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CAMERA DEVICE AND ELECTRONIC DEVICE

Abstract

The present application provides a camera device and an electronic device, and the camera device includes a lens module; a focusing drive module including a first casing, a lens barrel, a focusing drive assembly configured to drive the lens barrel to move, and a focusing guide assembly configured to guide the lens barrel to move along a direction of an optical axis of the lens module; and an anti-shake drive module including a second casing, a bracket, an image sensor, an anti-shake drive assembly configured to drive the bracket to move, and an anti-shake guide assembly configured to guide the bracket to move in a direction perpendicular to the optical axis. The lens module, the focusing drive module, and the anti-shake drive module are fixed into one unit. The camera device can effectively ensure the camera quality, is easier to assemble, and can effectively improve the product yield rate.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of International Application No. PCT/CN2024/091430, filed on May 7, 2024, which claims priority to Chinese patent application No. 202410191585.3, filed on Feb. 20, 2024, and Chinese patent application No. 202410516839.4, filed on Apr. 26, 2024. The entire contents of these applications are incorporated herein by reference in their entirety.

TECHNICAL FIELD
[0002] The present application relates to the field of camera devices, in particular to a camera device and an electronic device.
BACKGROUND
[0003] In the related art, common handheld optical products such as digital cameras, camcorders, and smartphones utilize optical systems composed of optical lens modules combined with imaging drive modules. Besides featuring autofocus functionality, the imaging drive module also incorporates image stabilization due to the susceptibility of handheld optical products to external forces during focusing or photography, such as shaking caused by handheld operation, vehicle movement, or environmental factors, leading to image blurring or lack of clarity. Consequently, the imaging drive module often includes image stabilization features. Given its integration of multiple functions, the structure of the imaging drive module is complex, including numerous components assembled together. As a result, the assembly process of the imaging drive module is intricate, and any slight oversight can easily result in improper assembly of handheld optical products, thereby affecting product yield.
[0004] Therefore, it is necessary to provide a camera device and an electronic device that offer clear imaging, easy assembly, and high product yield.
SUMMARY
[0005] An object of the present application is to provide a camera device and an electronic device to solve the technical problems of unclear imaging, difficult assembly and low product yield of the camera device in the related art.
[0006] The technical solution of the present application is as follows.
[0007] In a first aspect, the present application provides a camera device comprising: [0008] a lens module; [0009] a focusing drive module comprising:
[0010] a first casing;
[0011] a lens barrel accommodated in the first casing and fixed with the lens module;
[0012] a focusing drive assembly; the focusing drive assembly being connected to the first casing and the lens barrel for driving the lens barrel to move with respect to the first casing, and comprising a focusing magnetic steel and a focusing coil that are arranged correspondingly, wherein the focusing magnetic steel is fixed to the first casing, and the focusing coil is fixed to the lens barrel; and

[0013] a focusing guide assembly confined between the first casing and the lens barrel for guiding the lens barrel in a direction of an optical axis of the lens module; and [0014] an anti-shake drive module comprising:
[0015] a second casing;
[0016] a bracket accommodated in the second casing and fixed with the image sensor;
[0017] an image sensor;
[0018] an anti-shake drive assembly connected to the second casing and the bracket for driving the bracket to move with respect to the second casing; and an anti-shake guide assembly confined between the second casing and the bracket for guiding the bracket in a direction perpendicular to the optical axis of the lens module; [0019] wherein the lens module, the focusing drive module, and the anti-shake drive module are sequentially fixed into one unit.
[0020] In one embodiment, the anti-shake drive module comprises a planar first circuit board partially accommodated in the second casing; the first circuit board is fixed to a side of the bracket away from the lens module, and a first mounting hole is provided in a middle of the first circuit board; the image sensor is fixed in the first mounting hole, and the image sensor and the anti-shake drive assembly are electrically connected to the first circuit board.
[0021] In one embodiment, the first circuit board comprises a first circuit board body provided with the first mounting hole, a circuit board fixing portion elastically connected to an outside of the first circuit board body, and a first electrical connection portion fixed to the circuit board fixing portion; the first circuit board body and the circuit board fixing portion are accommodated in the second casing, and the first circuit board body is fixed to the bracket; the circuit board fixing portion is fixed to the second casing, and the first electrical connection portion is extended out of the second casing; the first circuit board further comprises a plurality of avoiding spaces that are symmetrically arranged, wherein the avoiding spaces are formed between the first circuit board body and the circuit board fixing portion; a side of the bracket facing the first circuit board is provided with anti-collision tabs arranged one-to-one with the avoiding spaces; each of the anti-collision tabs is arranged through one of the avoiding spaces correspondingly, and the bracket further comprises an anti-collision surface parallel to the direction of the optical axis.
[0022] In one embodiment, there are a plurality of the anti-shake guide assemblies, and each of the anti-shake guide assemblies is confined between the second casing and the bracket, and comprises a first ball and two support pieces; wherein the two support pieces are abutted against opposite ends of the first ball along the direction of the optical axis, respectively; one of the support pieces is also abutted against the second casing, and the other of the support pieces is also abutted against the bracket.
[0023] In one embodiment, there are a plurality of the anti-shake drive assemblies, and each of the anti-shake drive assemblies is connected to the second casing and bracket, and comprises an anti-shake magnetic steel and an anti-shake coil that are arranged correspondingly; wherein the anti-shake magnetic steel is fixed to the second casing, and the anti-shake coil is fixed to the bracket and electrically connected to the first circuit board; the anti-shake drive module further comprises anti-shake magnetic yokes arranged in correspondence with the anti-shake drive assemblies, wherein the anti-shake magnetic yokes are fixed to the bracket.
[0024] In one embodiment, the anti-shake drive module further comprises a second circuit board; the second circuit board is fixed between the anti-shake coil and the bracket, and the anti-shake coil is electrically connected to the first circuit board through the second circuit board.
[0025] In one embodiment, there are a plurality of the focusing guide assemblies; each of the focusing guide assemblies is confined between the first casing and the lens barrel, and comprises a plurality of second balls arranged sequentially along the direction of the optical axis.
[0026] In one embodiment, there are three second balls, and a diameter of the second ball located in the middle is smaller than diameters of two second balls located on both sides.
[0027] In one embodiment, there are a plurality of the focusing drive assemblies; each of the

