with the locking groove; and

when the handle assembly is placed on the base seat, the lower resisting portion is resisted by the base seat to drive the upper locking portion to rotate outward, such that the upper locking portion is disengaged from the locking groove.

Further, the first counterweight part comprises a first dumbbell piece mounting base for fixing the dumbbell pieces thereon, the first dumbbell piece mounting base comprises a first outer baffle;

the second counterweight part comprises a second dumbbell piece mounting base for fixing the dumbbell pieces thereon, the second dumbbell piece mounting base comprises a second outer baffle; and

the second outer baffle is used as the fixed element.

Further, the first dumbbell piece mounting base further comprises a first spacer and a second spacer fixed on an inner side of the first outer baffle, the first spacer and the second spacer are provided with a plurality of first recesses used to separate and limit the dumbbell pieces fixed on the first dumbbell piece mounting base; and

the second dumbbell piece mounting base further comprises a third spacer and a fourth spacer fixed on an inner side of the second outer baffle, the third spacer and the fourth spacer are provided with a plurality of second recesses used to separate and limit the dumbbell pieces fixed on the second dumbbell piece mounting base.

Further, each dumbbell piece further comprises a U-shaped groove extending from the mounting hole but not reaching the edge of the dumbbell piece, the open groove and the U-shaped groove are located at two opposite sides of the mounting hole, a width of the U-shaped groove is less than the diameter of the mounting hole, the open groove corresponds to the first spacer and the third spacer, the U-shaped groove corresponds to the second spacer and the fourth spacer.

According to the weight adjustable dumbbell provided by the present invention, the rotating mechanism is arranged on the outer side of the first counterweight part, and the weight adjustment of the dumbbell is realized through the cooperation of the transmission shaft, the first transmission sleeve and the second transmission sleeve. The operation is very convenient to bring better use experience to the user. In addition, the use of a planetary gear transmission mechanism as the rotating mechanism saves labor during the weight adjustment operation, which can further improve the user's experience.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an isometric, assembled view of a weight adjustable dumbbell according to an embodiment of the present invention.

FIG. **2** is an isometric, exploded view of the weight adjustable dumbbell shown in FIG. **1**.

FIG. **3** is another isometric, exploded view of the weight adjustable dumbbell shown in FIG. **1** (the dumbbell pieces and the base seat are not shown).

FIG. **4** is an isometric, exploded view of the prompt mechanism and the self-locking mechanism in the weight adjustable dumbbell shown in FIG. **1**.

FIG. **5** is an isometric view of the locking member in the self-locking mechanism shown in FIG. **4**.

FIG. **6** is a cross-sectional view of some elements in the weight adjustable dumbbell shown in FIG. **1**.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Specific embodiments of the present invention are described in further detail below in conjunction with the accompanying drawings. The following embodiments are used to illustrate the present invention, but are not used to limit the scope of the present invention.

As shown in FIGS. **1** to **2**, in this embodiment, a weight adjustable dumbbell includes a handle assembly **1** and a base seat **3**, and the base seat **3** is used to place the handle assembly **1**.

As shown in FIGS. **1** to **3**, in this embodiment, the handle assembly **1** includes a handle **11**, a first counterweight part **12** and a second counterweight part **13** respectively arranged at two ends of the handle **11**, an adjusting mechanism **14**, a prompt mechanism **15** and a self-locking mechanism **16**. In this embodiment, the first counterweight part **12** is a counterweight part located on a first end of the handle **11**, and the second counterweight part **13** is a counterweight part located on a second end of the handle **11**. Of course, the first counterweight part **12** may also be a counterweight part located on the second end of the handle **11**, and the second counterweight part **13** is a counterweight part located on the first end of the handle **11**, which may be adjusted according to the design requirements.

The handle **11** includes a handle main portion **110** and a first side plate **114** and a second side plate **115** respectively fixed to two ends of the handle main portion **110** by welding or screws. The handle main portion **110** is a hollow tubular structure, and a plurality of anti-rotation grooves **111** are provided inside the handle main portion **110** and extends axially through the handle **11** (including the first side plate **114** and the second side plate **115**), such that the handle **11** forms a hollow structure.

