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Landing gear and unmanned aerial vehicle

Abstract

A landing gear and an unmanned aerial vehicle. The landing gear includes: a driving device; a first transmission shaft, connected to the driving device; and a first supporting leg, connected to the first transmission shaft. The driving device is configured to drive the first transmission shaft to rotate about a first direction and a second direction. The first transmission shaft drives the first supporting leg to rotate about the second direction. An included angle between the first direction and the second direction is an acute angle. In this way, when the driving device drives the first transmission shaft to rotate, the landing gear may be retracted or extended.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of International Patent Application No. PCT/CN2022/105442 filed on Jul. 13, 2022; which claims priority to Chinese Patent Application No. 2021108737622, filed on Jul. 30, 2021 and entitled "LANDING GEAR AND UNMANNED AERIAL VEHICLE", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

(1) Embodiments of this disclosure relate to the field of landing gear technologies.

BACKGROUND

(2) An unmanned aerial vehicle is referred to as a UAV for short. The unmanned aerial vehicle is a non-manned aircraft operated by a radio remote control device and a self-contained program control apparatus, or a non-manned aircraft completely or intermittently autonomously operated by an on-board computer. Currently, the unmanned aerial vehicle is widely used in fields such as aerial photography, agriculture, plant protection, micro self-portrait photography, express delivery transportation, disaster relief, wild animal observation, infectious disease surveillance, surveying and mapping, news reporting, power inspection, disaster rescue, and film and television photography. The unmanned aerial vehicle is provided with a landing gear. When the unmanned aerial vehicle lands on the ground or another object, the landing gear supports the unmanned aerial vehicle.

(3) In a process of implementing this disclosure, the applicant of this disclosure found that, at present, the landing gear of the unmanned aerial vehicle is fixed and cannot be retracted. Therefore, it is inconvenient during performing tasks by the unmanned aerial vehicle.

SUMMARY

(4) In view of the above problems, embodiments of this disclosure provide a landing gear and an unmanned aerial vehicle, the problems that the landing gear is fixed and cannot be retracted overcome or at least partially is resolved.

(5) According to an aspect of this disclosure, a landing gear is provided and includes: a driving device; a first transmission shaft, where one end of the first transmission shaft is connected to the driving device; and a first supporting leg, connected to the other end of the first transmission shaft. The driving device is configured to drive the first transmission shaft to rotate about a first direction and a second direction. The first transmission shaft drives the first supporting leg to rotate about the second direction. An included angle between the first direction and the second direction is an acute angle.

(6) According to an aspect in an embodiment of this disclosure, an unmanned aerial vehicle is provided and includes the landing gear.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) One or more embodiments are exemplarily described with reference to the corresponding figures in the accompanying drawings, and the descriptions are not to be construed as limiting the embodiments. Elements in the accompanying drawings that have same reference numerals are

represented as similar elements, and unless otherwise particularly stated, the figures in the accompanying drawings are not drawn to scale.

(2) FIG. **1** is a schematic diagram of an implementation of a landing gear in one direction according to an embodiment of this disclosure;

(3) FIG. **2** is a schematic diagram of an implementation of a landing gear in another direction according to an embodiment of this disclosure;

(4) FIG. **3** is a schematic diagram of a driving device in one direction according to an embodiment of this disclosure;

(5) FIG. **4** is a schematic diagram of a driving device in another direction according to an embodiment of this disclosure;

(6) FIG. **5** is a schematic diagram of another implementation of a landing gear according to an embodiment of this disclosure;

(7) FIG. **6** is a schematic diagram of a first supporting leg according to an embodiment of this disclosure; and

(8) FIG. **7** is a schematic diagram of an unmanned aerial vehicle according to an embodiment of this disclosure.

DETAILED DESCRIPTION

(9) For ease of understanding this disclosure, this disclosure is described in more detail below with reference to the accompanying drawings and specific embodiments. It should be noted that, when a component is expressed as “being fixed to” another component, the component may be directly on the another component, or one or more intermediate components may exist between the component and the another component. When one component is expressed as “being connected to” another component, the component may be directly connected to the another component, or one or more intermediate components may exist between the component and the another component. The terms “vertical”, “horizontal”, “left”, “right”, “inner”, “outside”, and similar expressions used in this specification are merely used for an illustrative purpose.