focusing drive assemblies is connected to the first casing and lens barrel respectively; the focusing drive module further comprises a focusing magnetic yoke arranged in correspondence with the focusing drive assemblies, wherein the focusing magnetic yoke is fixed to the lens barrel.
[0028] In one embodiment, the first casing comprises a first shell and a base inserted within the first shell, and the focusing drive module further comprises an elastic member and a third circuit board; the elastic member is connected to the base and lens barrel; a conductive insert is embedded in the base, and the focusing coil is electrically connected to the third circuit board through the elastic member and the conductive insert in turn.
[0029] In one embodiment, the second casing comprises a second shell and a base covered on a side of the second shell away from the focusing drive module; a convex portion is formed by extending outwardly from an edge of the base, and an edge of the second shell is formed with a concave portion for accommodating the convex portion; the convex portion and the concave portion are fixed together by laser welding, and a gap between the second shell and the base is glued and sealed.
[0030] In one embodiment, the second casing is provided with a second mounting hole for cooperating with the lens module, and a lower end of the first casing is formed with a limiting tab inserted in the second mounting hole.
[0031] In one embodiment, the anti-shake guide assembly is further configured to guide the bracket to rotate on an axis of the optical axis in a plane perpendicular to the optical axis.
[0032] In a second aspect, the present application provides an electronic device comprising a device body and any one of the above-mentioned camera devices, wherein the camera device is provided on the device body.
[0033] The beneficial effect of the present application is that the camera device and the electronic device of the present application are provided with a focusing guide assembly for guiding the lens barrel to move along a direction of an optical axis of the lens module, and an anti-shake guiding assembly for guiding the bracket to move along a direction perpendicular to the direction of the optical axis of the lens module, so as to effectively limit the movement direction of the lens barrel and the image sensor, thereby realizing anti-shake and effectively ensuring the camera quality. Furthermore, the lens module, the focusing drive module, and the anti-shake drive module are three independent modules. When assembling, each module is assembled separately, and then the three modules are assembled together, which reduces the difficulty of assembling and is easier to assemble, thereby effectively improving the product yield rate.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0034] FIG. **1** shows a structural schematic diagram of a camera device of the present application.
[0035] FIG. **2** shows a structural schematic diagram of the camera device shown in FIG. **1**.
[0036] FIG. **3** shows a schematic cross-sectional view along line A-A of FIG. **2**.
[0037] FIG. **4** shows an exploded view of the camera device shown in FIG. **1**.
[0038] FIG. **5** shows an exploded view of the camera device shown in FIG. **1**.
[0039] FIG. **6** shows an exploded view of a focusing drive module in the camera device shown in FIG. **1**.
[0040] FIG. **7** shows a structural schematic diagram of a lens barrel in the camera device shown in FIG. **1**.
[0041] FIG. **8** shows a structural schematic diagram of the focusing drive module in the camera device shown in FIG. **1** with a first casing removed.
[0042] FIG. **9** shows a structural schematic diagram of the focusing drive module in the camera device shown in FIG. **1** with the first casing removed.