The first counterweight part **12** includes a first dumbbell piece mounting base **121** and a plurality of dumbbell pieces **122** that can be fixed to the first dumbbell piece mounting base **121**. The first dumbbell piece mounting base **121** includes a first outer baffle **1212** and a first spacer **1213** and a second spacer **1214** fixed on the inner side of the first outer baffle **1212**. The first side plate **114** of the handle **11** is fixed on the inner sides of the first spacer **1213** and the second spacer **1214**. The first spacer **1213** and the second spacer **1214** are provided with a plurality of first recesses **1215** (four in this embodiment) used to separate and limit the dumbbell pieces **122**.

The second counterweight part **13** includes a second dumbbell piece mounting base **131** and a plurality of dumbbell pieces **122** that can be fixed to the second dumbbell piece mounting base **131**. The second dumbbell piece mounting base **131** includes a second outer baffle **1312** and a third spacer **1313** and a fourth spacer **1314** fixed on the inner side of the second outer baffle **1312**. The second side

plate **115** of the handle **11** is fixed on the inner sides of the third spacer **1313** and the fourth spacer **1314**. The third spacer **1313** and the fourth spacer **1314** are provided with a plurality of second recesses **1315** (four in this embodiment) used to separate and limit the dumbbell pieces **122**.

As shown in FIG. **2**, each dumbbell piece **122** has a circular shape, and a mounting hole **1221** is provided in the middle of each dumbbell piece **122**. Two opposite sides of the mounting hole **1221** extend radially outward, such that an open groove **1222** extending from the mounting hole **1221** to the edge of the dumbbell piece **122** is formed on one side of the mounting hole **1221**, and a U-shaped groove **1223** extending from the mounting hole **1221** but not reaching the edge of the dumbbell piece **122** is formed on the other side of the mounting hole **1221**. The open groove **1222** and the U-shaped groove **1223** correspond to the first spacer **1213** (or the third spacer **1313**) and the second spacer **1214** (or the fourth spacer **1314**) respectively, which are used to separate and limit the dumbbell pieces **122** and avoid rotation of the dumbbell pieces **122**. The width of the open groove **1222** and the U-shaped groove **1223** is less than the diameter of the mounting hole **1221**.

As shown in FIG. **3**, the adjusting mechanism **14** includes a planetary gear transmission mechanism **141**, a transmission shaft **142**, a first transmission sleeve **143**, a second transmission sleeve **144**, a planetary gear support **145**, a ring gear support **146** and a first cover **147**.

The planetary gear transmission mechanism **141** is arranged on the outer side of the first counterweight part **12** and includes a ring gear **1411**, a sun gear **1412** and a planetary gear **1413** which are meshed with each other. The ring gear **1411** is used for operating, and the planetary gear **1413** is fixed on the first dumbbell piece mounting base **121** through the planetary gear support **145**. The sun gear **1412** is fixedly connected with the transmission shaft **142**, for example, the sun gear **1412** may be provided with a non-circular mounting hole, and one end of the transmission shaft **142** is inserted into the non-circular mounting hole of the sun gear **1412**, such that the transmission shaft **142** is fixedly connected with the sun gear **1412**. When rotating the ring gear **1411**, the ring gear **1411** can drive the transmission shaft **142** to rotate through the sun gear **1412**. The ring gear **1411** is fixed to the ring gear support **146** by screws. In this embodiment, the planetary gear transmission mechanism **141** serves as a rotating mechanism to drive the transmission shaft **142** to rotate, which is labor-saving and smoother than directly driving the transmission shaft **142** to rotate. Of course, in other embodiments, the transmission shaft **142** may also be directly driven to rotate, or other rotating mechanisms, such as an ordinary gear train, may be used to drive the transmission shaft **142** to rotate.

The first cover **147** is fixed to the ring gear **1411** by screws. The first cover **147** serves as an operating member of the adjusting mechanism **14**, and the ring gear **1411** is driven to rotate by rotating the first cover **147**. Further, a receiving space is formed between the first cover **147** and the ring gear support **146** to receive the planetary gear transmission mechanism **141** therein.