(10) Unless otherwise defined, all descriptions of technical and scientific terms used herein have the same meaning as commonly understood by a person skilled in the art to which this disclosure belongs. Terms used in specification of this disclosure are merely intended to describe objectives of specific embodiments, but are not intended to limit this disclosure. A term “and/or” used in this specification includes any or all combinations of one or more related listed items.

(11) Refer to FIG. **1** and FIG. **2**. A landing gear **1** comprises a driving device **10**, a first transmission shaft **20**, a first supporting leg **30**, a second transmission shaft **40**, and a second supporting leg **50**. The driving device **10** is connected to one end of the first transmission shaft **20**. The first supporting leg **30** is connected to the other end of the first transmission shaft **20**. The driving device **10** is configured to drive the first transmission shaft **20**. The first transmission shaft **20** drives the first supporting leg **30** to rotate. The driving device **10** is connected to one end of the second transmission shaft **40**. The second supporting leg **50** is connected to the other end of the second transmission shaft **40**. The driving device **10** is configured to drive the second transmission shaft **40**. The second transmission shaft **40** drives the second supporting leg **50** to rotate. In the above manner, when the driving device **10** drives the first transmission shaft **20** to rotate, the first supporting leg **30** of the landing gear **1** rotates. When the driving device **10** drives the second transmission shaft **40** to rotate, the second supporting leg **50** of the landing gear **1** rotates. The first supporting leg **30** or the second supporting leg **50** of the landing gear **1** may be retracted or extended. The landing gear **1** is applied to an unmanned aerial vehicle. When the first supporting leg **30** of the landing gear **1** is retracted, occlusion of the field of view in photography can be reduced and air resistance during flight is reduced. When the first supporting leg **30** of the landing gear **1** is extended, the unmanned aerial vehicle may be assisted to land on the ground to wait. When the second supporting leg **50** of the landing gear **1** is retracted, occlusion of the field of view in photography can be reduced and air resistance during flight is reduced. When the second

supporting leg **50** of the landing gear **1** is extended, the unmanned aerial vehicle may be assisted in landing on the ground. When the first supporting leg **30** and the second supporting leg **50** of the landing gear **1** are retracted synchronously, occlusion of the field of view in photography can be reduced and air resistance during flight is reduced. When the first supporting leg **30** and the second supporting leg **50** of the landing gear **1** are simultaneously lowered and extended, the unmanned aerial vehicle may be assisted in landing stably on the ground.

(12) For the aforementioned driving device **10**, refer to FIG. **3** and FIG. **4**. In some embodiments, the driving device **10** includes a driving assembly **101** and a synchronous wheel **102**. The driving assembly **101** is configured to allow arrangement of an external object. The driving assembly **101** is connected to the synchronous wheel **102**. The driving assembly **101** is configured to drive the synchronous wheel **102** to rotate. One end of the synchronous wheel **102** is connected to one end of the first transmission shaft **20**. When the driving assembly **101** drives the synchronous wheel **102** to rotate, the synchronous wheel **102** drives the first transmission shaft **20** to rotate. The other end of the synchronous wheel **102** is connected to one end of the second transmission shaft **40**. When the driving assembly **101** drives the synchronous wheel **102** to rotate, the synchronous wheel **102** drives the second transmission shaft **40** to rotate.

(13) For the driving assembly **101**, in some embodiments, the driving assembly **101** includes a driving unit **1011**, a driving wheel **1012**, and a synchronous belt **1013**. The driving unit **1011** is configured to allow arrangement of an external object. The driving wheel **1012** is rotatably connected to the driving unit **1011**. The synchronous belt **1013** is looped around the driving wheel **1012** and the synchronous wheel **102**. The driving unit **1011** is configured to drive the driving wheel **1012** to rotate, thereby driving the synchronous wheel **102** to rotate, and then driving the first transmission shaft **20** and the second transmission shaft **40** to rotate.