[0043] FIG. **10** shows a schematic cross-sectional view along line B-B of FIG. **9**.
[0044] FIG. **11** is a schematic diagram showing the positional relationship among a focusing drive assembly, a focusing guide assembly, and a focusing magnetic yoke in the camera device shown in FIG. **1**.
[0045] FIG. **12** is an exploded view of an anti-shake drive module in the camera device shown in FIG. **1**.
[0046] FIG. **13** shows an exploded view of the anti-shake drive module in the camera device shown in FIG. **1**.
[0047] FIG. **14** shows a structural schematic diagram of the anti-shake drive module in the camera device shown in FIG. **1** with the second casing and the anti-shake magnetic steel removed.
[0048] FIG. **15** shows a schematic assembly diagram of the bracket and the anti-shake magnetic yoke in the camera device shown in FIG. **1**.
[0049] FIG. **16** shows a structural schematic diagram of a first circuit board in the camera device shown in FIG. **1**.
[0050] FIG. **17** shows an exploded view of the camera device of the present application with the lens module removed.
[0051] FIG. **18** shows an exploded view of the camera device shown in FIG. **17** with the lens module removed.
[0052] FIG. **19** shows an exploded view of the focusing drive module of the camera device shown in FIG. **17**.
[0053] FIG. **20** shows a structural schematic diagram of a base in the camera device shown in FIG. **17**.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0054] The present application is further described below in conjunction with the accompanying drawings and embodiments.
[0055] An embodiment of the present application provides a camera device **10**, including a lens module **1**, a focusing drive module **2**, and an anti-shake drive module **3**. The lens module **1**, the focusing drive module **2**, and the anti-shake drive module **3** are arranged sequentially along a direction of an optical axis and are fixed into a single unit in sequence, as shown in FIGS. **1** to **5**. The focusing drive module **2** includes a first casing **201**, a lens barrel **202**, a focusing drive assembly **203**, and a focusing guide assembly **204**. The lens barrel **202** is accommodated in the first casing **201**, and the lens barrel **202** is fixed with the lens module **1**. The focusing drive assembly **203** is connected to the first casing **201** and the lens barrel **202**, and the focusing drive assembly **203** is configured to drive the lens barrel **202** to move relative to the first casing **201**. The focusing drive assembly **203** includes a focusing magnetic steel **2031** and a focusing coil **2032** that are arranged correspondingly. The focusing magnetic steel **2031** is fixed to the first casing **201**, and the focusing coil **2032** is fixed to the lens barrel **202**. A focusing guide assembly **204** is confined between the first casing **201** and the lens barrel **202**, and the focusing guide assembly **204** is configured to guide the lens barrel **202** to move in the direction of the optical axis of the lens module **1**. The anti-shake drive module **3** includes a second casing **301**, a bracket **302**, an image sensor **303**, an anti-shake drive assembly **304**, and an anti-shake guide assembly **305**. The bracket **302** is accommodated in the second casing **301**, and the bracket **302** is fixed with the image sensor **303**. The anti-shake drive assembly **304** is connected to the second casing **301** and the bracket **302**, and the anti-shake drive assembly **304** is configured to drive the bracket **302** to move relative to the second casing **301**. The anti-shake guide assembly **305** is confined between the second casing **301** and the bracket **302**, and the anti-shake guide assembly **305** is configured to guide the bracket **302** to move in a direction perpendicular to the optical axis of the lens module **1**.
[0056] In the embodiment of the present application, as shown in FIGS. **6** and **12**, the camera device **10** is provided with a focusing guide assembly **204** configured to guide the lens barrel **202** to move in the direction of the optical axis of the lens module **1**, and the anti-shake guide assembly

305 is configured to guide the bracket **302** to move in the direction perpendicular to the optical axis of the lens module **1**, so as to effectively limit the movement direction of the lens barrel **202** and the image sensor **303**, thereby realizing anti-shake and effectively ensuring the camera quality. Furthermore, the lens module **1**, the focusing drive module **2**, and the anti-shake drive module **3** are three independent modules. When assembling, each module is assembled separately, and then the three modules are assembled together, which reduces the difficulty of assembling and makes it easier to assemble, thereby effectively improving the product yield rate.

[0057] In this embodiment, the focusing guide assembly **204** for guiding the lens barrel **202** to move in the direction of the optical axis of the lens module **1** may be that the focusing guide assembly **204** guides the lens barrel **202** to move in the direction of the optical axis of the lens module **1**.

[0058] In this embodiment, the anti-shake guide assembly **305** for guiding the bracket **302** to move in the direction perpendicular to the optical axis of the lens module **1** may be that the anti-shake guide assembly **305** guides the bracket **302** to move in the direction perpendicular to the optical axis of the lens module **1**. Additionally, the anti-shake guide assembly **305** may also be configured to guide the bracket **302** to rotate on an axis of the optical axis in a plane perpendicular to the optical axis. In some embodiments, the anti-shake drive module **3** further includes a first circuit board **306**. As shown in FIGS. **12** and **13**, the first circuit board **306** is in a planar shape, which can effectively reduce the thickness of the anti-shake drive module **3** as well as the camera device **10**, and thus effectively reduce the size of the camera device **10**. Moreover, the first circuit board **306** is partially accommodated in the second casing **301**, the first circuit board **306** is fixed to a side of the bracket **302** away from the lens module **1**, and a first mounting hole **3061** is opened in the middle of the first circuit board **306**. The image sensor **303** is fixed in the first mounting hole **3061**, and the image sensor **303** and the anti-shake drive assembly **304** are electrically connected to the first circuit board **306**.

[0059] In some embodiments, the first circuit board **306** may be a Flexible Printed Circuit (FPC), which is easier to assemble.

[0060] In some embodiments, as shown in FIGS. **12** and **13**, the first circuit board **306** includes a first circuit board body **3062**, a circuit board fixing portion **3063**, and a first electrical connection portion **3064**. The first mounting hole **3061** is provided in the first circuit board body **3062**. The circuit board fixing portion **3063** is elastically connected to the outside of the first circuit board body **3062**. The first electrical connection portion **3064** is fixed to the circuit board fixing portion **3063**. The first circuit board body **3062** and the circuit board fixing portion **3063** are accommodated in the second casing **301**, and the first circuit board body **3062** is fixed to the bracket **302**. The circuit board fixing portion **3063** is fixed to the second casing **301**, and the first electrical connection portion **3064** is extended out of the second casing **301**.