The outer periphery of the first cover **147** is provided with a plurality of scales to indicate the dumbbell weights corresponding to different positions of the first cover **147**. In this embodiment, there are five scale values, which are 5 pounds, 10 pounds, 15 pounds, 20 pounds and 25 pounds. When the scales are located on the top, these scale values respectively represent the weight of no dumbbell piece, two dumbbell pieces, four dumbbell pieces, six dumbbell pieces and eight dumbbell pieces. Of course, the scales may also represent other weight units (such as kilograms), and the scale values may also be set at different quantities (such as 10, 20, etc.). The number of the scale values is also not limited to five, but generally corresponds to the number of the dumbbell pieces. The number of the scale values is equal to the number of the dumbbell pieces on one side plus 1 (because the initial value is the weight without dumbbell pieces).

Of course, in other embodiments, other structures may also be used as the operating member of the adjustment mechanism **14**, such as an operating rod fixed on the ring gear **1411** (of course, it should extend out from the first cover **147**), the scales are still set on the first cover **147** (the first cover **147** does not move), and the dumbbell weight is indicated by shifting the operating rod to the position of a corresponding scale. In this embodiment, the first cover **147** is used as the operating member of the adjusting mechanism **14**, which can reduce components, simplify operation and make the scale be indicated clearer.

The center of the ring gear support **146** is provided with a through hole **1461**, and the ring gear support **146** is sleeved around the outer periphery of the circular planetary gear support **145** by the through hole **1461**, such that the ring gear support **146** can rotate around the planetary gear support **145**.

As shown in FIG. **3** and FIG. **6**, the transmission shaft **142** is a long shaft, which runs through the first counterweight part **12** and the second counterweight part **13**, and its outer diameter at the position corresponding to the dumbbell pieces **122** is less than the width of the open groove **1222** of each dumbbell piece **122**. The first transmission sleeve **143** and the second transmission sleeve **144** are sleeved at two ends of the transmission shaft **142**, and the transmission shaft **142** is meshed with the first transmission sleeve **143** and the second transmission sleeve **144**, such that the transmission shaft **142** can drive the first transmission sleeve **143** and the second transmission sleeve **144** to move axially along the transmission shaft **142**. In this embodiment, the transmission shaft **142** is a screw rod, the first transmission sleeve **143** and the second transmission sleeve **144** are screw nuts respectively, two ends of the screw rod are provided with an external thread **1421**, and the interior of each screw nut is provided with an internal thread **1431** matched with the external thread **1421** (but the thread directions of the two internal threads **1431** are opposite). The transmission shaft **142** drives the first transmission sleeve **143** and the second transmission sleeve **144** to move axially along the transmission shaft **142** through the cooperation of the internal thread **1431** and the external thread **1421**. In other embodiments, other structures may also be used to make the transmission shaft **142** drive the first transmission sleeve **143** and the second transmission sleeve **144** to move axially along the transmission shaft **142**, for example, a spiral groove is cooperated with a projecting pin, but the use of internal and external threads matched with each other in this embodiment is smoother for rotation.

The outer diameter of the first transmission sleeve **143** and the second transmission sleeve **144** is greater than the width of the open groove **1222** but less than the diameter of the mounting hole **1221**. When driven by the transmission shaft **142** to move axially in approaching directions or in opposite directions (since the thread directions of the two internal threads **1431** are opposite), distal ends of the first transmission sleeve **143** and the second transmission sleeve **144** can insert into (when moving in opposite directions) or leave (when moving in approaching directions) the mounting holes **1221** of portion or all of the dumbbell pieces **122**,

to thereby adjust the number of the dumbbell pieces **122** fixed on the first transmission sleeve **143** and the second transmission sleeve **144**, such that the dumbbell pieces **122** are fixed on or detached from the first counterweight part **12** and the second counterweight part **13**, thereby adjusting the weight of the dumbbell (the specific adjusting will be described later).

In this embodiment, the transmission ratio between the ring gear **1411**, the sun gear **1412**, the transmission shaft **142** and the first transmission sleeve **143** and the second transmission sleeve **144** is set by calculation, such that when the ring gear **1411** rotates one turn, each of the first transmission sleeve **143** and the second transmission sleeve **144** moves axially five times the distance between the centers of two adjacent dumbbell pieces **122** (it can also be other multiples, which corresponds to the number of the dumbbell pieces, in this embodiment, the multiple is equal to the number of the dumbbell pieces on one side plus 1). In other embodiments, it is not limited to one turn corresponding to the number of the dumbbell pieces, but other corresponding relationships can also be set, for example, when the ring gear **1411** rotates half turn or ⅔ turn, the first transmission sleeve **143** and the second transmission sleeve **144** each move axially five times the distance between the centers of two adjacent dumbbell pieces **122**. In this embodiment, the setting of one turn corresponding to the number of the dumbbell pieces **122** is easier to operate (the spacing between the five scales is equal) and more convenient (the rotation range is large).