(14) In some embodiments, the driving device **10** further includes a first bracket **103**, a second bracket **104**, a first bearing **105**, a second bearing **106**, a third bracket **107**, a third bearing **108**, a fourth bracket **109**, and a fourth bearing **110**. The first bracket **103** is provided with a first through hole **1031**. The first bearing **105** is mounted in the first through hole **1031**. The second bracket **104** is provided with a second through hole **1041**. The second bearing **106** is mounted in the second through hole **1041**. The first bearing **105** is configured to be disposed on one end of the first transmission shaft **20**. The second bearing **106** is configured to be disposed on one end of the second transmission shaft **40**. The third bracket **107** is provided with a third through hole **1071**. The third bearing **108** is mounted in the third through hole **1071**. The third bearing **108** is configured to be disposed on the other end of the first transmission shaft **20**. The fourth bracket **109** is provided with a fourth through hole **1091**. The fourth bearing **110** is mounted in the fourth through hole **1091**. The fourth bearing **110** is configured to be disposed on the other end of the second transmission shaft **40**. In other words, the first bracket **103** and the third bracket **107** is configured to dispose the first transmission shaft **20** on an external object. The second bracket **104** and the fourth bracket **109** is configured to dispose the second transmission shaft **40** on an external object.

(15) It is worth noting that the first bracket **103**, the second bracket **104**, the first bearing **105**, the second bearing **106**, the third bracket **107**, the third bearing **108**, the fourth bracket **109**, and the fourth bearing **110** mentioned above may alternatively not be disposed, and functions of the driving device **10** driving the first transmission shaft **20** and the second transmission shaft **40** may also be achieved.

(16) It is worth noting that the driving device **10** is not limited to the foregoing structure, but may also have other implementations. For example, referring to FIG. **5**, the driving device **10** includes two driving cells **101***a*, the two driving cells **101***a* both are configured to allow arrangement of an external object. One driving cell **101***a* is connected to one end of the first transmission shaft **20**, and the other driving cell **101***a* is connected to one end of the second transmission shaft **40**. One driving cell **101***a* is configured to drive the first transmission shaft **20**, and the other driving cell **101***a* is configured to drive the second transmission shaft **40**.

(17) For the first transmission shaft **20** and the first supporting leg **30**, refer to FIG. **2**. One end of the first transmission shaft **20** is connected to the driving device **10**. The other end of the first transmission shaft **20** is connected to the first supporting leg **30**. The first transmission shaft **20** drives the first supporting leg **30** to rotate.
(18) Refer to FIG. **2**. The first transmission shaft **20** is rotatable about a first direction O**1** and a second direction O**2**. The first transmission shaft **20** drives the first supporting leg **30** to rotate about the second direction O**2**. An included angle b**1** between the first direction O**1** and the second direction O**2** is an acute angle.
(19) In some embodiments, an angle range of the acute angle is between 30 and 60 degrees.
(20) It is worth noting that an included angle a**1** between a connection line from one end to the other end of the first supporting leg **20** and the second direction O**2** is greater than zero. In other words, a connection line from one end to the other end of the first supporting leg **20** does not coincide with the second direction O**2**.
(21) When the driving device **10** includes the driving assembly **101** and the synchronous wheel **102**, one end of the synchronous wheel **102** drives the first transmission shaft **20** to rotate about the first direction O**1** and the second direction O**2**.
(22) When the driving device **10** includes one driving cell **101***a*, the driving cell **101***a* drives the first transmission shaft **20** to rotate about the first direction O**1** and the second direction O**2**.
(23) It is worth noting that in some embodiments, the first transmission shaft **20** is a universal shaft.
(24) The first transmission shaft **20** rotates about the first direction O**1** and the second direction O**2**, the driving device **10** drives the first transmission shaft **20** to rotate, and the first transmission shaft **20** drives the first supporting leg **30** to rotate about the second direction O**2**, so that a rotation flexibility of the first supporting leg **30** is good, and the landing gear **1** is applicable in a wide range of scenarios. Because the first transmission shaft **20** has two rotation directions, motion of the first supporting leg **30** relative to the driving device **10** is a three-dimensional spatial motion according to the trajectory when the first transmission shaft **20** drives the first supporting leg **30** to rotate, which is different from a situation in which the first transmission shaft **20** rotates about one single direction to implement retracting or lowering and extending in an inflexible single way, so that the landing gear **1** is applicable in different scenarios.
(25) It may be understood that the first transmission shaft **20** rotates about the first direction O**1** and the second direction O**2**, which is different from user's perception when the first transmission shaft **20** rotates about one single direction.
(26) For the first supporting leg **30**, refer to FIG. **6**. The first supporting leg **30** comprises a first connecting arm **301**, a second connecting arm **302**, and a first connector **303**. One end of the first connecting arm **301** is connected to the other end of the first transmission shaft **20**. The other end of the first connecting arm **301** is connected to one end of the second connecting arm **302**. One end of the first connector **303** is connected to the other end of the first transmission shaft **20**. The other end of the first connector **303** is connected to one end of the first connecting arm **301**. An included angle m**1** between the first connecting arm **301** and the second connecting arm **302** is an obtuse angle. The other end of the second connecting arm **302** is configured to abut against an external object. When the first supporting leg **30** rotates to keep the other end of the second connecting arm **302** away from the first transmission shaft **20**, because the included angle m**1** between the first connecting arm **301** and the second connecting arm **302** is an obtuse angle, the other end of the second connecting arm **302** is close to one end of the first connecting arm **301**, and a structure of the landing gear **1** is compact.
(27) The first connector **303** is disposed between the first transmission shaft **20** and the first connecting arm **301**, and a distance between the first transmission shaft **20** and the first connecting arm **301** may be adjusted by appropriately choosing a size of the first connector **303**, to improve matching of the driving device **10** and the first supporting leg **30** in the landing gear **1**.
(28) It is worth noting that in some embodiments, the first connector **303** may alternatively not be