[0061] In some embodiments, the first circuit board **306** further includes a frame-shaped elastic connection portion **3066**. The elastic connection portion **3066** is elastically connected to the first circuit board body **3062** and the circuit board fixing portion **3063**, such that the first circuit board body **3062** can be moved in a plane perpendicular to the direction of the optical axis, thereby driving the image sensor **303** to move.

[0062] As an example, as shown in FIG. **16**, the elastic connection portion **3066** may include two sets of first elastic edges **30661** and two sets of second elastic edges **30662**. The two sets of first elastic edges **30661** are arranged correspondingly, and each set of the first elastic edges **30661** is connected to the first circuit board body **3062** through a first connecting arm **3067**. The two sets of second elastic edges **30662** are arranged correspondingly, and each set of second elastic edges **30662** is connected to the circuit board fixing portion **3063** through a second connecting arm **3068**, such that the first circuit board body **3062** can be moved in the plane perpendicular to the direction of the optical axis with respect to the circuit board fixing portion **3063**, thereby driving the image sensor **303** to move.

[0063] In some embodiments, each set of first elastic edges **30661** may include a plurality of first elastic edges **30661** provided in parallel, and each set of second elastic edges **30662** may include a plurality of second elastic edges **30662** provided in parallel, so as to ensure the strength and the restoring force of the elastic connection portion **3066**. For example, as shown in FIG. **16**, each set of first elastic edges **30661** may include two first elastic edges **30661** provided in parallel, and each set of second elastic edges **30662** may include two second elastic edges **30662** provided in parallel.
[0064] In some embodiments, as shown in FIGS. **12** and **13**, the first circuit board **306** is further provided with a plurality of avoiding spaces **3065**. All of the avoiding spaces **3065** are arranged symmetrically, and each of the avoiding spaces **3065** is formed between the first circuit board body **3062** and the circuit board fixing portion **3063**. Accordingly, as shown in FIG. **15**, the bracket **302** is provided with anti-collision tabs **3021**, which are formed on a side of the bracket **302** facing the first circuit board **306** and arranged one-to-one with the avoiding spaces **3065**. Each anti-collision tab **3021** is arranged through the corresponding avoiding space **3065**, thereby preventing the first circuit board **306** and the image sensor **303** from colliding with the second casing **301** along the direction of the optical axis, and effectively protecting the first circuit board **306** and the image sensor **303**.
[0065] In some embodiments, as shown in FIG. **15**, in order to further protect the first circuit board **306** and the image sensor **303**, the bracket **302** is further provided with a collision surface **3022** parallel to the direction of the optical axis, and the collision surface **3022** avoids the first circuit board **306** and the image sensor **303** from colliding with the second casing **301** along the direction perpendicular to the direction of the optical axis, thereby effectively protecting the first circuit board **306** and the image sensor **306** and the image sensor **303**.
[0066] In this embodiment, as shown in FIG. **15**, the bracket **302** is provided with the anti-collision tabs **3021** and the anti-collision surface **3022**, which can protect the first circuit board **306** and the image sensor **303** in an all-round way, thereby avoiding the first circuit board **306** and the image sensor **303** from colliding with the second casing **301**, and effectively improving the service life of the camera device **10**.
[0067] In some embodiments, there are a plurality of anti-shake guide assemblies **305**. Each anti-shake guide assembly **305** is confined between the second casing **301** and the bracket **302**, and each anti-shake guide assembly **305** includes a first ball **3051** and two support pieces **3052**, as shown in FIG. **3**. The two support pieces **3052** are abutted against opposite ends of the first ball **3051** along the direction of the optical axis, respectively. One of the support pieces **3052** is also abutted against the second casing **301**, and the other of the support pieces **3052** is also abutted against the bracket **302**, thereby effectively protecting the second casing **301** and the bracket **302** from wear and tear after a long period of time, and effectively improving the service life of the camera device **10**.
[0068] In some embodiments, the bracket **302** is formed with a first limit cylinder **3023**, as shown in FIGS. **3** and **14**. One of the support pieces **3052** is provided in the first limit cylinder **3023**, and the first ball **3051** is also accommodated in the first limit cylinder **3023**, thereby effectively limiting the support piece **3052** and the first ball **3051**. Accordingly, the second casing **301** is formed with a second limit cylinder **30111**, and the other of support pieces **3052** is provided in the second limit cylinder **30111**, thereby effectively limiting the support piece **3052**, ensuring the stability of the structure of the anti-shake drive module **3**, and avoiding random movement of the support piece **3052** and the first ball **3051**.
[0069] In some embodiments, the support piece **3052** may be made of ceramic material. The first ball **3051** may also be made of ceramic material. It should be understood that in other embodiments, the support pieces **3052** and/or the first ball **3051** may also be made of other materials.
[0070] In some embodiments, there are a plurality of anti-shake drive assemblies **304**. Each anti-shake drive assembly **304** is connected to the second casing **301** and the bracket **302**, and each anti-shake drive assembly **304** includes an anti-shake magnetic steel **3041** and an anti-shake coil **3042**