In order to prevent the first transmission sleeve **143** and the second transmission sleeve **144** from rotating with the transmission shaft **142**, the first transmission sleeve **143** and the second transmission sleeve **144** are also provided with an anti-rotation structure, to make the first transmission sleeve **143** and the second transmission sleeve **144** move axially under the driving of the transmission shaft **142** due to the limitation of the anti-rotation structure. In this embodiment, the anti-rotation structure includes anti-rotation strips **1432**, **1442** respectively provided on the outer periphery of the first transmission sleeve **143** and the second transmission sleeve **143**. Through the cooperation between the anti-rotation grooves **111** of the handle **11** and the anti-rotation strips **1432**, **1442**, the first transmission sleeve **143** and the second transmission sleeve **144** are prevented from rotating with the transmission shaft **142**.

An annular groove **1422** is also provided at the middle position of the transmission shaft **142**, the handle **11** is provided with a semicircular stopper **113** fixed to the handle main portion **110** through screws **112** at the position corresponding to the annular groove **1422**, and the semicircular stopper **113** is engaged in the annular groove **1422** of the transmission shaft **142**, such that the transmission shaft **142** can rotate relative to the handle **11** but cannot move axially.

As shown in FIG. **3** and FIG. **4**, the prompt mechanism **15** includes a fixed element (in this embodiment, the second outer baffle **1312** of the second dumbbell piece mounting base **131** is used as the fixed element), an elastic element (in this embodiment, a spring), a ball **152** and a rotating element **153**. The rotating element **153** is fixed to the transmission shaft **142** and rotates with the transmission shaft **142**. The rotating element **153** is a circular plate with a plurality of locking grooves **1532** evenly distributed around a periphery thereof. The rotating element **153** is provided with a plurality of circular holes **1531** (five in this embodiment), and the center of a circle formed by the centers of the circular holes **1531** is located at the axis of the transmission shaft **142**. The fixed element **1312** is fixedly provided with a tube **154** corresponding to the circular hole **1531**, and the ball **152** is installed to the outer end of the tube **154**. The elastic element is received in the tube **154** and located between the ball **152** and the fixed element **1312**, and pushes the ball **152** to move outward from the outer end of the tube **154**, such that the ball **152** is movably installed on the fixed element **1312**. The tube **154** corresponds to the rotation path of the circular holes **1531**, and the ball **152** is located on the circle formed by the centers of the circular holes **1531** (that is, on the rotation path of the circular holes **1531**). A suitable position relationship is set between the ball **152** and the circular holes **1531**, such that when the dumbbell is adjusted to a predetermined weight, the ball **152** is just located at the position of one of the circular holes **1531**, and is pushed by the elastic element to engage into the circular hole **1531**, so as to collide with the rotating element **153** and make a sound to give a prompt to the user.

The self-locking mechanism **16** includes a locking member **161**, an elastic member **162** (a torsion spring in this embodiment) and a mounting member **163**. As shown in FIG. **5**, the locking member **161** includes an upper locking portion **1611** and a lower resisting portion **1612**. The locking member **161** is rotatably mounted on the fixed element **1312** through the mounting member **163** which includes a pin and a retaining ring in this embodiment (of course, other mounting structures may also be adopted). The elastic member **162** is arranged between the locking member **161** and the fixed element **1312**. The locking member **161** and the elastic member **162** are connected with each other, such that the elastic member **162** can drive the upper locking portion **1611** to rotate inward to be engaged with the locking groove **1532** of the rotating element **153**. At this time, the rotating element **153** is locked and cannot rotate, such that the transmission shaft **142** and the first cover **147** also cannot rotate, to ensure that the first cover **147** will not be rotated due to misoperation during the use of the dumbbell, thereby ensuring the operation safety. When the handle assembly **1** is placed on the base seat **3**, the lower resisting portion **1612** is resisted by a protrusion **33** (as shown in FIG. **2**) formed on the base seat **3** to drive the upper locking portion **1611** to rotate outward, such that the upper locking portion **1611** is disengaged from the locking groove **1532** of the rotating element **153**. At this time, the rotating element **153** is released and can rotate, and then the transmission shaft **142** and the first cover **147** also can rotate, such that the weight adjustment operation can be carried out.