disposed.
(29) For the second transmission shaft **40** and the second supporting leg **50**, refer to FIG. **2**. One end of the second transmission shaft **40** is connected to the driving device **10**. The other end of the second transmission shaft **40** is connected to the second supporting leg **50**. The second transmission shaft **40** drives the second supporting leg **50** to rotate.
(30) Refer to FIG. **2**. The second transmission shaft **40** is rotatable about a third direction O**3** and a fourth direction O**4**. The second transmission shaft **40** drives the second supporting leg **50** to rotate about the fourth direction O**4**. An included angle b**2** between the third direction O**3** and the fourth direction O**4** is an acute angle.
(31) In some embodiments, an angle range of the acute angle is between 30 and 60 degrees.
(32) It is worth noting that an included angle a**3** between a connection line from one end to the other end of the second supporting leg **50** and the fourth direction O**4** is greater than zero. In other words, a connection line from one end to the other end of the second supporting leg **50** does not coincide with the fourth direction O**4**.
(33) When the driving device **10** includes another driving cell **101***a*, the another driving cell **101***a* drives the second transmission shaft **40** to rotate about the third direction O**3** and the fourth direction O**4**.
(34) When the driving device **10** includes the driving assembly **101** and the synchronous wheel **102**, the other end of the synchronous wheel **102** drives the second transmission shaft **40** to rotate about the third direction O**3** and the fourth direction O**4**. Because one end of the synchronous wheel **102** drives the first transmission shaft **20** to rotate about the first direction O**1** and the second direction O**2**, the other end of the synchronous wheel **102** drives the second transmission shaft **40** to rotate about the third direction O**3** and the fourth direction O**4**. In other words, the driving device **10** drives the first supporting leg **30** and the second supporting leg **50** simultaneously, so that a structure of the landing gear **1** is compact.
(35) It is worth noting that in some embodiments, the first direction O**1** coincides with the third direction O**3**.
(36) In some embodiments, the second direction O**2** and the fourth direction O**4** are symmetrical, so that the driving device **10** simultaneously drives the first supporting leg **30** and the second supporting leg **50** to move synchronously. A movement direction of the first supporting leg **30** and the second supporting leg **50** is the same, so that when the first supporting leg **30** and the second supporting leg **50** are synchronously lowered and extended, the unmanned aerial vehicle may be assisted in landing stably on the ground.
(37) It is worth noting that in some embodiments, the second transmission shaft **40** is a universal shaft.
(38) The second transmission shaft **40** rotates about the third direction O**3** and the fourth direction O**4**, the driving device **10** drives the second transmission shaft **40** to rotate, and the second transmission shaft **40** drives the second supporting leg **50** to rotate about the fourth direction O**4**, so that a rotation flexibility of the second supporting leg **50** is good, and the landing gear **1** is applicable in a wide range of scenarios. Because the second transmission shaft **40** has two rotation directions, motion of the second supporting leg **50** relative to the driving device **10** is a three-dimensional spatial motion according to the trajectory when the second transmission shaft **40** drives the second supporting leg **50** to rotate, which is different from a situation in which the second transmission shaft **40** rotates about one single direction to implement lifting or lowering and extending in an inflexible single way, so that the landing gear **1** is applicable in different scenarios.
(39) It may be understood that the second transmission shaft **40** rotates about the third direction O**3** and the fourth direction O**4**, which is different from user's perception when the second transmission shaft **40** rotates about one single direction.
(40) It may be understood that referring to FIG. **1**, FIG. **3**, and FIG. **4** together, when the driving device **10** includes a first bracket **103**, a second bracket **104**, a first bearing **105**, and a second