that are arranged correspondingly, as shown in FIG. **3**. The anti-shake magnetic steel **3041** is fixed to the second casing **301**. The anti-shake coil **3042** is fixed to the bracket **302**, and the anti-shake coil **3042** is electrically connected to the first circuit board **306**. The anti-shake drive module **3** further includes an anti-shake magnetic yoke **307**, which is arranged correspondingly with the anti-shake drive assembly **304**. The anti-shake magnetic yoke **307** is fixed to the bracket **302**, and the anti-shake magnetic yoke **307** and the anti-shake magnetic steel **3041** are magnetically adsorbed, so that the anti-shake guide assembly **305** is abutted between the bracket **302** and the second casing **301**, and ensures that the bracket **302** and the second casing **301** can be matched with each other to press the anti-shake guide assembly **305**. The anti-shake magnetic yoke **307** may also provide a restoring force, to allow the bracket **302** to have a reset function.

[0071] In some embodiments, a first limit portion **3024** is formed on the bracket **302**, as shown in FIG. **14**. The first limit portion **3024** is arranged in one-to-one correspondence with the anti-shake coil **3042**. During assembly, the anti-shake coil **3042** can be sleeved in the first limit portion **3024**, so as to quickly and accurately locate the anti-shake coil **3042** onto the bracket **302**.

[0072] As an example, each first limit portion **3024** may include a plurality of limit posts that are spaced apart, as shown in FIG. **14**. The anti-shake coil **3042** is sleeved in all of the limit posts, thereby positioning the anti-shake coil **3042** onto the bracket **302**.

[0073] It should be understood that in other embodiments, the first limit portion **3024** may also be made of other structures.

[0074] In some embodiments, the anti-shake coil **3042** and the anti-shake magnetic yoke **307** may be provided at opposite ends of the bracket **302** along the direction of the optical axis, respectively, as shown in FIGS. **14** and **15**, which not only ensures an effective fit of the anti-shake coil **3042** and the anti-shake magnetic yoke **307** with the anti-shake magnetic steel **3041**, but also prevents the detachment of the anti-shake magnetic yoke **307** from the bracket **302** caused by the magnetic attraction between the anti-shake magnetic yoke **307** and the anti-shake magnetic yoke **3041**.

[0075] In some embodiments, as shown in FIG. **15**, a third mounting hole **3025** may be provided on a side of the bracket **302** back away from the anti-shake coil **3042**. The third mounting hole **3025** may be configured to mount the anti-shake magnetic yoke **307** so as to quickly and efficiently locate and limit the anti-shake magnetic yoke **307** to the bracket **302**.

[0076] In some embodiments, the anti-shake drive module **3** further includes a second circuit board **308**, as shown in FIG. **14**. The second circuit board **308** is fixed between the anti-shake coil **3042** and the bracket **302**. The anti-shake coil **3042** is electrically connected to the first circuit board **306** through the second circuit board **308**. By electrically connecting the anti-shake coil **3042** and the first circuit board **306** located on the opposite side of the bracket **302** through the second circuit board **308**, it makes wiring easier and makes the electrical connection relationship more stable.

[0077] In some embodiments, the second circuit board **308** may include a second circuit board body **3081** and a second electrical connection portion **3082**, as shown in FIG. **14**. The second circuit board body **3081** is in the shape of a frame. The second electrical connection portion **3082** extends from the second circuit board body **3081** toward the first circuit board **306**. The second electrical connection portion **3082** can be configured to electrically connect to the first circuit board body **3062**, which not only has a simple structure and facilitates the connection, but also ensures the stability of the electrical connection relationship between the second circuit board **308** and the first circuit board **306**.

[0078] In some embodiments, the second circuit board body **3081** is in a planar shape, which can effectively reduce the thickness of the anti-shake drive module **3** and the camera device **10**, thereby effectively reducing the size of the camera device **10**.

[0079] In some embodiments, the second circuit board **308** may be a Flexible Printed Circuit (FPC), which is more convenient for assembly.

[0080] In some embodiments, the anti-shake drive module **3** further includes an anti-shake drive chip. The anti-shake drive chip can control the current of the anti-shake coil **3042**. As an example,