The outer side of the prompt mechanism **15** is further provided with a second cover **158** for covering around the various components of the prompt mechanism **15** and the self-locking mechanism **16** to protect these components.

As shown in FIG. **2**, one end of the base seat **3** is provided with a first receiving groove **31** corresponding to the planetary gear transmission mechanism **141** to provide space for accommodating the planetary gear transmission mechanism **141** and for convenient operation, and the other end of the base seat **3** is provided with a second receiving groove **32** corresponding to the prompt mechanism **15** to provide space for accommodating the prompt mechanism **15**.

The following describes how to adjust the weight. When the first transmission sleeve **143** and the second transmission sleeve **144** are in the innermost positions, by lifting the handle assembly **1**, all the dumbbell pieces **122** will remain on the base seat **3**. At this time, the dumbbell weight is 5 pounds, and the 5-pound scale on the first cover **147** is located at the top position. When it is necessary to add to 10 pounds, the first cover **147** is rotated to the 10-pound position (that is, the 10-pound scale is at the top position). At this time, the first cover **147** drives the ring gear **1411** to

rotate, the ring gear **1411** drives the transmission shaft **142** to rotate, and the transmission shaft **142** drives the first transmission sleeve **143** and the second transmission sleeve **144** to move axially outward in opposite directions for a preset distance respectively (the preset distance is the distance between the centers of two adjacent dumbbell pieces). At this time, the first transmission sleeve **143** and the second transmission sleeve **144** are located in the centers of the innermost two dumbbell pieces **122**. When rotating in place, the ball **152** in the prompt mechanism **15** just falls into one of the circular holes **1531** to produce a sound. When the handle assembly **1** is lifted, the innermost two dumbbell pieces **122** are fixed on the handle assembly **1**, while the other dumbbell pieces **122** remain on the base seat **3**. The adjustment of other weights is the same and will not be described repeatedly. The above-described adjusting is to increase the weight. If the user wants to reduce the weight, the first cover **147** is rotated in a reverse direction, and at this time, the first transmission sleeve **143** and the second transmission sleeve **144** move axially inward in approaching directions respectively, such that the first transmission sleeve **143** and the second transmission sleeve **144** leave the centers of the dumbbell pieces **122**, and the dumbbell pieces **122** stay in the base seat **3** when lifting the handle assembly **1**.

Compared with the prior art, according to the weight adjustable dumbbell of this embodiment, the rotating mechanism is arranged on the outer side of the first counterweight part, and the weight adjustment of the dumbbell is realized through the cooperation of the transmission shaft, the first transmission sleeve and the second transmission sleeve. The operation is very convenient to bring better use experience to the user. In addition, the use of the planetary gear transmission mechanism as the rotating mechanism saves labor during the weight adjustment operation, which can further improve the user's experience.

In this description, the azimuth or positional relationship indicated by the terms "up", "down", "front", "back", "left", "right", "top", "bottom", "inside", "outside", "vertical", "horizontal" is based on the azimuth or positional relationship shown in the accompanying drawings, only for the sake of clarity and convenience of description of the technical solution. Therefore, it cannot be understood as a limitation of the present invention.

In this description, the terms "include", "comprise", or any other variation thereof are intended to cover non-exclusive inclusion, including not only those elements listed, but also other elements not explicitly listed.

The above is only the specific embodiments of the present invention, but the protection scope of the present invention is not limited to this. Any person skilled in the technical field can easily think of changes or replacements within the technical scope disclosed by the present invention, which should be covered by the protection scope of the present invention. Therefore, the protection scope of the present invention shall be subject to the appended claims.