bearing **106**, the first bracket **103** and the second bracket **104** is configured to allow arrangement of an external object, one end of the first transmission shaft **20** passes through the first bearing **105** and then is connected to one end of the synchronous wheel **102**, and one end of the second transmission shaft **40** passes through the second bearing **106** and then is connected to the other end of the synchronous wheel **102**. In other words, the first transmission shaft **20** may be disposed on an external object via the first bracket **103**, and the second transmission shaft **40** may be disposed on an external object via the second bracket **104**.

(41) It may be understood that when the driving device **10** includes a third bracket **107** and a third bearing **108**, the other end of the first transmission shaft **20** is fitted in the third bearing **108** and then connected to the first supporting leg **30**. In other words, the first transmission shaft **20** may alternatively be disposed on an external object via the third bracket **107**.

(42) It may be understood that when the driving device **10** includes a fourth bracket **109** and a fourth bearing **110**, the other end of the second transmission shaft **40** is fitted in the fourth bearing **110** and then connected to the second supporting leg **50**. In other words, the second transmission shaft **40** may alternatively be disposed on an external object vis the fourth bracket **109**.

(43) For the second supporting leg **50**, the second supporting leg **50** includes a third connecting arm (not shown), a fourth connecting arm (not shown), and a second connector (not shown). One end of the third connecting arm is connected to the other end of the second transmission shaft **40**. The other end of the third connecting arm is connected to one end of the fourth connecting arm. One end of the second connector is connected to the other end of the second transmission shaft **40**. The other end of the second connector is connected to one end of the third connecting arm. An included angle between the third connecting arm and the fourth connecting arm is an obtuse angle. The other end of the fourth connecting arm is configured to abut against an external object. When the second supporting leg **50** rotates to keep the other end of the fourth connecting arm away from the second transmission shaft **40**, because the included angle between the third connecting arm and the fourth connecting arm is an obtuse angle, the other end of the fourth connecting arm is close to one end of the third connecting arm, and a structure of the landing gear **1** is compact.

(44) The second connector is disposed between the second transmission shaft **40** and the third connecting arm, and a distance between the second transmission shaft **40** and the third connecting arm may be adjusted by appropriately choosing a size of the second connector, to improve matching of the driving device **10** and the first supporting leg **30** in the landing gear **1**.

(45) It is worth noting that in some embodiments, the second connector may alternatively not be disposed.

(46) It is worth noting that the landing gear **1** is also provided with a controller (not shown). The controller is connected to the driving device **10**. The controller is configured to control the driving device **10** to drive the first transmission shaft **20**, and the controller is further configured to control the driving device **10** to drive the second transmission shaft **40**. Program procedures involved in the controller use the existing program procedures. The controller also uses the existing processors, such as an Intel I3 processor, an AMD Ryzen processor, and the like.

(47) In embodiments of this disclosure, a landing gear **1** includes a driving device **10**, a first transmission shaft **20**, and a first supporting leg **30**. One end of the first transmission shaft **20** is connected to the driving device **10**. The other end of the first transmission shaft **20** is connected to the first supporting leg **30**. The driving device **10** is configured to drive the first transmission shaft **20** to rotate about a first direction O**1** and a second direction O**2**. The first transmission shaft **20** drives the first supporting leg **30** to rotate about the second direction O**2**. An included angle b**1** between the first direction O**1** and the second direction O**2** is an acute angle. By using the foregoing manner, when the driving device **10** drives the first transmission shaft **20** to rotate, and the first supporting leg **30** of the landing gear **1** rotates about the second direction O**2**, the first supporting leg **30** of the landing gear **1** may be retracted or extended. The landing gear **1** is used in the unmanned aerial vehicle. When the first supporting leg **30** of the landing gear **1** is retracted,