the anti-shake drive chip may be fixed to and electrically connected to the second circuit board **308**.
[0081] In this embodiment, the anti-shake magnetic steel **3041** is fixed to the second casing **301**. The anti-shake coil **3042**, the anti-shake magnetic yoke **307**, and the anti-shake drive chip are all fixed to the bracket **302**. That is, the anti-shake coil **3042**, the anti-shake magnetic yoke **307**, the anti-shake drive chip, and the bracket **302** may move together.
[0082] It should be understood that in other embodiments, the anti-shake drive chip may also be fixed to and electrically connected to the first circuit board **306**.
[0083] In some examples, the model number of the anti-shake drive chip may be AK7323.
[0084] In some embodiments, there are a plurality of focusing guide assemblies **204**. As shown in FIG. **10**, each focusing guide assembly **204** is confined between the first casing **201** and the lens barrel **202**, and includes a plurality of second balls **2041** arranged sequentially along the direction of the optical axis. Each second ball **2041** is confined between the first casing **201** and the lens barrel **202**, and may roll in the direction of the optical axis.
[0085] In some embodiments, the second ball **2041** may be made of ceramic material. In other embodiments, the second ball **2041** may also be made of other materials.
[0086] As an example, all of the second balls **2041** may have equal diameters. Alternatively, the diameters of the second balls **2041** may not be equal. For example, as shown in FIG. **10**, each focusing guide assembly **204** includes three second balls **2041**. Two second balls **2041** on both sides have equal diameters, and the diameter of the second ball **2041** in the middle is smaller than the diameters of the two second balls **2041** on both sides, which not only prevents the second ball **2041** in the middle from interfering with the two second balls **2041** on both sides, but also makes the overall structure more stable.
[0087] In this embodiment, the first casing **201** is provided with a first limit groove **221**, which extends in the direction of the optical axis. The lens barrel **202** is provided with a second limit groove **2021**, which extends in the direction of the optical axis. The first limit groove **20121**, the second limit groove **2021**, and the focusing guide assembly **204** are provided in one-to-one correspondence. The correspondingly provided first limit groove **20121** and second limit groove **2021** are connected together to form a limit channel **205**, and the limit channel **205** extends in the direction of the optical axis. The focusing guide assembly **204** is limited between the corresponding first limit groove **20121** and the second limit groove **2021**. That is to say, the focusing guide assembly **204** is limited within the corresponding limit channel **205**, as shown in FIG. **10**, so as to ensure that the focusing guide assembly **204** can guide the lens barrel **202** to move along the direction of the optical axis of the lens module **1**.
[0088] In some embodiments, there are a plurality of focusing drive assemblies **203**. Each focusing drive assembly **203** is connected to the first casing **201** and the lens barrel **202**.
[0089] In some embodiments, the focusing drive module **2** further includes a focusing magnetic yoke **206** arranged correspondingly with the focusing drive assembly **203**. The focusing magnetic yoke **206** is fixed to the lens barrel **202**, and the focusing magnetic yoke **206** and the focusing magnetic steel **2031** are magnetically adsorbed, so that the focusing guide assembly **204** is abutted between the lens barrel **202** and the first casing **201**, ensuring that the lens barrel **202** and the first casing **201** can cooperate with each other to compress the focusing guide assembly **204**. Besides, the focusing magnetic yoke **206** can also provide a restoring force, enabling the lens barrel **202** to have a reset function.
[0090] In this embodiment, a second limit portion **2022** is formed on an outer side of the lens barrel **202**, as shown in FIG. **3**. The second limit portion **2022** is provided in one-to-one correspondence with the focusing coil **2032**. During assembly, the focusing coil **2032** can be sleeved in the second limit portion **2022** so as to quickly and accurately position the focusing coil **2032** onto the lens barrel **202**.
[0091] As an example, the second limit portion **2022** may be in a strip-like structure as shown in FIG. **6**, or the second limit portion **2022** may be in other structures.

[0092] In some embodiments, the focusing magnetic yoke **206** may be embedded in the lens barrel **202**, which not only effectively reduces the size of the focusing drive module **2** and the camera device **10**, but also enhances the strength of the lens barrel **202**, and prevent the detachment of the focusing magnetic yoke **206** from the lens barrel **202** caused by the magnetic attraction between the focusing magnetic yoke **206** and the focusing magnetic steel **2031**.
[0093] In some embodiments, the first casing **201** includes a first shell **2011** and a base **2012** inserted in the first shell **2011**, and the focusing drive module **2** further includes an elastic member **207** and a third circuit board **208**. As shown in FIGS. **8-9**, the elastic member **207** is connected to the base **2012** and the lens barrel **202**. The base **2012** is embedded with electrically conductive inserts. The electrically conductive insert not only plays the role of electrical connection, which can make the overall structure more compact, but also improve the strength of the base **2012**, thereby effectively improving the service life of the camera device **10**. The focusing coil **2032** is electrically connected to the third circuit board **208** through the elastic member **207** and the conductive insert in turn, and the third circuit board **208** can be fixed to the base **2012**. The elastic member **207** not only enables the lens barrel **202** to move more stably along the direction of the optical axis, but also facilitates the reset of the lens barrel **202**. Besides, the elastic member **207** can play a role in electrically connecting the conductive insert and the focusing coil **2032**, making the overall structure more compact.
[0094] In some embodiments, as shown in FIG. **8**, the base **2012** is provided with first support columns **20122** extending toward the inside of the first shell **2011**, and the focusing magnetic steel **2031** may be arranged between two adjacent first support columns **20122**, so as to effectively limit the focusing magnetic steel **2031** by the first support columns **20122**, avoiding the focusing magnetic steel **2031** from moving relative to the first casing **201**. In some embodiments, the third circuit board **208** may be a Flexible Printed Circuit (FPC), which is easier to assemble.
[0095] In this embodiment, the first limit groove **20121** is provided in the base **2012**. As an example, the first limit groove **20121** may be arranged in the first support column **20122**. A side of the first limit groove **20121** close to the anti-shake drive module **3** is formed with a first limit rib **20123**, and a side of the second limit groove **2021** away from the anti-shake drive module **3** is formed with a second limit rib **2023**. The first limit rib **20123** and the second limit rib **2023** cooperate with each other to collectively confine the focusing guide assembly **204** within the limit channel **205**.
[0096] In some embodiments, as shown in FIG. **7**, a side of the lens barrel **202** close to the anti-shake drive module **3** is formed with limit edges **2024**, and the second limit groove **2021** extends from the lens barrel **202** to the limit edge **2024**. The base **2012** is provided with limit holes **2024** that corresponds to the limit edges **2024** one by one, and the first limit groove **20121** extends into the limit holes **2024**. During assembly, each of the limit edges **2024** can be inserted in the corresponding limit holes **20124**, which can quickly and accurately realize the positioning of the lens barrel **202** and the base **2012**.
[0097] In some embodiments, the focusing drive module **2** further includes a focusing drive chip and a focusing chip magnetic steel. The focusing drive chip and the focusing chip magnetic steel cooperate with each other to detect the position of the lens barrel **202**. The focusing drive chip may be fixed to the third circuit board **208** and electrically connected to the third circuit board **208**. The focusing chip magnetic steel is fixed to the lens barrel **202** and is arranged opposite to the focusing drive chip. The focusing drive chip may control a current of the focusing coil **2032** while obtaining a change in the position of the focusing chip magnetic steel.
[0098] In some embodiments, the model number of the focusing drive chip may be AK7316.
[0099] In this embodiment, the focusing magnetic steel **2031** is fixed to the first casing **201**, and the focusing coil **2032**, the focusing magnetic yoke **206**, and the focusing chip magnetic steel are all fixed to the lens barrel **202**. That is, the focusing coil **2032**, the focusing magnetic yoke **206**, the focusing chip magnetic steel, and the lens barrel **202** can move together.