What is claimed is:

1. A weight adjustable dumbbell comprising a handle assembly, wherein the handle assembly comprises a handle and a first counterweight part and a second counterweight part respectively arranged at two ends of the handle, each of the first counterweight part and the second counterweight part comprises a plurality of dumbbell pieces, each dumbbell piece comprises a mounting hole and an open groove extending from the mounting hole to an edge of the dumbbell piece, a width of the open groove is less than a diameter of the mounting hole;

the weight adjustable dumbbell further comprises an adjusting mechanism, the adjusting mechanism comprises a rotating mechanism, a transmission shaft, a first transmission sleeve and a second transmission sleeve, the rotating mechanism is arranged on an outer side of the first counterweight part, the rotating mechanism is fixedly connected with the transmission shaft to drive the transmission shaft to rotate;

an outer diameter of the first transmission sleeve and the second transmission sleeve is greater than the width of the open groove but less than the diameter of the mounting hole, the first transmission sleeve and the second transmission sleeve are sleeved on the transmission shaft, and the transmission shaft is meshed with the first transmission sleeve and the second transmission sleeve, such that the transmission shaft can drive the first transmission sleeve and the second transmission sleeve to move axially along the transmission shaft and cause distal ends of the first transmission sleeve and the second transmission sleeve to insert into or leave the mounting holes of a portion of or all of the dumbbell pieces, whereby the dumbbell pieces are fixed on or detached from the first counterweight part and the second counterweight part.

2. The weight adjustable dumbbell according to claim **1**, wherein the transmission shaft is a screw rod, the first transmission sleeve and the second transmission sleeve are screw nuts respectively, two ends of the screw rod are provided with an external thread, an interior of each of the screw nuts is provided with an internal thread matched with the external thread, wherein the thread directions of the two internal threads are opposite.

3. The weight adjustable dumbbell according to claim **1**, wherein a planetary gear transmission mechanism is used as the rotating mechanism, the planetary gear transmission mechanism comprises a ring gear, a sun gear and a planetary gear which are meshed with each other, the ring gear is used for operating, the sun gear is fixedly connected with the transmission shaft, such that the ring gear drives the transmission shaft to rotate through the sun gear.

4. The weight adjustable dumbbell according to claim **3**, wherein the adjusting mechanism further comprises an operating member, the operating member is fixedly connected with the ring gear, such that the ring gear is driven to rotate by rotating the operating member.

5. The weight adjustable dumbbell according to claim **4**, wherein an outer periphery of the operating member is provided with a plurality of scales to indicate the dumbbell weights corresponding to different positions of the operating member.

6. The weight adjustable dumbbell according to claim **3**, wherein when the ring gear rotates one turn, the first transmission sleeve and the second transmission sleeve axially move multiples of a distance between the centers of two adjacent dumbbell pieces.

7. The weight adjustable dumbbell according to claim **1**, wherein the handle is a hollow structure, the transmission shaft, the first transmission sleeve and the second transmission sleeve are located inside the handle.

8. The weight adjustable dumbbell according to claim **7**, wherein the first transmission sleeve and the second transmission sleeve are provided with an anti-rotation structure, such that when driven by the transmission shaft, the first transmission sleeve and the second transmission sleeve can move only axially along the transmission shaft due to the limitation of the anti-rotation structure.

9. The weight adjustable dumbbell according to claim 8, wherein the anti-rotation structure comprises anti-rotation strips respectively provided on an outer periphery of the first transmission sleeve and the second transmission sleeve, the handle is internally provided with anti-rotation grooves, the first transmission sleeve and the second transmission sleeve are prevented from rotating with the transmission shaft through the cooperation between the anti-rotation grooves and the anti-rotation strips.

10. The weight adjustable dumbbell according to claim 9, wherein an annular groove is provided at a middle position of the transmission shaft, a stopper is fixed to the handle, and the stopper is engaged in the annular groove, such that the transmission shaft can rotate relative to the handle but cannot move axially.

11. The weight adjustable dumbbell according to claim 1, wherein the weight adjustable dumbbell further comprises a prompt mechanism arranged on an outer side of the second counterweight part, the prompt mechanism comprises a fixed element, an elastic element, a ball and a rotating element, the rotating element is fixed to the transmission shaft and rotates with the transmission shaft, the rotating element is provided with a plurality of holes, the ball is located on a rotation path of the holes, the ball is pushed by the elastic element and movably installed on the fixed element, when the dumbbell is adjusted to a predetermined weight, the ball is pushed into one of the holes by the elastic element.