occlusion of the field of view in photography can be reduced and air resistance during flight is reduced. When the first supporting leg **30** of the landing gear **1** is extended, the unmanned aerial vehicle may be assisted in landing on the ground. In addition, because the first transmission shaft **20** of the landing gear **1** in this disclosure is rotatable about the first direction O**1** and the second direction O**2**, where an included angle b**1** between the first direction O**1** and the second direction O**2** is an acute angle, compared with a case in which the first transmission shaft **20** rotates about one single direction, a rotation flexibility of the first supporting leg **30** of the landing gear **1** in this disclosure is high, so that the landing gear **1** is applicable in a wide range of scenarios. Moreover, because the first transmission shaft **20** has two rotation directions, a motion trajectory of the first supporting leg **30** relative to the driving device **10** is a three-dimensional spatial motion according to the trajectory when the first transmission shaft **20** drives the first supporting leg **30** to rotate, which is different from a situation in which the first transmission shaft **20** rotates about one single direction to implement lifting or lowering and extending in an inflexible single way, so that the landing gear **1** is applicable in different scenarios.

(48) Alternatively, the driving device includes a driving assembly and a synchronous wheel. The driving assembly is connected to the synchronous wheel. One end of the synchronous wheel is connected to one end of the first transmission shaft. The driving assembly is configured to drive the synchronous wheel to rotate. The synchronous wheel drives the first transmission shaft to rotate about the first direction and the second direction.

(49) Alternatively, the landing gear further includes a second transmission shaft and a second supporting leg. The second transmission shaft and the first transmission shaft are oppositely arranged on two sides of the synchronous wheel. One end of the second transmission shaft is connected to the other end of the synchronous wheel. The other end of the second transmission shaft is connected to the second supporting leg. When the driving assembly drives the synchronous wheel to rotate, the synchronous wheel drives the second transmission shaft to rotate about a third direction and a fourth direction, and the second transmission shaft drives the second supporting leg to rotate about the fourth direction. An included angle between the third direction and the fourth direction is an acute angle.

(50) Alternatively, the third direction coincides with the first direction.

(51) Alternatively, the driving device further includes a first bracket, a second bracket, a first bearing, and a second bearing. The first bracket is provided with a first through hole. The first bearing is mounted in the first through hole. The second bracket is provided with a second through hole. The second bearing is mounted in the second through hole. One end of the first transmission shaft passes through the first bearing and then is connected to one end of the synchronous wheel. One end of the second transmission shaft passes through the second bearing and then is connected to the other end of the synchronous wheel.

(52) Alternatively, the driving device further includes a third bracket and a third bearing. The third bracket is provided with a third through hole. The third bearing is mounted in the third through hole. The other end of the first transmission shaft is fitted in the third bearing and then connected to the first supporting leg.

(53) Alternatively, the driving device further includes a fourth bracket and a fourth bearing. The fourth bracket is provided with a fourth through hole. The fourth bearing is mounted in the fourth through hole. The other end of the second transmission shaft is fitted in the fourth bearing and then connected to the second supporting leg.

(54) Alternatively, the driving assembly includes a driving unit, a driving wheel, and a synchronous belt. The driving wheel is rotatably connected to the driving unit. The synchronous belt is looped around the driving wheel and the synchronous wheel. The driving unit is configured to drive the driving wheel to rotate.

(55) Alternatively, the first supporting leg includes a first connecting arm and a second connecting arm. One end of the first connecting arm is connected to the other end of the first transmission