[0100] In some embodiments, as shown in FIGS. **12-13**, the second casing **301** includes a second shell **3011** and a base **3012**. The base **3012** is covered on a side of the second shell **3011** away from the focusing drive module **2**, and the edge of the base **3012** is formed with a convex portion **30121** extending outwardly from the base **3012**. The edge of the second shell **3011** is formed with a concave portion **30112**. The concave portion **30112** can be configured to accommodate the convex portion **30121**. The convex portion **30121** and the concave portion **30112** are fixed together by laser welding, which is not only securely fixed, but also convenient for production. The gap between the second shell **3011** and the base **3012** is glued and sealed, thereby effectively securing the second shell **3011** and the base **3012**, and protecting the parts within the second shell **3011**.
[0101] In some embodiments, the anti-shake drive module **3** may further include a gasket **309**, refer to FIGS. **12-13**. The gasket **309** is padded between the first circuit board **306** and the base **3012**, which can effectively protect the image sensor **303** and the first circuit board **306**. Further, the gasket **309** may be abutted between the circuit board fixing portion **3063** and the base **3012**.
[0102] In some embodiments, a second mounting hole **30113** is provided in the second casing **301**, as shown in FIG. **4**. The second mounting hole **30113** cooperates with the lens module **1**. A lower end of the first casing **201** is formed with a limiting tab **20125** inserted in the second mounting hole **30113**, so that the focusing drive module **2** can be quickly and effectively positioned on the anti-shake drive module **3**.
[0103] In this embodiment, the second mounting holes **30113** are opened in the second shell **3011**. The limit tabs **20125** are formed in the base **2012**.
[0104] In some embodiments, as shown in FIG. **10**, the limit hole **20124** may extend to the limit tab **20125**, which may effectively reduce the thickness of the base **2012**, making the focusing drive module **2** more compact in structure, and thus effectively reducing the size of the camera device **10**.
[0105] It should be understood that in some embodiments, the limit hole **20124** may be a blind hole, as shown in FIG. **10**. In other embodiments, the limit hole **20124** may also be a through hole, as shown in FIG. **20**. The specific structure of the limit hole **20124** is not limited in the present application.
[0106] In some embodiments, the second shell **3011** may include a casing portion **30114** and a support seat **30115**. The support seat **30115** is abutted within the casing portion **30114**, and the support seat **30115** is provided with a second support post **30116** that extends toward the base **3012**, as shown in FIG. **12** and FIG. **13**. The second support post **30116** may be abutted against the circuit board fixing portion **3063**, thereby quickly and efficiently realizing the positioning of the second shell **3011** with the first circuit board **306**, and making the structure of the anti-shake drive module **3** more stable.
[0107] In this embodiment, the second limit cylinder **30111** is formed on the support base **30115**.
[0108] In some embodiments, as shown in FIGS. **12** and **13**, the anti-shake drive module **3** further includes an optical filter **310**. The optical filter **310** is covered on the image sensor **303**, and the optical filter **310** is fixed to the first circuit board body **3062**.
[0109] Embodiments of the present application further provide an electronic device including a device body and any one of the above-mentioned camera devices **10**. The camera device **10** is provided on the device body.
[0110] Described above are only some embodiments of the present application. It should be pointed out that for the ordinary skilled person in the field, under the premise of not departing from the creative concept of the present application, improvements may also be made, but these are within the scope of protection of the present application.