12. The weight adjustable dumbbell according to claim 11, wherein the fixed element is fixedly provided with a tube, the ball is installed to an outer end of the tube, the elastic element is received in the tube and located between the ball and the fixed element, and pushes the ball to move outward from the outer end of the tube, such that the ball is movably installed on the fixed element.

13. The weight adjustable dumbbell according to claim 11, wherein the first counterweight part comprises a first dumbbell piece mounting base for fixing the dumbbell pieces thereon, the first dumbbell piece mounting base comprises a first outer baffle;

the second counterweight part comprises a second dumbbell piece mounting base for fixing the dumbbell pieces thereon, the second dumbbell piece mounting base comprises a second outer baffle;

the second outer baffle is used as the fixed element.

14. The weight adjustable dumbbell according to claim 13, wherein the first dumbbell piece mounting base further comprises a first spacer and a second spacer fixed on an inner side of the first outer baffle, the first spacer and the second spacer are provided with a plurality of first recesses used to separate and limit the dumbbell pieces fixed on the first dumbbell piece mounting base;

the second dumbbell piece mounting base further comprises a third spacer and a fourth spacer fixed on an inner side of the second outer baffle, the third spacer and the fourth spacer are provided with a plurality of second recesses used to separate and limit the dumbbell pieces fixed on the second dumbbell piece mounting base.

15. The weight adjustable dumbbell according to claim 14, wherein each dumbbell piece further comprises a U-shaped groove extending from the mounting hole but not reaching the edge of the dumbbell piece, the open groove and the U-shaped groove are located at two opposite sides of the mounting hole, a width of the U-shaped groove is less than the diameter of the mounting hole, the open groove corresponds to the first spacer and the third spacer, the U-shaped groove corresponds to the second spacer and the fourth spacer.

16. The weight adjustable dumbbell according to claim 1, wherein the weight adjustable dumbbell further comprises a base seat for placing the handle assembly and a self-locking mechanism arranged on an outer side of the second counterweight part, the self-locking mechanism comprises a rotating element, a locking member and an elastic member, the rotating element is fixed to the transmission shaft and rotates with the transmission shaft, the rotating element is a circular plate with a plurality of locking grooves distributed around a periphery thereof, the locking member comprises an upper locking portion and a lower resisting portion, the locking member is rotatably mounted on a fixed element, the elastic member is arranged between the locking member and the fixed element, such that the elastic member can drive the upper locking portion to rotate inward to be engaged with the locking groove;

when the handle assembly is placed on the base seat, the lower resisting portion is resisted by the base seat to drive the upper locking portion to rotate outward, such that the upper locking portion is disengaged from the locking groove.

17. The weight adjustable dumbbell according to claim 16, wherein the first counterweight part comprises a first dumbbell piece mounting base for fixing the dumbbell pieces thereon, the first dumbbell piece mounting base comprises a first outer baffle;

the second counterweight part comprises a second dumbbell piece mounting base for fixing the dumbbell pieces thereon, the second dumbbell piece mounting base comprises a second outer baffle;

the second outer baffle is used as the fixed element.

18. The weight adjustable dumbbell according to claim 17, wherein the first dumbbell piece mounting base further comprises a first spacer and a second spacer fixed on an inner side of the first outer baffle, the first spacer and the second spacer are provided with a plurality of first recesses used to separate and limit the dumbbell pieces fixed on the first dumbbell piece mounting base;

the second dumbbell piece mounting base further comprises a third spacer and a fourth spacer fixed on an inner side of the second outer baffle, the third spacer and the fourth spacer are provided with a plurality of second recesses used to separate and limit the dumbbell pieces fixed on the second dumbbell piece mounting base.

19. The weight adjustable dumbbell according to claim 18, wherein each dumbbell piece further comprises a U-shaped groove extending from the mounting hole but not reaching the edge of the dumbbell piece, the open groove and the U-shaped groove are located at two opposite sides of the mounting hole, a width of the U-shaped groove is less than the diameter of the mounting hole, the open groove corresponds to the first spacer and the third spacer, the U-shaped groove corresponds to the second spacer and the fourth spacer.

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