shaft. The other end of the first connecting arm is connected to the second connecting arm. An included angle between the first connecting arm and the second connecting arm is an obtuse angle.
(56) Alternatively, the first supporting leg further includes a first connector. One end of the first connector is connected to the other end of the first transmission shaft. The other end of the first connector is connected to one end of the first connecting arm.
(57) An embodiment of this disclosure further provides an embodiment of an unmanned aerial vehicle. As shown in FIG. **7**, the unmanned aerial vehicle **100** includes the landing gear. A specific structure and functions of the landing gear refer to the above embodiments. Details are not described herein again.
(58) Beneficial effects in embodiments of this disclosure are: A landing gear is provided and includes a driving device, a first transmission shaft, and a first supporting leg. The driving device drives the first transmission shaft to rotate, and the first supporting leg of the landing gear rotates about a second direction and may be retracted or extended. The landing gear is used in the unmanned aerial vehicle. When the first supporting leg of the landing gear is retracted, occlusion of the field of view in photography can be reduced and air resistance during flight is reduced. When the first supporting leg of the landing gear is extended, the unmanned aerial vehicle may be assisted in landing on the ground. In addition, because the first transmission shaft of the landing gear in this disclosure is rotatable about the first direction and the second direction, where an included angle between the first direction and the second direction is an acute angle, compared with a case in which the first transmission shaft rotates about one single direction, a rotation flexibility of the first supporting leg of the landing gear in this disclosure is high, so that the landing gear is applicable in a wide range of scenarios. Moreover, because the first transmission shaft has two rotation directions, motion of the first supporting leg relative to the driving device is a three-dimensional spatial motion according to the trajectory when the first transmission shaft drives the first supporting leg to rotate, which is different from a situation in which the first transmission shaft rotates about one single direction to implement lifting or lowering in an inflexible single way, so that the landing gear is applicable in different scenarios.
(59) In addition, when the landing gear includes the second supporting leg, the synchronous lifting and lowering of the first supporting leg and the second supporting leg may be implemented. The synchronous lifting of the first supporting leg and the second supporting leg may reduce the occlusion during photographing and reduce air resistance of the unmanned aerial vehicle during flight. When the first supporting leg and the second supporting leg are simultaneously lowered, the unmanned aerial vehicle may be assisted in landing stably on the ground.
(60) It should be noted that exemplary embodiments of this disclosure are provided in the specification and accompanying drawings of this disclosure. However, this disclosure may be implemented in many different forms, and is not limited to the embodiments described in the specification. These embodiments are not considered as additional restrictions on the content of this disclosure. The objective of providing these embodiments is to enable a more thorough and comprehensive understanding of the disclosure of this disclosure. Moreover, embodiments that are not listed above formed by combining the foregoing technical features are regarded as falling within the scope of the specification of this disclosure. In addition, for a person of ordinary skill in the art, improvements or modifications may be made according to the above descriptions, and all these improvements and modifications shall fall within the protection scope of the appended claims of this disclosure.

Claims

1. A landing gear, comprising: a driving device; a first transmission shaft, wherein first end of the first transmission shaft is connected to the driving device; and a first supporting leg, connected to the second of the first transmission shaft, wherein the driving device is configured to drive the first

transmission shaft to rotate about a first direction and a second direction, the first transmission shaft drives the first supporting leg to rotate about the second direction, and a first included angle between the first direction and the second direction is an acute angle.

2. The landing gear according to claim 1, wherein the driving device comprises a driving assembly and a synchronous wheel, the driving assembly is connected to the synchronous wheel, a first end of the synchronous wheel is connected to a first end of the first transmission shaft, the driving assembly is configured to drive the synchronous wheel to rotate, and the synchronous wheel drives the first transmission shaft to rotate about the first direction and the second direction.

3. The landing gear according to claim 2, wherein the landing gear further comprises a second transmission shaft and a second supporting leg, the second transmission shaft and the first transmission shaft are oppositely arranged on two sides of the synchronous wheel, a first end of the second transmission shaft is connected to a second end of the synchronous wheel, and a second end of the second transmission shaft is connected to the second supporting leg; and when the driving assembly drives the synchronous wheel to rotate, the synchronous wheel drives the second transmission shaft to rotate about a third direction and a fourth direction, the second transmission shaft drives the second supporting leg to rotate about the fourth direction, and an second included angle between the third direction and the fourth direction is an acute angle.

4. The landing gear according to claim 3, wherein the third direction coincides with the first direction.

5. The landing gear according to claim 3, wherein the driving device further comprises a first bracket, a second bracket, a first bearing, and a second bearing; and the first bracket is provided with a first through hole, the first bearing is mounted in the first through hole, the second bracket is provided with a second through hole, the second bearing is mounted in the second through hole, the first end of the first transmission shaft passes through the first bearing and then is connected to the first end of the synchronous wheel, and the first end of the second transmission shaft passes through the second bearing and then is connected to the second end of the synchronous wheel.