Claims

1. A camera device, comprising: a lens module; a focusing drive module comprising: a first casing; a lens barrel accommodated in the first casing and fixed with the lens module; a focusing drive

assembly; the focusing drive assembly being connected to the first casing and the lens barrel for driving the lens barrel to move with respect to the first casing, and comprising a focusing magnetic steel and a focusing coil that are arranged correspondingly, wherein the focusing magnetic steel is fixed to the first casing, and the focusing coil is fixed to the lens barrel; and a focusing guide assembly confined between the first casing and the lens barrel for guiding the lens barrel in a direction of an optical axis of the lens module; and an anti-shake drive module comprising: a second casing; an image sensor; a bracket accommodated in the second casing and fixed with the image sensor; an anti-shake drive assembly connected to the second casing and the bracket for driving the bracket to move with respect to the second casing; and an anti-shake guide assembly confined between the second casing and the bracket for guiding the bracket in a direction perpendicular to the optical axis of the lens module; wherein the lens module, the focusing drive module, and the anti-shake drive module are sequentially fixed into one unit.

2. The camera device of claim 1, wherein the anti-shake drive module comprises a planar first circuit board partially accommodated in the second casing; the first circuit board is fixed to a side of the bracket away from the lens module, and a first mounting hole is provided in a middle of the first circuit board; the image sensor is fixed in the first mounting hole, and the image sensor and the anti-shake drive assembly are electrically connected to the first circuit board.

3. The camera device of claim 2, wherein the first circuit board comprises a first circuit board body provided with the first mounting hole, a circuit board fixing portion elastically connected to an outside of the first circuit board body, and a first electrical connection portion fixed to the circuit board fixing portion; the first circuit board body and the circuit board fixing portion are accommodated in the second casing, and the first circuit board body is fixed to the bracket; the circuit board fixing portion is fixed to the second casing, and the first electrical connection portion is extended out of the second casing; the first circuit board further comprises a plurality of avoiding spaces that are symmetrically arranged, wherein the avoiding spaces are formed between the first circuit board body and the circuit board fixing portion; a side of the bracket facing the first circuit board is provided with anti-collision tabs arranged one-to-one with the avoiding spaces; each of the anti-collision tabs is arranged through one of the avoiding spaces correspondingly, and the bracket further comprises an anti-collision surface parallel to the direction of the optical axis.

4. The camera device of claim 2, wherein there are a plurality of the anti-shake guide assemblies, and each of the anti-shake guide assemblies is confined between the second casing and the bracket, and comprises a first ball and two support pieces; wherein the two support pieces are abutted against opposite ends of the first ball along the direction of the optical axis, respectively; one of the support pieces is also abutted against the second casing, and the other of the support pieces is also abutted against the bracket.

5. The camera device of claim 4, wherein there are a plurality of the anti-shake drive assemblies, and each of the anti-shake drive assemblies is connected to the second casing and bracket, and comprises an anti-shake magnetic steel and an anti-shake coil that are arranged correspondingly; wherein the anti-shake magnetic steel is fixed to the second casing, and the anti-shake coil is fixed to the bracket and electrically connected to the first circuit board; the anti-shake drive module further comprises anti-shake magnetic yokes arranged in correspondence with the anti-shake drive assemblies, wherein the anti-shake magnetic yokes are fixed to the bracket.

6. The camera device of claim 5, wherein the anti-shake drive module further comprises a second circuit board; the second circuit board is fixed between the anti-shake coil and the bracket, and the anti-shake coil is electrically connected to the first circuit board through the second circuit board.

7. The camera device of claim 1, wherein there are a plurality of the focusing guide assemblies; each of the focusing guide assemblies is confined between the first casing and the lens barrel, and comprises a plurality of second balls arranged sequentially along the direction of the optical axis.

8. The camera device of claim 7, wherein there are three second balls, and a diameter of the second ball located in the middle is smaller than diameters of two second balls located on both sides.

9. The camera device of claim 1, wherein there are a plurality of the focusing drive assemblies; each of the focusing drive assemblies is connected to the first casing and lens barrel respectively; the focusing drive module further comprises a focusing magnetic yoke arranged in correspondence with the focusing drive assemblies, wherein the focusing magnetic yoke is fixed to the lens barrel.
10. The camera device of claim 9, wherein the first casing comprises a first shell and a base inserted within the first shell, and the focusing drive module further comprises an elastic member and a third circuit board; the elastic member is connected to the base and lens barrel; a conductive insert is embedded in the base, and the focusing coil is electrically connected to the third circuit board through the elastic member and the conductive insert in turn.
11. The camera device of claim 1, wherein the second casing comprises a second shell and a base covered on a side of the second shell away from the focusing drive module; a convex portion is formed by extending outwardly from an edge of the base, and an edge of the second shell is formed with a concave portion for accommodating the convex portion; the convex portion and the concave portion are fixed together by laser welding, and a gap between the second shell and the base is glued and sealed.
12. The camera device of claim 1, wherein the second casing is provided with a second mounting hole for cooperating with the lens module, and a lower end of the first casing is formed with a limiting tab inserted in the second mounting hole.
13. The camera device of claim 1, wherein the anti-shake guide assembly is further configured to guide the bracket to rotate on an axis of the optical axis in a plane perpendicular to the optical axis.
14. An electronic device, comprising an device body and a camera device of claim 1, wherein the camera device is provided on the device body.