6. The landing gear according to claim 3, wherein the driving device further comprises a third bracket and a third bearing, the third bracket is provided with a third through hole, the third bearing is mounted in the third through hole, and the second end of the first transmission shaft is fitted in the third bearing and then connected to the first supporting leg.

7. The landing gear according to claim 3, wherein the driving device further comprises a fourth bracket and a fourth bearing, the fourth bracket is provided with a fourth through hole, the fourth bearing is mounted in the fourth through hole, and the second end of the second transmission shaft is fitted in the fourth bearing and then connected to the second supporting leg.

8. The landing gear according to claim 2, wherein the driving assembly comprises a driving unit, a driving wheel, and a synchronous belt; the driving wheel is rotatably connected to the driving unit; the synchronous belt is looped around the driving wheel and the synchronous wheel; and the driving unit is configured to drive the driving wheel to rotate.

9. The landing gear according to claim 1, wherein the first supporting leg comprises a first connecting arm and a second connecting arm, a first end of the first connecting arm is connected to the second end of the first transmission shaft, a second end of the first connecting arm is connected to the second connecting arm, and a third included angle between the first connecting arm and the second connecting arm is an obtuse angle.

10. The landing gear according to claim 9, wherein the first supporting leg further comprises a first connector, a first end of the first connector is connected to the second end of the first transmission shaft, and a second end of the first connector is connected to the first end of the first connecting arm.

11. The landing gear according to claim 3, wherein the drive device comprises a first drive cell and a second drive cell, the first drive cell is connected to the first end of the first transmission shaft, the first drive cell is configured to drive the first transmission shaft to rotate, the second drive cell

is connected to the first end of the second transmission shaft, the second drive cell is configured to drive the second transmission shaft to rotate.

12. The landing gear according to claim 3, wherein the second supporting leg comprises a third connecting arm and a fourth connecting arm, a first end of the third connecting arm is connected to the second end of the second transmission shaft, a second end of the third connecting arm connected to a first end of the fourth connecting arm, and an fourth included angle between the first connecting arm and the second connecting arm is an obtuse angle.

13. An unmanned aerial vehicle, comprising a landing gear, wherein the landing gear comprises: a driving device; a first transmission shaft, wherein first end of the first transmission shaft is connected to the driving device; and a first supporting leg, connected to the second of the first transmission shaft, wherein the driving device is configured to drive the first transmission shaft to rotate about a first direction and a second direction, the first transmission shaft drives the first supporting leg to rotate about the second direction, and a first included angle between the first direction and the second direction is an acute angle.

14. The unmanned aerial vehicle according to claim 13, wherein the driving device comprises a driving assembly and a synchronous wheel, the driving assembly is connected to the synchronous wheel, a first end of the synchronous wheel is connected to a first end of the first transmission shaft, the driving assembly is configured to drive the synchronous wheel to rotate, and the synchronous wheel drives the first transmission shaft to rotate about the first direction and the second direction.

15. The unmanned aerial vehicle according to claim 14, wherein the landing gear further comprises a second transmission shaft and a second supporting leg, the second transmission shaft and the first transmission shaft are oppositely arranged on two sides of the synchronous wheel, a first end of the second transmission shaft is connected to a second end of the synchronous wheel, and a second end of the second transmission shaft is connected to the second supporting leg; and when the driving assembly drives the synchronous wheel to rotate, the synchronous wheel drives the second transmission shaft to rotate about a third direction and a fourth direction, the second transmission shaft drives the second supporting leg to rotate about the fourth direction, and an second included angle between the third direction and the fourth direction is an acute angle.

16. The unmanned aerial vehicle according to claim 15, wherein the third direction coincides with the first direction.

17. The unmanned aerial vehicle according to claim 15, wherein the drive device comprise a first drive cell and a second drive cell, the first drive cell is connected to the first end of the first transmission shaft, the first drive cell is configured to drive the first transmission shaft to rotate, the second drive cell is connected to the first end of the second transmission shaft, the second drive cell is configured to drive the second transmission shaft to rotate.

18. The unmanned aerial vehicle according to claim 17, wherein the second supporting leg comprised a third connecting arm and a fourth connecting arm, a first end of the third connecting arm is connected to the second end of the second transmission shaft, a second end of the third connecting arm connected to a first end of the fourth connecting arm, and an fourth included angle between the first connecting arm and the second connecting arm is an obtuse angle.